THE FLORIDA STATE UNIVERSITY
COLLEGE *of* LAW
Public Interest Law Center
Children's Advocacy Clinic
International Human Rights Advocacy Clinic
Farmworker & Immigration Rights Clinic

June 20, 2022

United Nations
The Office of the High Commissioner for Human Rights
Special Rapporteur on Contemporary Forms of Racism, Racial Discrimination, Xenophobia and Related Intolerance

Re: *Call for Submissions: 2022 Report on Climate and Racial Justice to the General Assembly*

Dear Special Rapporteur:

Please accept the enclosed submission on behalf of the Florida State University College of Law Public Interest Law Center's (PILC) International Human Rights Advocacy Clinic (IHRAC), and The Farmworker Association of Florida, Inc. (FWAF).

IHRAC offers students hands-on experience representing individual human rights survivors and international non-governmental organizations engaged in human rights advocacy. Participating students gain experience in areas including fact-finding, evidence collection, research, reports, policy briefs, litigation, UN standard setting, and norm development. Students develop a variety of skills including interviewing, persuasive writing, media, collaboration, leadership, professional identity, trauma-informed advocacy, and methods to cope with vicarious trauma. Students discuss current events in human rights and the role lawyers play in the human rights movement.

FWAF is a 39-year-old, statewide, grassroots, community-based, farmworker membership organization with five offices in the state and over 10,000 Haitian, Hispanic and African American members who have worked in the citrus, vegetable, mushroom, tropical fruit, fern, and ornamental plant industries. The organization's pesticide safety and environmental health and climate justice programs work to address the historic environmental injustices impacting Florida's communities. FWAF's long-standing mission is to build power among farmworker and rural low-income communities, and to respond to and gain control over the social, political, economic, workplace, health, and environmental justice issues that impact their lives. The organization's guiding vision is a social environment where farmworkers' contribution, dignity, and worth are acknowledged, appreciated, and respected through economic, social, and environmental justice. This vision includes farmworkers being treated as equals, and not exploited or discriminated against based on race, ethnicity, gender, immigration or socioeconomic status.

PILC and FWAF collaborate to offer an immersive Alternative Spring Break program. Each year, a group of students from FSU College of Law is selected to travel to a farmworker

community in Apopka, Florida, home of FWAF's headquarters. The students work alongside FWAF to learn about the environmental, legal, and cultural issues that migrant workers face. Students receive education on the U.S. immigration system, such as the legal requirements for obtaining a work visa. In addition to learning about these issues through the FWAF, students work directly with migrant workers to gain a better understanding of the issues they face. Students learn about labor trafficking from area experts and survivors. Jeannie Economos, Coordinator of FWAF's Pesticide Safety and Environmental Health Program and a leading expert and advocate on farmworker rights, serves as the "tour guide" for the trip. Her passionate energy is infectious, and she provides the students with a top-notch, hands-on learning experience that always serves as one of the highlights of their law school career.

It is an honor for our organizations to partner in making this submission. Thank you for your commitment to advancing climate and racial justice. Should we be able to provide further assistance or support to your work, please do not hesitate to contact us.

Gratefully,

Sophia Muina, JD Candidate, Graduate Student in International Affairs, Class of 2023
Research Assistant, International Human Rights Advocacy Clinic

Darby Kerrigan Scott, Esq.
Director, International Human Rights Advocacy Clinic

Jeannie Economos
Coordinator, Pesticide Safety and Environmental Health Program, The Farmworker Association of Florida, Inc.

Sara Mangan, Esq.
Climate Justice Organizer
The Farmworker Association of Florida, Inc.

Introduction

The United States has a long history of racism in the agricultural sector – forcefully removing Native Americans from their homelands, forcing enslaved Africans and their descendants to work the land, and exploiting Hispanic farmworkers under inhumane conditions. Inequity is still prevalent in the United States today, with white non-Hispanic individuals owning 98% of farmland while 80% of the labor force is Hispanic.[1] Federal and state policy has historically favored white men, with some states blocking reparations or ownership of land by nonwhite individuals.[2] Homestead acts have given subsidized farms disproportionately to white individuals and corporations while the federal government has often discriminated in lending to nonwhite farmers.[3] Finally, southern landowners' efforts to exclude Black sharecroppers from the New Deal legislation during the Great Depression began an enduring phenomenon known as agricultural exceptionalism, or the systematic exclusion of farmworkers from federal labor protections such as the National Labor Relations Act and Fair Labor Standards Laws.[4]

Raking in $7.4 billion in agricultural cash receipts in 2020, Florida has one of the largest agricultural sectors in the country.[5] Over the last century, there has been a 74% decrease of Black farmers in the state due to a lack of access to support often available to white farmers.[6] Discriminatory lending practices, only relatively recently barred, contribute to nonwhite farmers playing catch up with their counterparts with no measures in place to close the gap.[7] Additionally, the Florida Legislature has failed to pass legislation to protect farmworkers from the effects of excessive heat during intense labor.[8]

These deliberate policy choices, coupled with climate change, continue to impact lower income BIPOC (Black, Indigenous, and People of Color) communities in the agriculture sector. Whether

[1] Megan Horst, How Racism Has Shaped the American Farming Landscape (Jan. 24, 2019), https://www.eater.com/2019/1/25/18197352/american-farming-racism-us-agriculture-history (last visited June 12, 2022).
[2] *Id*.
[3] *Id*.
[4] Sarah O. Rodman, Agricultural Exceptionalism at the State Level: Characterization of Wage and Hour Laws for U.S. Farmworkers (Feb. 22, 2016), Jour. of Agriculture, Food Systems, and Community Development (last visited June 19, 2022).
[5] Florida, Economic Impact of Agriculture (n.d.), https://economic-impact-of-ag.uada.edu/florida/#:~:text=In%202020%2C%20Florida%20generated%20around,percent%20of%20total%20state%20GDP (last visited June 22, 2022).
[6] Anthony Hill, Black farmers in our area say long legacy of institutional racism has led to their disappearance (Jan. 15, 2021), https://www.abcactionnews.com/longform/how-black-farmers-in-our-area-say-a-long-legacy-of-institutional-racism-has-led-to-their-disappearance (last visited June 22, 2022).
[7] *Id*.
[8] Sam Bloch, Florida farm workers endure 116 dangerously hot working days every growing season. Laws to protect them have failed three years in a row (Jul, 7, 2020), https://thecounter.org/florida-laws-fail-to-protect-farm-workers-unsafe-working-days-due-to-heat/ (last visited June 22, 2022).

undocumented (like the majority of farmworkers) or recipients of H-2A guest worker visas, agricultural workers face significant risk of exploitation.

Sugar Cane Burning

Florida was the largest sugar cane producer in 2019 at 15.8 million tons.[9] Sugar cane burning has impacted the health of residents in Florida's communities around the south shore of Lake Okeechobee.[10] The burning season occurs for six to eight consecutive months.[11] The communities of Belle Glade, Pahokee, and South Bay are home to many low-income BIPOC communities.[12] Belle Glade, for instance, has a significant population of agricultural workers of Haitian and Jamaican descent.[13] The sugar companies selectively burn toward low-income communities, rather than wealthier communities of Palm Beach County such as Wellington.[14] Burn restrictions are implemented if prevailing winds would blow smoke into this higher-end development.[15]

In wealthier communities, green harvesting is utilized as an alternative to sugar cane burning.[16] Many places around the world have made this switch and countries such as Brazil have committed to phasing out burning in response to the detrimental environmental and health impacts.[17] In green harvesting, machines are used to remove the outer foliage of the sugar cane rather than burning it.[18] In turn, the foliage can be used for many purposes and thus leads to the creation of new jobs with minimal impact to the environment.[19]

In 2021, the Florida legislature passed SB 88, later signed into law by Governor DeSantis.[20] The law generally prohibits individuals who live more than a half mile from the site from holding farms liable for nuisance with limited exceptions.[21] This law bars those affected by sugar cane burning from seeking compensation for the damage to their health and devaluation of their

[9] Mark Hudson, Agriculture in the Sunshine State (Jul. 29, 2021), https://www.usda.gov/media/blog/2019/10/15/agriculture-sunshine-state (last visited June 22, 2022).
[10] Nano Riley, Burning Sugarcane in Florida is Making People Sick. Could "Green Harvesting Change the Game?, Civil Eats (July 15, 2019), at 1 (last visited May 20, 2022).
[11] Robert Mitchell, End the injustice of sugarcane burning (Feb. 12, 2022), https://www.palmbeachpost.com/story/opinion/2022/02/12/commentary-end-burning-sugarcane-now/6734007001/ (last visited June 22, 2022).
[12] Riley, *supra* note 10 at 2.
[13] *Id*.
[14] *Id*.
[15] *Id*. at 4.
[16] *Id*. at 2.
[17] *Id*. at 5.
[18] *Id*.
[19] *Id*.
[20] Governor Signs Right to Farm Bill Following Overwhelming Legislative Support, Office of the Florida Governor (Apr. 29, 2021), https://www.flgov.com/2021/04/29/governor-signs-right-to-farm-bill-following-overwhelming-legislative-support/ (last visited June 9, 2022).
[21] Fla SB 88 (2021).

property.[22] Given the distance smoke carries, many affected by the burning will not have access to recourse.[23] This impunity for the sugar industry removes a large incentive to make the switch to greener alternatives while continuing to create long-term health effects for low-income communities and reduce the value of their properties. It should be noted that the sugar industry spent $11 million on Florida campaigns in 2020.[24]

Pesticide Use

The increased dependency on pesticides can be traced back to colonization. Native populations cultivated and utilized a vast knowledge of natural pesticide control known as Traditional Ecological Knowledge (TEK) over thousands of years.[25] The decimation of native populations by colonization also meant the destruction of their practices and knowledge, shifting to a capitalist system that sought to expand wealth as fast as possible at the expense of the environment.[26] Pesticides not only impact the health of those exposed, but the runoff into lakes disrupts the ecosystem, contaminating bodies of water and their inhabitants.[27]

Currently, the United States uses 1.1 billion pounds of pesticides annually.[28] These contain 1,000 active substances, 16,000 formulations, and often used as mixtures, with the Federal Insecticide Fungicide Rodenticide Act (FIFRA) regulating their use.[29] All pesticides must be registered with the Environmental Protection Agency (EPA) and the impact of the pesticides are weighed against the benefits. Although FIFRA sets uniform standards, states have the authority to regulate pesticide use.[30] Florida applies pesticides at a rate seven times the national average. Of the most commonly applied pesticides,[31] ten are listed as having dire health effects, three contain acute toxicity, and eight are described by the EPA as causing injury or death through skin

---

[22] Robbie Gaffney, Democratic Lawmakers, Advocates Say Right to Farm Bill is Ploy to Protect Sugarcane Burning (Apr. 7, 2021), https://news.wfsu.org/state-news/2021-04-07/democratic-lawmakers-advocates-say-right-to-farm-bill-is-ploy-to-protect-sugarcane-burning (last visited June 12, 2022).
[23] Mike Kiniry, Is Right to Farm Really About the Right to Farm? (May 3, 2021), https://news.wgcu.org/show/gulf-coast-life/2021-05-03/is-right-to-farm-really-about-the-right-to-farm (last visited June 12, 2022).
[24] Mary Ellen Klas, After sugar's $11 million flex, Florida lawmakers push to protect industry (Mar. 31, 2021). https://www.tampabay.com/news/florida-politics/2021/03/31/after-sugars-11-million-flex-florida-lawmakers-push-to-protect-industry/ (last visited June 12, 2022).
[25] Nathan Donley et. al., Pesticides and Environmental Injustice Root Causes, Current Regulatory Reinforces and a Path Forwards, 22 BMC Public Health (2022).
[26] *Id*.
[27] Report on Community Health Survey, Lake Apopka Farmworkers Environmental Health Project (May 2006), at 3.
[28] Pesticides in our Food System, FoodPrint (Apr. 4, 2018), https://foodprint.org/issues/pesticides/#:~:text=The%20most%20recent%20report%20on,six%20billion%20pounds%20used%20worldwide (last visited June 12, 2022).
[29] Lihlani Nelson, Pesticides and Farmworker Health, Center for Agricultural Food Systems (May 12, 2022). Powerpoint.
[30] *Id*.
[31] Donley et. al., *supra* note 25.

contact.[32] Often, farmworkers do not receive the proper pesticide training to use the chemicals as safely as possible.[33] In addition, farmworkers may not be provided with or use adequate protective gear.[34] As one farmworker recounted in The Farmworker Association of Florida, Inc.'s (FWAF) study, "That spray made you dizzy and sleepy. They didn't give you anything to protect yourself, no gloves, no goggles, no facemask."[35]

The federal and state enforcement mechanisms for pesticide regulations are often inadequate, and neither federal nor state policies specifically consider the health impacts on farming communities' regular exposure.[36] The EPA does not consider the impact on specific communities when weighing the costs on health against economic benefits. Rather, the negative impact of the pesticide is weighed *in general* against the cost of the product *to society*.[37] The constant exposure of farmworkers is not factored into this analysis.[38] Additionally, the EPA does not weigh the impact of multiple pesticides being used at the same time.[39] Reproductive health is impacted by exposure to pesticides, yet how the mixing of these chemicals contributes to reproductive health is not considered.[40] Although OSHA covers field sanitation regulations on farms, this protection excludes 93% of farms that employ 1.2 million workers because they are classified as small farms.[41]

Rising temperatures have increased the use of pesticides due to the increase in pests and disease, leading to higher rates of exposure to farmworkers.[42] Protective clothing, or PPE, can increase one's internal body temperature by 12-27 degrees Fahrenheit.[43] This also increases the rate of secondary and take-home exposures as pesticide residues stick to clothing and are brought back into dwellings, putting entire families at risk.[44] Noncompliance with regulations of required signage of treated areas and re-entry intervals can lead workers to become exposed to pesticide

[32] Lihlani Nelson, Pesticides, Farmworker Justice's Environmental Justice Symposium, (May 2022), https://prod-stitched-screen-recordings.s3-ap-south-1.amazonaws.com/recordings/b1cca8a0-bc2e-11ec-9458-c5ffdd47e3cc/678aee4a-e98e-4073-a998-2c0ce03124f7/b1cca8a0-bc2e-11ec-9458-c5ffdd47e3cc_f103e477.mp4 (last visited June 20, 2022).
[33] Donley et. al., *supra* note 25.
[34] *Id*.
[35] Laura Bermudez, Farmworkers in Florida: Silence is their Rational Choice (Sept. 18, 2012), https://floridafarmworkers.org/wp-content/uploads/2021/07/RESOURCES-03-LauraBermudez-final-report-with-cover-page.pdf at 6 (last visited June 20, 2022).
[36] Nelson, *supra* note 32.
[37] *Id*.
[38] *Id*.
[39] *Id*.
[40] *Id*.
[41] *Id*.
[42] Farmworkers at Risk: The Growing Dangers of Pesticide and Heat, Union of Concerned Scientists (2019) at 4.
[43] *Id*. at 5.
[44] *Id*. at 4, 6.

residues.[45] One farmworker explained that "there were no signs to explain to workers that they should leave the room and come back at a later time".[46]

These policies have a disproportionate impact on BIPOC communities. One study indicated 12 of 14 markers of harmful pesticides were found in levels up to five times higher in Black and Mexican populations than white populations.[47] Today, approximately 86% of farmworkers in the U.S. are Hispanic.[48] Various intersectional issues and barriers increase the vulnerability of the largely Hispanic farm-working population, including language barriers and immigration status.[49]

Heat-Related Illness

Despite the advancement of technology, many agricultural sectors require manual labor. Rising temperatures for prolonged periods lead to a higher risk of heat-related illnesses (HRI) among workers. One study found only 16% of farmworkers reported receiving any form of HRI training and only two states implement heat-related regulations.

Currently, there are no federal standards to protect workers from heat stress.[50] A study conducted to document the intensity of labor performed by Florida farmworkers determined they worked at higher levels of vigorous activity than the average worker.[51] Among the study group, crop workers would slow down in response to a rise in temperature, while fernery and nursery workers who were generally less impacted by the heat—potentially due to shorter work days and more opportunities for air conditioned breaks—would remain working at the same levels.[52] The study showed outdoor workers are exposed to temperatures above the National Institute of Occupational Safety and Health recommended limits.[53]

Working conditions also contribute to a heightened risk of HRI for farmworkers. Payment by piece rate instead of an hourly wage or salary creates a disincentive to rest or take water breaks.[54] Additionally, employer-provided housing may lack reliable and adequate A/C or fans.[55] As mentioned earlier, protective gear increases the core body temperature for farmworkers which in

[45] Donley et. al., *supra* note 25.
[46] Bermudez, *supra* note 35 at 9.
[47] Donley et. al., *supra* note 25.
[48] Abby D. Mutic et. al, Classification of Heat-Related Illness Symptoms Among Florida Farmworkers (Aug. 27, 2017), 50.1 Jour. of Nursing Scholarship at 77.
[49] *Id*. at 75.
[50] Union of Concerned Scientists, *supra* note 42 at 5.
[51] Jacqueline M. Mix et. al., Physical Activity and Work Activities in Florida Agricultural Workers, Am. Jour. of Industrial Medicine (2019) at 1063.
[52] *Id*. at 1063.
[53] *Id*.
[54] *Id*. at 1059.
[55] Union of Concerned Scientists, *supra* note 42 at 5.

turn creates a greater risk for HRI. To add to the problem, many farmworkers have no access to health insurance or worker's compensation to address the symptoms of HRI.

Farmworker Housing

Housing options for farmworkers are limited, with 85% of farmworkers accessing housing in the private market.[56] Of those, 60% rent while the remaining own.[57] In rural areas close to where they work, the availability of quality rentals is minimal.[58] Given that their salaries are tied to seasonal crop production, workers may not be approved for a rental.[59] Migrant farmworkers also face difficulties searching for temporary housing as they migrate following crop seasons and seasonal demands.[60] Despite certain regulations required for safe housing, enforcement in rural farm areas is weak and many lack a safe supply of potable water, septic systems, reliable power sources, and basic municipal services. One example is nitrate contamination of drinking water.[61] FWAF has conducted outreach in farmworker communities, documenting these unsafe conditions and overcrowding.[62]

Although they make up less than 20% of housing for farmworkers, employer-provided accommodations pose multiple risks for farmworkers. Housing conditions vary throughout states, but on the eastern migrant stream, many often rely on labor contractors for housing and transportation.[63] These housing units are frequently located near where pesticides are sprayed, increasing exposure through pesticide drift and exposure to residues. Existing power imbalances are exacerbated when the employer is the source of both income *and* housing for workers, who may choose to endure poor conditions for fear of losing their income and shelter simultaneously.

Immigration Policies

A key issue affecting farmworkers that intersects with climate and racial justice is U.S immigration policies. Over half of farmworkers lack immigration status, and those who come legally under temporary H-2A worker visas are vulnerable to abuse.[64] The use of recruitment agents to bring individuals from other countries exploits the vulnerable workers and severely

[56] Farmworkers Housing and Health in the United States- A General Introduction and Overview (Sept. 24, 2014) at 8.
[57] *Id*.
[58] *Id*.
[59] *Id*.
[60] *Id*. at 11.
[61] Sara Mangan, Request for Information to solicit feedback on the beta version of the Climate and Economic Justice Screening Tool, CESJT at 5.
[62] *Id*.
[63] Farmworkers Housing and Health in the United States, *supra* note 56 at 9.
[64] No Way to Treat a Guest: Why the H-2A Agricultural Visa Program Fails U.S. and Foreign Workers, Farmworker Justice (2012) at 7-8.

limits their options for recourse.[65] Climate change impacts are forcing more people to migrate and increasing the number of individuals seeking work in the United States,[66] leading to increased exploitation of already very vulnerable populations.[67]

Employers must show there is a shortage of domestic workers before qualifying to hire workers under an H-2A visa.[68] These workers are exempt from social security and unemployment tax, making them a desirable option for employers.[69] When a worker comes under an H-2A visa, she or he agrees to work for a specific employer and does not have the option to leave and look for another job.[70] Often, these workers are recruited through recruitment agents who are hired by farm owners.[71] Agents will often charge farmworkers an illegal recruitment fee, forcing them to start their work in the United States in debt.[72] Located in the farmworkers' home countries, these agents often threaten their families and homes if they fail to pay or try to leave the job.[73]

Although H-2A guest workers make up only 11% of full-time farmworkers,[74] their lack of protection sets a dangerous standard in the industry.[75] These workers are commonly subjected to poor wages and working conditions.[76] Farmworkers often have no bargaining or political power, leaving them with few options but to continue working under exploitative conditions.[77] The H-2A visas offer no path to a permanent immigration status in the U.S.[78] A farmworker recounted the environment in the nursery where she worked as being constantly under pressure to work quickly. "They want you to always rush…and just so that they don't fire you, well you just give more, go and work faster."[79] She discussed how her health symptoms from the pesticides were ignored by the owners. Developing a severe rash accompanied by a burning sensation and white blotches, the farmworker went to a clinic after six months without improvement.[80] Fearing for

[65] *Id*. at 7.
[66] Sarah Bermeo, Climate migration and climate finance: Lessons from Central America (Nov. 19, 2021), https://www.brookings.edu/blog/future-development/2021/11/19/climate-migration-and-climate-finance-lessons-from-central-america/ (last visited June 12, 2022).
[67] Farmworker Justice, *supra* note 64 at 17.
[68] *Id*.
[69] *Id*.
[70] *Id*.
[71] *Id*. at 22.
[72] *Id*.
[73] *Id*. at 23.
[74] Philip Martin, A Look at H-2A Growth and Reform in 2021 and 2022 (Jan. 3, 2022), www.wilsoncenter.org/article/look-h-2a-growth-and-reform-2021-and-2022#:~:text=H-2A%20workers%20are%20in,jobs%20in%20US%20crop%20agriculture (last visited June 12, 2022).
[75] Farmworker Justice, *supra* note 64 at 11.
[76] *Id*.
[77] *Id*. at 8.
[78] *Id*. at 12.
[79] Bermudez, *supra* note 35 at 17.
[80] *Id*.

her job, she opted to not report it as a work-related injury.[81] She also reported only receiving one official 15-minute break during the entire working day.[82]

Lack of immigration status for most farmworkers coupled with labor market conditions make it difficult to find an alternative, safer job. The limited options available outside of farm work often require some form of transportation, which can pose a significant barrier.[83] Although some use employment agencies to find alternative work, undocumented status can hinder access to these resources and alternative employment options are inconsistent.[84] A farmworker testified there would be days without any work available, and employment agencies began requiring more documentation.[85]

With the increase of climate change comes an increase of climate refugees escaping food insecurity.[86] A persistent drought has impacted the Dry Corridor in Central America, depleting the means of survival of subsistence farmers that rely on the land.[87] Studies show a decrease in precipitation leads to an increase of migrant flows, creating a direct link between food insecurity and migration.[88] As developed countries are reluctant to fund grassroots organizations to address climate change resilience in regions most impacted, the flow of climate refugees will continue to increase.[89]

Conclusion

The lack of sufficiently protective federal regulations and oversight in agriculture has created an industry ripe for the exploitation of its workers. The immigration policies of the United States make it difficult for farmworkers—whether undocumented or subject to an H2-A visa—to obtain protection, leaving them fearful of their employers with little choice but to endure exploitative and abusive working conditions. Climate change is leading to hotter weather and more dangerous working conditions, compounding these problems.

The United States must implement fair immigration policies, end the exclusion of farmworkers from labor protections, create more oversight and enforcement, and address both the health hazards and environmental injustice of exposure to sugar cane burning, extreme heat, and various pesticides to provide farmworkers with adequate protection. Ultimately, the United

[81] *Id*.
[82] *Id*.
[83] *Id*. at 12.
[84] *Id*.
[85] *Id*.
[86] Sarah Bermeo, Climate migration and climate finance: Lessons from Central America (Nov. 19, 2021), https://www.brookings.edu/blog/future-development/2021/11/19/climate-migration-and-climate-finance-lessons-from-central-america/ (last visited June 12, 2022).
[87] *Id*.
[88] *Id*.
[89] *Id*.

States must be more proactive in addressing climate change by drastically cutting carbon emissions and working with developing countries to increase overall climate resilience.

Additionally, recent research and studies have shown the potential of regenerative and agroecological practices of agriculture to mitigate the effects of climate change and sequester carbon, while utilizing a non-extractive method of agricultural production.

Index of Supporting Documents

1. Farmworker Justice, Issue Brief: The Climate Crisis and its Impact on Workers (May 2022).

2. Sara Mangan, Request for Information to solicit feedback on the beta version of the Climate and Economic Justice Screening Tool, CESJT.

3. Laura Bermudez, Farmworkers in Florida: Silence is their Rational Choice (Sept. 18, 2012).

4. Sarah O. Rodman, Agricultural Exceptionalism at the State Level: Characterization of Wage and Hour Laws for U.S. Farmworkers (Feb. 22, 2016), Jour. of Agriculture, Food Systems, and Community Development (last visited June 19, 2022).

5. No Way to Treat a Guest: Why the H-2A Agricultural Visa Program Fails U.S. and Foreign Workers, Farmworker Justice (2012).

6. Farmworkers Housing and health in the United States- A General Introduction and Overview (Sept. 24, 2014).

7. Nathan Donley, et. al, Pesticides and Environmental Injustice in the USA: Root Causes, Current Regulatory Reinforcement, and a Path Forward, 22 BMC Public Health (Apr. 19, 2022).

8. Public Citizen, Unworkable: Dangerous Heat Puts Florida Workers at Risk

9. Jacqueline M. Mix et. al., Physical Activity and Work Activities in Florida Agricultural Workers, Am. Jour. Of Industrial Medicine (2019).

10. Farmworkers at Risk: The Growing Dangers of Pesticide and Heat, Union of Concerned Scientists (2019).

11. Nano Riley, Burning Sugarcane in Florida is Making People Sick. Could “Green Harvesting Change the Game?, Civil Eats (July 15, 2019).

12. Abby D. Mutic et. al, Classification of Heat-Related Illness Symptoms Among Florida Farmworkers (Aug. 27, 2017), 50.1 Jour. of Nursing Scholarship

13. Report on Community Health Survey, Lake Apopka Farmworkers Environmental Health Project (May 2006).

FARMWORKER JUSTICE

Issue Brief

The Climate Crisis and Its Impacts on Farmworkers

Prepared for Farmworker Justice's
Environmental Justice Symposium; May 17-18th, 2022

Introduction

The climate crisis severely impacts the health and livelihoods of the approximately 2.4 million farmworkers in the U.S.[1] Rising temperatures increase the risk of heat-related illnesses and deaths and also allow pest populations to grow and expand their range, leading to greater use of toxic pesticides by agricultural employers. Changing weather patterns result in more frequent and longer droughts, increasingly severe storms and wildfires, and other natural disasters that threaten farmworkers' food security and access to clean water, in addition to their physical safety.

The socioeconomic challenges farmworkers face cause them to experience the effects of the climate crisis more severely. Approximately 37 percent of the nation's farmworkers do not have work authorization,[2] and over 300,000 workers are on H-2A temporary visas.[3] Twenty-one percent of farmworkers have family incomes below the federal poverty level. Language barriers are common; 67 percent of farmworkers report being limited English proficient (64 percent speak Spanish as their primary language and 3 percent speak indigenous languages). [4]

Further, farmworkers endure hazardous working conditions. Unlike most occupations, agriculture is exempt from many federal labor protections. Moreover, there is insufficient enforcement of agricultural workplace safety regulations; smaller farms with fewer than 10 employees are exempted by law from enforcement of federal Occupational Safety and Health Administration (OSHA) rules.

These factors make it extremely difficult for farmworkers to withstand the health and economic impacts of the climate crisis. Farmworker Justice's Environmental Justice Symposium, May 17 and 18, 2022, brings together experts and professionals across the environmental, health, and farmworker community to share information and recommendations regarding climate change and farmworkers. This issue brief outlines some of the most relevant laws, regulations, and government programs regarding heat stress, pesticides, food security, and water access. The Symposium will highlight the intersection of these issues and climate change in farmworker communities.

Heat Stress

Among all weather-related workplace hazards, heat is the leading cause of worker deaths. Agricultural workers face a rate of heat-related death 35 times higher than the rate for all other industries in the U.S.[5] Heat exposure may cause heat exhaustion, dizziness, nausea, acute kidney injury and, over the long term, increase the risk for chronic kidney disease.

Federal Overview

The U.S. does not have a federal standard to protect workers from excessive heat. On October 27, 2021, the Occupational Safety and Health Administration (OSHA) announced that it will create a standard to address heat exposure in the workplace.[6] The proposed rule is part of the Biden Administration's inter-agency effort to address extreme heat.[7] In the absence of a federal standard, OSHA's General Duty Clause applies.[8]

On April 8, 2022, OSHA also launched a National Emphasis Program (NEP) to protect outdoor and indoor workers from heat hazards. The NEP enables OSHA to conduct inspections in high-risk industries on any day that heat warnings or advisories are in effect for the local area. It will also initiate compliance assistance in targeted high-risk industries on heat priority days when the heat index is expected to be 80°F or higher.

Legislation has also been introduced in Congress to address heat illness. The "Asunción Valdivia Heat Illness and Fatality Prevention Act of 2021" would require OSHA to issue a federal standard for heat stress protections within 2 years tailored to the specific hazards of the workplace and with meaningful participation of workers.[9] The standard would require that workers have guaranteed paid breaks and access to hydration, and employers would be required to create emergency response procedures, provide training, and implement acclimatization plans for workers, among other provisions.

State Overview

California was the first state to adopt a standard to protect outdoor workers from heat exposure in 2005.[10] More recently, Washington passed emergency heat rules for farmworkers to strengthen its previously existing standard, adopted in 2008.[11] Washington is working to create permanent protections based on the emergency rules.[12, 13] Oregon similarly adopted temporary emergency rules in 2021 covering employees who work outdoors in extreme heat,[14] and issued a permanent rule in May 2022.[15] On January 31, 2022, Colorado's Department of Labor and Employment issued final regulations on agricultural labor conditions, mandated by the "Farmworkers Bill of Rights."[16, 17] The regulations include several provisions on extreme heat and became effective on May 1, 2022. Minnesota has a heat standard that only applies to indoor work; therefore, most agricultural workers are not covered.[18]

There are legislative and regulatory efforts in other states to protect outdoor workers from heat exposure.

Maryland. Lawmakers passed a bill (HB 722) that requires regulators to issue standards for protections from heat exposure for outdoor workers by October 1, 2022. The bill was signed into law in May 2020.[19]

Nevada. The state began a rulemaking process in 2020 to adopt a heat stress standard and has issued a proposed rule. The rule must be finalized by the Division of Industrial Relations and approved by the Legislative Commission before it goes into effect.[20]

Virginia. The Safety and Health Codes Board voted six to five in December 2021 to end the process started two years earlier to enact heat safety rules for outdoor workers.[21, 22]

Florida. Lawmakers introduced a bill in the Senate and House (SB 732 and HB 887) to protect outdoor workers from extreme heat. However, despite a unanimous vote in the Senate Agriculture Committee, no action was taken in the House.[23, 24]

Food security

Studies show that between 20 and 80 percent of farmworkers will experience food insecurity, without consistent access to healthy or nutritious food, at some point during the year.[25] Droughts and other natural disasters that impact agriculture and the availability of work can have a tremendous impact on farmworkers' food security.

Despite their low wages, many farmworkers are ineligible for federal assistance programs. They also often live in rural communities with limited access to stores, food banks, or food assistance programs. Community-based organizations, food banks, religious organizations, and health centers, among others, provide food assistance to farmworker communities.

Federal Food Assistance Programs

There are several federal programs that provide food assistance. The Supplemental Nutrition Assistance Program (SNAP) previously known as "food stamps," provides additional financial assistance to families to purchase food.[26] During the COVID-19 pandemic, SNAP benefits were expanded to more people with increased financial assistance.[27] The Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) provides assistance in the form of federal grants to states for health care referrals, supplemental foods, and nutrition education for low-income women who are pregnant, breastfeeding, or postpartum, and to infants and children up to age five who are determined to be at a nutritional risk.[28] Additionally, the Disaster Supplemental Nutrition Assistance Program (D-SNAP) provides emergency food assistance to individuals who qualify for disaster assistance as authorized by the president. D-SNAP grants qualifying individuals one month of benefits on a debit card that can be utilized at most grocery stores.[29]

In addition to SNAP, WIC, and D-SNAP, specific programs provide free or reduced meals for children and free food for seniors. Children from low income, qualified households can receive free or reduced-price school meals through the National School Lunch Program, the School Breakfast Program, and the Summer Food Service Program.[30, 31, 32] Low-income seniors can access food through the Senior Farmers' Market Nutrition Program,[33] as well as the Commodity Supplemental Food Program.[34, 35] Finally, the U.S. Department of Agriculture (USDA) has a Community Food Projects Competitive Grant Program (CFPCGP) that provides grants to low income communities for food assistance.[36]

Eligibility and Barriers to Food Access for Farmworkers

U.S. citizens, qualified immigrants, and children under 18 years old are eligible for SNAP benefits.[37] Six states – California, Connecticut, Illinois, Maine, Minnesota, and Washington – expanded SNAP eligibility to other immigrant categories. There are no immigration restrictions

for WIC, D-SNAP, or the school lunch and breakfast programs. Only fifteen percent of farmworkers across the country utilize SNAP benefits.[38]

Pesticides

Farmworkers are often exposed to toxic pesticides in the workplace. Climate change has exacerbated the threats posed by pesticides as more pesticides are applied to combat increasing numbers of pests.[39]

Regulatory Overview

The federal and state regulations that oversee pesticide registration, labeling, application, spray, and other aspects of pesticides are complicated and diffused between different agencies. The Environmental Protection Agency (EPA) is the primary agency with oversight over pesticides. The Federal Insecticide, Fungicide and Rodenticide Act (FIFRA) authorizes EPA to register pesticides.[40] FIFRA preempts state laws on licensing requirements for pesticides. Under the Federal Food, Drug and Cosmetic Act (FFDCA), the EPA establishes tolerances (maximum legally permissible levels) for pesticide residues in food.[41] The EPA also oversees the Worker Protection Standard (WPS), which provides protections for farmworkers from pesticide exposure.[42] EPA requires that individuals who apply Restricted Use Pesticides (RUPs), the most toxic class of pesticides available, be certified in accordance with EPA and state and/or tribal regulations.[43]

EPA and the states, normally through the state agriculture department, register or license pesticides for application in the U.S.[44] Prior to registration, EPA conducts a risk assessment to determine the risk to workers from exposure to a pesticide. If the risk to workers is determined to be of concern, risk management measures may be used to manage those risks by reducing exposure. These measures may include mandating the use of personal protective equipment (PPE).[45] However, farmworkers are not always provided the PPE required, or provided training in its use. Furthermore, the use of PPE can increase the risk of heat stress.

The Occupational Safety and Health Act prohibits OSHA from having jurisdiction over workplaces and hazards that are covered by other federal agencies. Since FIFRA addresses pesticide safety and the WPS addresses workplace protections, OSHA does not have standards that specifically address pesticide exposure in the workplace. Still, the OSHA Field Sanitation Standard requires that employers make potable water and handwashing facilities available in fields, which can help reduce pesticide exposure.[46]

Enforcement and surveillance

States have the primary responsibility to enforce pesticide use violations if EPA determines there are adequate regulations to enforce the federal statutes regulating pesticides. FIFRA gives states broad latitude in enforcing pesticides, but states cannot create different labeling or packaging requirements from federal law. Tribes have limited enforcement responsibility under FIFRA.[47]

Pesticide exposure surveillance occurs at both the federal and state level. The National Institute for Occupational Safety and Health (NIOSH) utilizes the Pesticide Surveillance Program to monitor pesticide exposures that occur in the workplace.[48] The Pesticide Surveillance Program is predominantly composed of the Sentinel Event Notification System for Occupational Risk (SENSOR) program, which works to create surveillance capacity within states.[49] However, only thirteen states participate in the SENSOR program.

Water Access

Access to clean, safe water is not always the norm for farmworkers, many of whom live in substandard housing that in some cases is served by old or inadequate water infrastructure that compromises water quality. Others live in informal housing or labor camps that lack indoor plumbing.[50] Some obtain their water from wells, which in agricultural areas may be contaminated with fertilizers, pesticides and microorganisms from animal waste. Droughts and storms, which are becoming more intense and frequent due to climate change, also affect the availability and quality of water sources. Lack of clean drinking water puts farmworkers' health at risk and forces many farmworker families to spend a portion of their limited income purchasing water.

Resolution 64/292 of the United Nations recognizes "the right to safe and clean drinking water and sanitation as a human right."[51] The U.S. abstained from voting on this resolution,[52] but in 2012 California became the first state in the nation to adopt a law recognizing access to clean, safe and affordable water as a human right.[53] In 2019, California established the Safe and Affordable Drinking Water Fund, which will provide $130 million annually in fiscal years 2020 through 2030 to be used for safe drinking water projects, including improving climate change adaptation and resiliency in disadvantaged communities.[54]

Safe Drinking Water Act

The Safe Drinking Water Act (SDWA) is the main federal law that regulates drinking water quality in the U.S.[55] Under SDWA, EPA sets water quality standards and oversees the states, localities, and water suppliers to ensure the standards are followed. The SDWA does not regulate domestic wells, but some states have adopted their own regulations. The EPA maintains a directory of state private drinking water well programs.[56]

EPA's Ground Water Rule (GWR) applies to water systems that use ground water sources. It seeks to reduce the risk of disease caused by fecal contamination of drinking water. It sets requirements for compliance monitoring, source water monitoring, and water treatment.[57]

Infrastructure funding and other assistance

The Drinking Water State Revolving Fund (DWSRF) provides financing to public water systems – usually in the form of low- or no-interest loans – to finance infrastructure projects such as improving water treatment systems or fixing water distribution systems.[58] Congress appropriates funds for the DWSRF, which EPA then distributes to each state's fund as capitalization grants. Capitalization grants are awarded based on the results of the most recent Drinking Water Infrastructure Needs Assessment.[59] States provide a 20 percent match.

The U.S. Department of Housing and Urban Development (HUD) administers Community Development Block Grants (CBDGs) that can be used to build or improve public water systems.[60] Improvements that can be financed through CDBGs include the development of new water sources, improvement of water treatment systems and replacement of old pipes. USDA-Rural Development administers Rural Utilities Service Water and Environmental Programs (WEP) funding for construction of water and waste facilities in small rural communities with populations of fewer than 10,000 people.[61] It also provides funding for private wells through the Rural Decentralized Water Systems Grant Program, available to rural areas, tribal lands in rural areas, and colonias.[62] These grants help nonprofits provide low-interest loans to low-income homeowners to construct, refurbish or service water wells.

Finally, the Infrastructure, Investment and Jobs Act (Bipartisan Infrastructure Bill) authorized a total of $11.7 billion for the Drinking Water State Revolving Fund (DWSRF) capitalization grants, $510 million for the Assistance for Small and Disadvantaged Communities Drinking Water Grant Program and $500 million for lead service line replacement for fiscal years 2022-2026.[63]

***

More information about heat, food security, pesticides, and water access in farmworker communities can be found on FJ's website. A final report with strategies and recommendations from the Environmental Justice Symposium will be published in summer 2022.

HRSA Disclaimer: This publication is supported by the Health Resources and Services Administration (HRSA) of the U.S. Department of Health and Human Services (HHS) as part of an award totaling $550,000 with 0% financed by non-governmental sources. The contents are those of the author and do not necessarily represent the official views of, nor an endorsement by, HRSA, HHS, or the U.S. Government.

References

1 U.S. Department of Agriculture (USDA). 2017 Census of Agriculture. United States. Summary and State Data. Volume 1, Geographic Area Series, Part 51. AC-17-A-51. April 2019. Available at: https://www.nass.usda.gov/Publications/AgCensus/2017/Full_Report/Volume_1,_Chapter_1_US/usv1.pdf.

2 U.S. Department of Labor (DOL). Findings from the National Agricultural Workers Survey (NAWS) 2017–2018. Research Report No. 14. Available at: https://www.dol.gov/sites/dolgov/files/ETA/naws/pdfs/NAWS%20Research%20Report%2014.pdf.

3 DOL, Office of Foreign Labor Certification. H-2A Selected Statistics FY 2021. Available at: https://www.dol.gov/sites/dolgov/files/ETA/oflc/pdfs/H-2A_Selected_Statistics_FY2021.pdf.

4 DOL. Findings from the National Agricultural Workers Survey (NAWS) 2017–2018. Research Report No. 14. Available at: https://www.dol.gov/sites/dolgov/files/ETA/naws/pdfs/NAWS%20Research%20Report%2014.pdf.

5 Gubernot DM, et al. Characterizing occupational heat-related mortality in the United States, 2000-2010: an analysis using the Census of Fatal Occupational Injuries database. Am J Ind Med. 2015 Feb;58(2):203-11. doi: 10.1002/ajim.22381. PMID: 25603942; PMCID: PMC4657558. Available at: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4657558/.

6 Occupational Safety and Health Administration (OSHA). Heat Injury and Illness Prevention in Outdoor and Indoor Work Settings. October 27, 2021. 86 FR 59309. Available at: https://www.federalregister.gov/documents/2021/10/27/2021-23250/heat-injury-and-illness-prevention-in-outdoor-and-indoor-work-settings.

7 The White House. FACT SHEET: Biden Administration Mobilizes to Protect Workers and Communities from Extreme Heat.

September 20, 2021. Available at: https://www.whitehouse.gov/briefing-room/statements-releases/2021/09/20/fact-sheet-biden-administration-mobilizes-to-protect-workers-and-communities-from-extreme-heat/.

8 OSHA. Heat. Available at: https://www.osha.gov/heat-exposure/standards.

9 Asunción Valdivia Heat Illness and Fatality Prevention Act of 2021. S. 1068. 117th Cong. (2021). Available at: https://www.congress.gov/bill/117th-congress/senate-bill/1068.

10 T8 CCR 3395. Available at: https://www.dir.ca.gov/title8/3395.html.

11 WSR 21-17-135. Available at: https://lawfilesext.leg.wa.gov/law/wsr/2021/17/21-17-135.htm.

12 *Id.*

13 Zavala D, Bernton H. Washington state to release emergency heat rules for farmworkers as advocates demand added protections," Seattle Times, Jul. 12, 2021. Available at: https://www.seattletimes.com/business/agriculture/washington-state-to-release-emergency-heat-rules-for-farmworkers-as-advocates-demand-added-protections/.

14 OAR 437-004-1130. Available at: https://osha.oregon.gov/OSHARules/div4/437-004-1130-temp-heat.pdf.

15 Oregon Occupational Safety & Health Division. Oregon OSHA's Adoption of Rules to Address Employee and Labor Housing Occupant Exposure to High Ambient Temperatures. May 9, 2022. Available at: https://osha.oregon.gov/OSHARules/adopted/2022/ao3-2022-letter-alh-heat.pdf.

16 7 CCR 1103-15. Available at: https://cdle.colorado.gov/sites/cdle/files/7%20CCR%201103-15%20%20Agricultural%20Labor%20Conditions%20Rules.pdf.

17 Colorado Senate. SB 21-087. Available at: https://cdle.colorado.gov/sites/cdle/files/7%20CCR%201103-15%20%20Agricultural%20Labor%20Conditions%20Rules.pdf.

18 Minn. R. 5205.0110. Available at: https://www.law.cornell.edu/regulations/minnesota/Minn-R-5205-0110.

19 Md. Labor and Employment Code Ann. § 5-1201. Available at: https://law.justia.com/codes/maryland/2020/labor-and-employment/title-5/subtitle-12/section-5-1201/.

20 State of Nevada. Department of Business and Industry Division of Industrial. Proposed Regulation of the Division of Industrial Relations of the Department of Business and Industry. LCB File No. R053-20. January 25, 2021. Available at: https://dir.nv.gov/uploadedFiles/dirnvgov/content/Governance/R053-20P%201-25-21.pdf.

21 37:2 VA. R. 2761. May 10, 2011. Available at: http://register.dls.virginia.gov/vol37/iss19/v37i19.pdf.

22 Alex Brown, Virginia Nixes Effort to Issue Heat Safety Rules for Workers. December 9, 2021. Available at: https://www.pewtrusts.org/en/research-and-analysis/blogs/stateline/2021/12/09/virginia-nixes-effort-to-issue-heat-safety-rules-for-workers.

23 Fla. SB 732 (2021). Available at: https://www.flsenate.gov/Session/Bill/2022/732/?Tab=BillHistory.

24 Fla. HB 887 (2021). Available at: https://www.flsenate.gov/Session/Bill/2022/887.

25 Ip EH, Saldana S, Arcury TA, Grzywacz JG, Trejo G, Quandt SA. Profiles of Food Security for US Farmworker Households and Factors Related to Dynamic of Change. Am J Public Health. 2015;105(10):e42-e47. doi:10.2105/AJPH.2015.302752. Available at: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4566520/.

26 USDA Food and Nutrition Service (USDA FNS). Supplemental Nutrition Assistance Program (SNAP). Available at: https://www.fns.usda.gov/snap/supplemental-nutrition-assistance-program.

27 USDA FNS. FNS Responds to COVID-19. Available at: https://www.fns.usda.gov/coronavirus#:~:text=Access%20to%20the%20Pandemic%20EBT,to%20expand%20SNAP%20online%20purchasing.

28 USDA FNS. Special Supplemental Nutrition Program for Women, Infants, and Children (WIC). Available at: https://www.fns.usda.gov/wic.

29 Department of Homeland Security. Disaster Supplemental Nutrition Assistance Program (D-SNAP). Available at: https://www.disasterassistance.gov/get-assistance/forms-of-assistance/5769.

30 USDA FNS. National School Lunch Program. Available at: https://www.fns.usda.gov/nslp.

31 USDA FNS. School Breakfast Program. Available at: https://www.fns.usda.gov/sbp/school-breakfast-program.

32 USDA FNS. Summer Food Service Program. Available at: https://www.fns.usda.gov/sfsp/summer-food-service-program.

33 USDA FNS. Senior Farmers' Market Nutrition Program. Available at: https://www.fns.usda.gov/sfmnp/senior-farmers-market-nutrition-program.

34 USDA FNS. Commodity Supplemental Food Program. Available at: https://www.fns.usda.gov/csfp/commodity-supplemental-food-program.

35 USDA FNS. USDA Foods Available List for CSFP. Available at: https://www.fns.usda.gov/csfp/csfp-foods-available.

36 USDA FNS. Community Food Projects Competitive Grant Program (CFPCGP). Available at: https://nifa.usda.gov/grants/programs/community-food-projects-competitive-grant-program-cfpcgp.

37 USDA FNS. SNAP Eligibility. Available at: https://www.fns.usda.gov/snap/recipient/eligibility.

38 *See* note 2 above.

39 Vermont Law School. Johns Hopkins Center for a Liveable Future, Essentially Unprotected: A Focus on Farmworker Health Laws and Policies Addressing Pesticide Exposure and Heat-Related Illness, https://www.vermontlaw.edu/sites/default/files/2021-04/Essentially-Unprotected-FINAL.pdf.

40 Farmworker Justice. Clinician's Guide to the Federal Insecticide, Fungicide, and Rodenticide Act. Available at: https://www.farmworkerjustice.org/wp-content/uploads/2012/08/2016-FIFRA-FQPA-Clinicians-Guide-Online.pdf.

41 EPA. Summary of the Federal Food, Drug, and Cosmetic

Act. Available at: https://www.epa.gov/laws-regulations/summary-federal-food-drug-and-cosmetic-act.

42 Farmworker Justice. Clinician's Guide to the EPA's Worker Protection Standard (June 2020). Available at: https://www.farmworkerjustice.org/wp-content/uploads/2020/07/FJMCN-WPS-Clinician-Guide_June-2020.pdf.

43 EPA. How to Get Certified as a Pesticide Applicator. Available at: https://www.epa.gov/pesticide-worker-safety/how-get-certified-pesticide-applicator.

44 EPA. Regulatory and Guidance Information by Topic: Pesticides. Available at: https://www.epa.gov/regulatory-information-topic/regulatory-and-guidance-information-topic-pesticides.

45 EPA. How EPA Protects Workers from Pesticide Risk. Available at: https://www.epa.gov/pesticide-worker-safety/how-epa-protects-workers-pesticide-risk.

46 Farmworker Justice. Clinician's Guide to OSHA's Field Sanitation Standard. Available at: https://www.farmworkerjustice.org/wp-content/uploads/2012/08/2016-OSHAs-Field-Sanitation-Standard-Clinicians-Guide.pdf.

47 EPA. Guidance: Funding Development and Administration of Tribal Pesticide Field Program and Enforcement Cooperative Agreements. Available at: https://www.epa.gov/compliance/guidance-funding-development-and-administration-tribal-pesticide-field-program-and.

48 National Institute for Occupational Safety and Health. About the NIOSH Pesticide Surveillance Program. Available at: https://www.cdc.gov/niosh/topics/pesticides/overview.html#:~:text=The%20SENSOR%2DPesticides%20program%20is,more%20occupational%20illnesses%20or%20injuries.

49 *Id.*

50 Villarejo, D. California's Hired Farm Workers Move to the Cities: The Outsourcing of Responsibility for Farm Labor Housing. California Rural Legal Assistance Priorities Conference, Asilomar, California. July 16, 2013; revised manuscript, January 24, 2014. Available at: https://archive.crla.org/sites/all/files/u6/2014/rju0214/VillarejoFrmLbrHsngHlth_CRLA_012414.pdf.

51 United Nations. Resolution 64/292. July 28, 2010. Available at: https://www.un.org/ga/search/viewm_doc.asp?symbol=A/Res/64/292.

52 United Nations. General Assembly Adopts Resolution Recognizing Access to Clean Water, Sanitation as Human Right, by Recorded Vote of 122 in Favour, None against, 41 Abstentions. July 28, 2010. Available at: https://www.un.org/press/en/2010/ga10967.doc.htm.

53 Cal. Wat. Code § 106.3. Available at: https://leginfo.legislature.ca.gov/faces/codes_displaySection.xhtml?lawCode=WAT&sectionNum=106.3.

54 California Water Boards. About the SAFER Program. Available at: https://www.waterboards.ca.gov/safer/background.html#:~:text=The%20fund%20provides%20%24130%20million,with%20drinking%20water%20standards%20violations.

55 EPA. Summary of the Safe Drinking Water Act. Available at: https://www.epa.gov/laws-regulations/summary-safe-drinking-water-act.

56 EPA. Private Drinking Water Well Programs in Your State. Available at: https://www.epa.gov/privatewells/private-drinking-water-well-programs-your-state.

57 EPA. Ground Water Rule. Available at: https://www.epa.gov/dwreginfo/ground-water-rule.

58 EPA. How the Drinking Water State Revolving Fund Works. https://www.epa.gov/dwsrf/how-drinking-water-state-revolving-fund-works#tab-1.

59 EPA. EPA's 6th Drinking Water Infrastructure Needs Survey and Assessment. https://www.epa.gov/dwsrf/epas-6th-drinking-water-infrastructure-needs-survey-and-assessment#:~:text=EPA's%206th%20Drinking%20Water%20Infrastructure%20Needs%20Survey%20and%20Assessment%20shows,over%20the%20next%2020%20years.

60 U.S. Department of Housing and Urban Development. Community Development Block Grant. Available at: https://www.hudexchange.info/programs/cdbg/.

61 USDA Rural Development (USDA RD). Water & Environmental Programs. Available at: https://www.rd.usda.gov/programs-services/water-environmental-programs.

62 USDA RD. Rural Decentralized Water Systems Grant Program. Available at: https://www.rd.usda.gov/programs-services/water-environmental-programs/rural-decentralized-water-systems-grant-program.

63 U.S. Department of Health and Human Services. Low Income Household Water Assistance Program (LIHWAP). Available at: https://www.acf.hhs.gov/ocs/programs/lihwap.

May 25, 2022

Submitted via regulations.gov

Brenda Mallory
Chair
Council on Environmental Quality
730 Jackson Place NW
Washington, DC 20503

Re: Request for information (RFI) to solicit feedback on the beta version of the Climate and Economic Justice Screening Tool (Docket No. CEQ-2022-0002)

Dear Chair Mallory,

The Farmworker Association of Florida submits these comments in response to the Council of Environmental Quality's (CEJ) Request for Information concerning the beta version of the Climate and Economic Justice Screening Tool (CEJST). Established in 1983, the Farmworker Association of Florida (FWAF) is a statewide, grassroots, community-based, non-profit, farmworker membership organization with over 10,000 Haitian, Hispanic, and African American members and five offices in the state of Florida, working for social and environmental justice with farmworkers.

We are excited and hopeful about the opportunities represented by the Justice40 Initiative and the CEJST. The CEJST captures a lot of useful information, but we are concerned that the tool is missing some information that will be vital to tracking and capturing the needs of farmworkers, and so we offer suggestions on how the tool can better track this very vulnerable environmental justice community.

Farmworkers perform work that is both necessary and incredibly dangerous. They receive low pay, have fewer labor protections than most workers, and are especially vulnerable to effects of climate change. They are also a community that is uniquely difficult to track due to the fact that many farmworkers migrate and move with the seasons and harvests for work; many live in very remote and rural areas, and many fear or distrust authorities and did not participate in the most recent census. In addition, many speak a language other than English, and lack of immigration status can pose an additional barrier to tracking these communities.

However, there is data available to help ensure farmworkers are represented in the CEJST.

Location of farmworker communities:

While locating farmworker communities is challenging for the above stated reasons, there are tools available that can be incorporated into the CEJST.

Recommendations:

- Use the Census of Agriculture Data by the U.S. Department of Agriculture (USDA) on farm employment to identify locations of farmworker communities. This data represents

employers, not worker communities, but should give an approximate location of farmworkers living in the area.

- Use data from USDA Rural Development on construction of multi-family on-farm and off-farm housing for farmworkers constructed with finances from the agency.

Heat stress:

Temperatures in recent years have been the hottest in over 2000 years, and that trend is currently showing no signs of stopping. Agricultural workers are particularly vulnerable to illnesses caused by excessive heat, with a death rate from heat-related causes at roughly 20x the rate of workers in all other civilian professions.[1]

Agricultural workers often wear multiple layers of clothing and protective gear to protect themselves from the sun and pesticides, increasing the temperature they experience from 12 – 37 degrees F.[2] They are often under pressure to work quickly and fear retaliation for stopping to drink water, use the bathroom, and take breaks, even when experiencing symptoms of heat stress.[3] A plant nursery worker reported in an interview that her employer told her to stop drinking so much water so she would not have to use the bathroom.[4]

One significant risk from frequent heat stress is kidney damage. In the Girasoles study, funded by NIOSH and conducted by researchers at Emory University and the Farmworker Association of Florida, researchers looked into heat hazards experienced by farmworkers over the course of three days:

> *Study results showed that over four in five workers had core temperatures that exceeded 38°C(100.4°F) on at least one of the study days. This temperature is the recommended physiologic limit for core temperature, at which the risk of serious heat injury rises steeply for many individuals. Beyond body core temperature that exceeded recommended limits, multiple participants were found to meet criteria for acute kidney injury on at least one of the three study days. Over one in three workers experienced acute kidney injury stage 1 or higher on at least one study day according to the change in their blood creatinine levels from before the workday to after. Approximately half of the workers were dehydrated prior to going to work, and that proportion increased to over three-fourths after the workday. The likelihood of a worker developing acute kidney injury during a workday increased by nearly 50 percent for each 5-degree F increase in heat index.*[5]

[1] Rafter Ferguson, Kristina Dahl, and Marcia DeLonge; "Farmworkers At Risk: The Growing Dangers of Pesticide and Heat; Nov. 2019; Union of Concerned Scientists; https://www.ucsusa.org/sites/default/files/2019-12/farmworkers-at-risk-report-2019-web.pdf

[2] Id.

[3] David Arkush, Valerie Mac, Nell Hodgson, Jeannie Economos, and Shanna Devine; "Unworkable: Dangerous Heat Puts Florida Farmworkers at Risk, 2018; Public Citizen and the Farmworker Association of Florida, https://www.citizen.org/article/unworkable-dangerous-heat-puts-florida-workers-at-risk-2/

[4] Laura Bermudez, M.A.; Farmworkers in Florida: Silence is their Rational Choice: A Report for the Farmworker Association of Florida on Working Conditions for Farmworkers in Central Florida Ornamental Plant Nurseries based on Interviews with Workers; September 18, 2012; https://floridafarmworkers.org/about/resources-and-reports/

[5] Id.

The kidney disease seen in agricultural workers around the world, including in the United States, is not caused by high blood pressure or diabetes, and is believed to be caused by a combination of factors, especially heat stress, dehydration, and pesticide exposure.[6]

Recommendations:

- We propose that, since increased heat is a part of climate change, agricultural workers are difficult to track by census data for myriad reasons, and they experience chronic kidney disease at far higher rates than the general population, chronic kidney disease be added to the health factors used to identity disadvantaged communities. A map of chronic kidney disease, broken down by census districts, can be found here and should be easy to incorporate into the existing data: https://hub.arcgis.com/maps/cdcarcgis::places-chronic-kidney-disease/explore?location=36.942742%2C-118.268750%2C3.50

Pesticide Exposure:

Along with heat stress, pesticide exposure is an environmental and occupational health hazard that affects farmworkers. As temperatures rise and growing seasons lengthen, experts anticipate many growers increasing their use of pesticides as the warmer conditions and increase of carbon dioxide in the atmosphere create more favorable conditions for insects.[7]

Farmworkers are already exposed to pesticides on a regular basis through their work at a much higher rate than non-agricultural workers.[8] Chronic exposure is common among workers working in fruits, vegetables, plant nurseries, tobacco, and other crops.[9] Many of these pesticides are endocrine disruptors.[10] Others can cause neurological effects and birth defects in the children of farmworkers.[11]

[6] University of Colorado Anschutz Medical Campus. "Chronic kidney disease epidemic in agricultural workers: High heat, toxins." ScienceDaily. ScienceDaily, 8 May 2019. <www.sciencedaily.com/releases/2019/05/190508185839.htm>.
[7] Lisa Gross; In California's Farm Country, Climate Change Is Likely to Trigger More Pesticide Use, Fouling Waterways; May 10, 2021; Inside Climate News; https://insideclimatenews.org/news/10052021/in-californias-farm-country-climate-change-is-likely-to-trigger-more-pesticide-use-fouling-waterways/
[8] Damalas, C. A., & Koutroubas, S. D. (2016). Farmers' Exposure to Pesticides: Toxicity Types and Ways of Prevention. Toxics, 4(1), 1. https://doi.org/10.3390/toxics4010001
[9] Arcury, T. A., & Quandt, S. A. (1998). Chronic Agricultural Chemical Exposure Among Migrant and Seasonal Farmworkers. Society & natural resources, 11(8), 829–843. https://doi.org/10.1080/08941929809381121
[10] Damalas, C. A., & Koutroubas, S. D. (2016). Farmers' Exposure to Pesticides: Toxicity Types and Ways of Prevention. Toxics, 4(1), 1. https://doi.org/10.3390/toxics4010001
[11] Arcury TA, Quandt SA. Pesticides at works and at home: exposure of migrant farmworkers. Lancet. 2003 Dec 13;362(9400):2021. Doi: 10.1016/S0140-6736(03)15027-1. MPID: 14686376.

Scientific evidence also shows that people of color, specifically Mexican Americans and non-Hispanic Blacks had up to 5.8 times the concentration of pesticides or pesticide-related metabolites in their bodies as non-Hispanic whites.[12]

A worker tasked with spraying pesticides at her workplaces said in an interview:

[Translated from Spanish] "That spray makes you dizzy and sleepy. They didn't give you anything to protect yourself, no gloves, no goggles, no facemask."[13]

Another worker explained:

> [Translated from Spanish] "Sometimes they would spray two rows from you and the movement of the air, all the spray would still land on us…before (people from outside) would come to check on the [plant] nurseries, so they would put up the signs saying not to enter because they had just sprayed." But the worker went on to explain in her interview that since no one had come to check recently, the safety practices had been widely ignored.[14]

Recommendations:

- Incorporate areas in the country where fruit and vegetables, Christmas trees, tobacco, and plant nurseries – all areas with high risk of pesticide exposure to workers- are known to be present in the map, and that are areas where crops that continue to use hand harvesting (as opposed to mechanical harvesting) are grown, to track potential pesticide exposure. A map of fruit and vegetable production in the U.S. can be found here: https://www.researchgate.net/figure/Fruit-and-vegetable-production-map_fig3_273479198
- Include data on pesticide poisoning incidents collected by the National Institute for Occupational Safety and Health (NIOSH)'s SENSOR program. However, it is important to note that only 13 states are currently participating in this program. There is also a need for increased funding for SENSOR, so that, in the future, more states can be included in the program.
- Include data on pesticide poisoning from the American Association of Poison Control Centers National Poison Data System but note that pesticide exposures are vastly underreported and that those reporting exposures are not always identified as being farmworkers.
- Include birth defects tracking data collected by the Centers for Disease Control in the map and state tracking registries to track and specifically identify birth defects in disadvantaged communities, but note that the data may not be consistent from state to

[12] Donley N, Bullard RD, Economos J, Figueroa I, Lee J, Liebman AK, Martinez DN, Shafiei F. Pesticides and environmental injustice in the USA: root causes, current regulatory reinforcement, and a path forward. BMC Public Health. 2022 Apr 19;22(1): 708. doi: 10.1186/s12889-022-13507-4. PMID: 35436924; PMCID: PMC9017009

[13] Laura Bermudez, M.A.; Farmworkers in Florida: Silence is their Rational Choice: A Report for the Farmworker Association of Florida on Working Conditions for Farmworkers in Central Florida Ornamental Plant Nurseries based on Interviews with Workers; September 18, 2012; https://floridafarmworkers.org/about/resources-and-reports/

[14] Id.

state, which may lead to undercounting and not a complete representative analysis of differences from state to state.

Housing:

From my own experience doing outreach to farmworker housing, I can testify that overcrowded housing, lack of safe drinking water, use of portable toilets instead of plumbing, deteriorating housing, and housing that is right up against crops sprayed with pesticides is commonplace.

The American Public Health Association reports about farmworker housing:

> *Inadequate and crowded housing, poor sanitation, and lack of potable water and sewage systems cause farmworkers to be vulnerable to infectious and intestinal disorders at rates much higher than in the general population.[31] A national survey of farmworker housing units found that half of these units were "crowded," defined by the US Census Bureau as having more than one person per room, compared with only 2% of all US households.[21] Crowded conditions are associated with increased incidence of tuberculosis and influenza; farmworkers are approximately 6 times more likely to develop tuberculosis than other workers,[18] and may also be more vulnerable to influenza pandemics.[32] Lack of sanitation can contribute to the contraction of hepatitis, gastroenteritis, and other conditions, and farmworkers have parasitic infection rates 11 to 59 times higher than in the general population.[19] Contaminated water sources are also common; consequently, the rate of going to clinics for diarrhea is 20 times higher among farmworkers than among the urban poor.[33]*[15]

The above was written before the Covid-19 pandemic, in which overcrowded housing also increased the risks of farmworkers contracting Covid-19.[16]

Nitrates are of particular concern as groundwater contaminants in agricultural areas. They have been known to contaminate drinking water, particularly in rural and predominantly Latino areas -- especially where farmworkers live.[17] Nitrate poisoning from contaminated drinking water can be especially fatal to infants and is linked to increased risk of colorectal cancer, thyroid disease, and neural tube defects.[18]

[15] American Public Health Association, Policy Statement: Improving Housing for Farmworkers in the United States Is a Public Health Imperative; Nov. 1, 2011; Policy Number 20118; https://www.apha.org/policies-and-advocacy/public-health-policy-statements/policy-database/2014/07/09/10/32/improving-housing-for-farmworkers-in-the-united-states-is-a-public-health-imperative

[16] Covid-19 Impact On Agricultural Workers, National Center for Farmworker Health, Inc., January, 2022, http://www.ncfh.org/msaws-and-covid-19.html

[17] Lisa Gross, October 7, 2020, "Nitrate Tainted Drinking Water Plagues California Farmworker Towns, Study Shows", Fern's Ag Insider, https://thefern.org/ag_insider/nitrate-tainted-drinking-water-plagues-california-farmworker-towns-study-shows/

[18] Ward M, et al. Drinking Water Nitrate and Human Health: An Updated Review. Int J Environ Res Public Health. 2018;15(7):1557.

Recommendations:

- Incorporate data from the U.S. Census Bureau's American Community Survey (ACS) on housing with incomplete indoor plumbing, a frequent problem in farmworker housing that can be used to identify both farmworker communities and other disadvantaged communities.
- Incorporate data from the ACS on housing occupancy to identify overcrowded housing to identify both farmworker communities and other disadvantaged communities.
- Fund and push for studies on contaminants in drinking water, particularly well water used in remote areas by farmworkers and other impoverished rural residents so that data on nitrates and other toxic contaminants in drinking water can be represented.

Heath Care

A citrus worker in Florida, who was interviewed in a short video documentary, reported a severe injury to his hand from a snake bite. In the video, he explains that he simply did not have the money to have the injury treated, so he endured it without help.[19]

Tragically, this worker's story is a common one. Many farmworkers live in medically underserved areas[20] and lack health insurance.[21] It is important to invest in better medical services for farmworkers, and the CEJST can help to deepen understanding of where the need is greatest.

Recommendations:

- Use data collected by the Health Resources and Services Administration (HRSA) of the U.S. Department of Heath to map medically underserved areas (MUAs).
- Use the American Community Survey health insurance data to identify communities with low health insurance rates.
- Use the National Vital Statistics system data to identify communities with lower rates of prenatal care.

[19] Naranjeros, Harvard Law Documentary Studio; directed by Lauren Estévez; https://floridafarmworkers.org/about/video-stories/

[20]4 Luque JS, Castañeda H. Delivery of mobile clinic services to migrant and seasonal farmworkers: a review of practice models for community-academic partnerships. J Community Health. 2013 Apr;38(2):397-407. doi: 10.1007/s10900-012-9622-4. PMID:23054421.

[21] Ornelas I, Fung W, Gabbard S, Carroll D. Findings from the National Agricultural Workers Survey (NAWS) 2017–2018: A Demographic and Employment Profile of United States Farmworkers. Research Report No. 14. Prepared for the U.S. Department of Labor by JBS International.: https://wdr.doleta.gov/research/FullText_Documents/ETAOP2021-22%20NAWS%20Research%20Report%2014%20(2017-2018)_508%20Compliant.pdf.

H-2A Guest Workers

A growing number of farmworkers in the U.S. are H-2A guestworkers. These seasonal guestworkers are brought to the United States by agricultural employers and their visas are tied to their employment with that employer; they do not have the freedom to seek employment elsewhere if conditions are bad.[22]

> *Social and geographic isolation, lower than advertised wages, less work than promised, dirty and dilapidated housing, dangerous working conditions, and even forced labor or slavery typify the experience of many guest workers. Some have been brought to replace domestic workers who still want the work and are entitled to such jobs. But, allowed to work only for a single employer who can send them home at will, most H-2A workers are too fearful of retaliation to speak out about these harsh (and frequently illegal) working conditions.*[23]

H-2A regulations state protections for farmworkers, including housing standards, worker's compensation, and rules against recruiters in workers' home countries charging workers fees to be considered for the jobs that cause workers to start work already indebted. However, H-2A workers frequently find their housing overcrowded, moldy, infested with rats or other pests, and generally unsafe.[24] In addition, employers often send injured workers home, rather than provide health care or allow them to file for workers compensation – treating them as disposable.[25] And worst of all, recruiters in workers' home countries often charge illegal recruitment fees, which force many H-2A workers into debt bondage. These workers sometimes leave the deeds to their homes in the hands of the recruiters in exchange for the opportunity to come to the United States and work. Some even fear for the lives of their families back home if they cannot pay their debts, so they suffer through dangerous and dehumanizing working conditions in order to pay back the debt.[26]

All of these factors contribute to a system in which H-2A workers are exceptionally vulnerable to all of the dangers explained above – heat stress, pesticide exposure, lack of safe housing and potable water, and lack of access to healthcare – and extremely unlikely to complain or seek help for fear of losing their jobs and visas, or worse.

Recommendations:

- Track H-2A guestworkers as disadvantaged communities. Employers must include the locations of H-2A guestworker housing in their applications to the Department of Labor for H-2A guestworkers. The US Department of Labor can provide this information.

[22] No Way to Treat a Guest: Why the H-2A Agricultural Visa Program Fails U.S. and Foreign Workers; A Report by Farmworker Justice; https://www.farmworkerjustice.org/wp-content/uploads/2012/07/7.2.a.6-fwj.pdf
[23] Id.
[24] Id.
[25] Id.
[26] Id.

Conclusion

Throughout the United States, farmworkers are a disadvantaged community on the frontlines of environmental justice issues and climate change. They face a unique set of challenges that are expected to increase with climate change, including: heat stress, pesticide exposure, inadequate housing with lack of safe drinking water, and lack of health care access.

This population is difficult to capture on the CEJST, but not impossible. We ask that CEQ includes the recommended data in the mapping project to make ensure that farmworker communities, who are frontline environmental justice and climate change communities, and among the most disadvantaged in the nation, are captured in the tool as much as possible.

Thank you.

Sara Mangan
Farmworker Association of Florida
Climate Justice Organizer
1264 Apopka Blvd.
Apopka, FL 32703
(407) 886 – 5151
sara@floridafarmworkers.org

Farmworkers in Florida:
Silence is their rational choice

Release date: September 18, 2012

Laura Bermudez, M.A.

**A Report for the Farmworker Association of Florida
on Working Conditions for Farmworkers in
Central Florida Ornamental Plant Nurseries
based on interviews with workers**

Farmworkers in Florida: Silence is their rational choice

Release date: September 18, 2012

Laura Bermudez, M.A.

Laura Bermudez holds degrees in Sociology and Anthropology from the University of Houston. She has conducted social science research with minority populations in the United States for almost ten years. She has extensive experience with ethnographic fieldwork and conducting qualitative research in various areas including: diabetes, the nutritional transition in emerging countries, obesity and overweight, and gang violence and drug use.

ABSTRACT

This research documents cases of farmworker abuse and cases of pesticide exposure in Central Florida; it explores why farmworkers do not denounce their working conditions. The researcher conducted informal interviews with 16 participants, who were currently employed or had been employed in a nursery or fernery. The data compiled through these interviews was analyzed using qualitative research methods.

The findings suggest that there are various types of worker abuse including: issues with proper or adequate sanitation, the constant rushing pace of farmworkers making the work environment more dangerous, lack of safety equipment, work injuries not being covered by employers through workers compensation, no overtime pay rate, and hazardous practices of pesticide application. There are also several cases where farmworkers had adverse health effects due to exposure to pesticides. The findings also suggest that farmworkers make the rational choice not to speak out against their employers because of multiple factors: there are few alternative jobs; farmworkers face financial pressure to support their dependents in their home country; the health issues of farmworkers and their children create a financial burden on their spouses, who are often also farmworkers. Understanding the complex array of factors that inhibit them from reporting workplace hazards is an important first step to understanding the plight of Central Florida's farmworker population.

INTRODUCTION

The working conditions of farmworkers have been documented in the past, highlighting deplorable conditions such as inadequate sanitary facilities, substandard housing, pesticide exposure, sun exposure and heat stress. (1) Worker abuse and violations of regulations have also been explored (2, 3). The Environmental Protection Agency revised the Worker Protection Standards in 1992 (4) and regulatory bodies in various states have acted accordingly and have set local regulations to protect farmworkers. For example, the 2004 Farmworker Safety Act, a section of which was later renamed the Alfredo Bahena Act, "incorporated the federal Worker Protection Standards into Florida state law. It also increased the fines for pesticide safety violations, increased the number of field inspectors, and authorized the use of worker representatives to file complaints."(5) This law also prohibited crew leaders from price gouging farmworkers for food, water and housing, enhanced the regulation of pesticides and stipulated that workers have a right to obtain information on these pesticides at their jobsite (6). However,

as the findings of this research will reveal, the abuse of workers and violations of workplace protections continue in many parts of Central Florida. These cases of maltreatment and unsafe working conditions are seldom reflected in official statistics.

Farmworkers suffer chronic exposure to pesticides, which negatively impacts their health. Some farmworkers are subjected to acute pesticide exposure, which can result in immediate and severe health problems. Flocks et al. explained that "exposure to pesticides can be dermal, oral, and respiratory and can occur through direct contact with pesticides during application, contact with pesticide residue on plants, upon entering a recently treated area, or through drift from nearby applications." Studies have reported that exposure to pesticides prior to conception was associated with reduced fecundability (7, 8, 9). There are also studies documenting the elevated risk of stillbirths for women exposed to pesticides working in agriculture and horticulture (10, 11, 12). Other studies have documented the effects of pesticide exposure in-utero; their findings include fetal growth delay (13, 14, 15), birth defects like orafacial defects (16), musculoskeletal defects (17, 18, 19), neural tube defects (20, 21, 22), and childhood leukemia (21, 22).

While some states have responded with measures to regulate the use of pesticides, farmworker exposure to pesticides continues to take place in Central Florida. As with cases of worker abuse, the official statistics do not reflect the caseload seen by community organizations like the Farmworker Association of Florida. Cases of pesticide exposure include adverse health effects on workers: severe skin rashes, long-term skin lesions, and respiratory problems. Adverse health outcomes for their children may also be linked: low birth weight, asthma, allergies, and malformations. Increasingly, there are also links to learning disabilities, autism and ADHD in children of mothers exposed to pesticides (23).

The present study documents cases of current and former farmworkers in Apopka and Pierson in Central Florida. The following is a small description of the fernery and nursery industry in Central Florida. In general terms, nurseries produce a variety of ornamental plants, including: cut flowers, potted plants, and garden plants; ferneries produce cut foliage (25). Nursery work mostly takes place inside plastic greenhouses; fernery work happens under a large black mesh structure or under large shade trees. Tasks at nurseries include: planting at conveyor belts; loading pots of plants into trays; and loading and carrying trays, boxes, and bags of soil. These tasks involve close contact with plants and soil, which have been chemically treated (25). Fernery workers also come into frequent dermal contact with chemically treated soil and plants. They must "bend over, thrust their arms into the bushes of ferns, cut fronds at their base, and bundle them into bunches" (25); then load these bunches onto trailers. The ferns can grow thigh high and when the ferns are wet with morning dew, workers' unprotected clothes and skin get soaked with a mixture of water and traces of pesticide. Some workers tie plastic aprons or plastic garbage bags around their waists in an effort to protect themselves from the chemicals (25).

For the purposes of this study, the terms "nursery" and "fernery" are sometimes used loosely and interchangeably, because that was the use given to them in some of the informal interviews. The research focuses on the working conditions that ferneries and nurseries have in common. The common conditions include: the physical labor involved; the enclosed work environment, which does not allow for pesticides to dissipate as easily as they would in an open field (24); and the interaction with pesticides.

PURPOSE

The present research was conducted at the request of the Farmworker Association of Florida. This research has two aims. The first is to document cases of worker abuse and pesticide exposure and the second aim is to understand the incongruence between official statistics of worker abuse and pesticide exposure in Florida, and the number of people voicing cases of worker abuse and pesticide exposure at local community organizations. Why aren't real cases of abuse and pesticide exposure being reflected in the official statistics? Why do farmworkers remain silent about what they experience in their jobs?

SAMPLE

The findings in this research are based on a "convenience sample" of 16 individuals. Some participants were picked randomly in the waiting room of a local clinic. Other participants were clients from a local community-based organization who were picked based on their availability to participate in the study on specific days of the week. Interviewees were all currently employed or had been employed in ferneries or nurseries in the surrounding area.

All of the participants are female, with the exception of two male participants. There are two reasons for this gender imbalance. First, the clinic is well known for its maternity health services, so the majority of the people in the waiting room are women. Second, many of the community organization's clients were available to participate because they were mothers staying home with their children. It is important to point out that many of the female participants discussed their husbands' experiences working at nurseries or ferneries.

All of the participants are of Hispanic descent. Central Florida's nursery/fernery industry workers are mostly Hispanic, but there is a small minority of Haitian and African-American workers. Although the sample does not reflect this ethnic distribution, many of the themes explored in the findings, such as poverty and fear of losing their jobs, can apply to the farmworker population in general. The informal interviews were conducted in Spanish.

The participants' migratory status varied. Some participants were undocumented, others had U.S. permanent residency, others were citizens, and others chose not to reveal their migratory status during their interview. The status distinctions will be made whenever pertinent to the findings. All names mentioned here are pseudonyms and any references to specific companies were omitted for the privacy and protection of participants.

METHODS

The primary methodology in this research is qualitative. The value of qualitative research lies in its power to *discover unexpected links* between people's feelings, behaviors, ideas, and facts; and its power to *explain the rationale* for particular behaviors[1]. The researcher conducted informal interviews with participants either within the clinic grounds or in participants' homes. The interviews touched on a variety of themes in order to gain a holistic understanding of workers' lives. These informal discussions included the following: participants' arrival in the United States, work, family, health, household structure, finances, and ties to home country. The

[1] Qualitative research entails ethnographic fieldwork (observing and participating in the context under study), informal interviewing, triangulation of sources to verify data, and qualitative data analysis (organizing all of the text that was culled during fieldwork to discover emerging themes and finding the links amongst said themes).

interviews were not recorded in an effort to ease participant's anxiety about discussing sensitive topics.

FINDINGS

This section explores the two aims of the research separately. First, it deals with excerpts from different case studies where farmworkers discussed instances of worker abuse and pesticide exposure. These excerpts have been edited for brevity but the full version of every case study can be found in the appendix section. The second portion of the section will explain the rationale behind farmworkers' choice to remain silent about their working conditions and why some continue working at nurseries/ferneries. The last section of the findings is dedicated to one particular case that vividly illustrates the context of farmworkers' lives.

Worker abuse and pesticide exposure

- *Issues with sanitation*

A few participants brought up issues with sanitation at nurseries. In many cases, toilets were located far from the greenhouse, where the majority of the work takes place; many bosses were reluctant to allow workers to take a bathroom break.

> Camila explained that at one of the nurseries where she worked, the working conditions were very bad. There were no toilets in the nursery, so workers were obliged to ask for permission to use the toilet inside the owner's home. The boss often asked Camila to wait or to "go" outside of the nursery instead of walking all the way to the house. Camila refused to do this on several occasions; she quit after three months.

Another participant bitterly remembered the unsanitary conditions at another nursery:

> Melisa explained that the nursery has been kept in worsening conditions for many years under the pretext that they are going bankrupt. "Hubo un tiempo en que ni agua nos daban. Ni papel higienico!" *["There was a time when they didn't even give us water or even toilet paper!"*] … In addition, the nursery used to pay someone to clean the workers' toilets. Today the workers have to take turns cleaning the toilets every week.

Other participants also mentioned that bosses didn't allow people to take bathroom breaks, so workers had to "hold it" until either the official 15-minute breaks or the 30-minute lunch break.

- *Being rushed in a dangerous environment*

Participants explained that being constantly rushed, while working with heavy pots or trays or with hazardous chemicals, was often dangerous and could lead to injuries. They described an environment where safety regulations were casually violated for the sake of productivity and efficiency. One participant described an injury caused by rushing inside the nursery:

> Flor stayed 2.5 years at her first nursery job, until the owners closed it down. "De allí salí acabada." *["I left that place physically deteriorated"*] Flor slipped while rushing to turn off a water hose. She scraped her hands and one arm; her elbow and shoulder were also injured. "Me llevaron al medico y luego me llevaron a trabajar." ["*They took me to the doctor and then they took me back to work*"] Flor did not want to lose her hours of work from earlier that day so she

> continued to work that day. The nursery covered the visit to the doctor. "Alguien me dijo que iba a recibir terapias (para rehabilitar el codo y hombro) pero nunca dijeron nada mas. Y yo no dije nada para que no me corrieran, mi necesidad era grande." *["Someone told me that I would get physical therapy for (my elbow and shoulder), but they never said anything else. And I didn't ask so that they wouldn't fire me, I was in great need"*] Flor still feels pain in her arm and shoulder; her elbow still hurts on cold days.

Another participant, Marianna, explained that workers were constantly rushed, as if they were paid "por contrato" ("by contract", that is, per number of units such as plants or trays) instead of by the hour. She knows about that form of work, because her husband picks cucumbers and apples, and is paid by the bucket. He makes $100 per day, while nursery workers make an average of $300 *per week* and, according to Marianna, work at a similar rhythm. Marianna pointed out that workers were so rushed that there wasn't any chatter among them.

The mother-in-law of one of the participants was present for a portion of an interview and quickly jumped in to tell the story of her own falls:

> The mother in law fell several times, but the nursery bosses couldn't send her to the doctor because "el patron estaba en quiebra…todavía estan en quiebra". *["The boss was going bankrupt…they're still going bankrupt."*] Instead, she chose to clean the nursery floors voluntarily on the weekends so that no one else would slip and fall anymore.

One participant, Flor, mentioned that workers often have to rush to load the specific number and types of plants when a client sends in an order, and that it is very important that orders go out on time. She explained that if an order required a particular plant that happened to be in a greenhouse that had recently been sprayed, she would quickly run in and bring out the plants, just so that she didn't have a late or incomplete order. She said she did this was because she was afraid to lose her job.

- *Lack of safety equipment*

Participants often complained about not having appropriate equipment to protect themselves from the harmful chemicals being sprayed on the plants or the residue of these chemicals on the leaves, soil, and surfaces in the greenhouses. For example, one participant, Ingrid, explained that one of her duties at the nursery was to spray a 5-gallon mixture of water and pesticide. "Ese spray mareaba y te adormecía. No daban nada para protegerse, ni guantes, ni gafas, ni máscara." [*That spray made you dizzy and sleepy. They didn't give you anything to protect yourself, no gloves, no goggles, no facemask."*]

Another participant, Melisa, described the situation at her workplace:

> The bosses at this nursery never provided workers with gloves, so we had to buy our own. Melisa calculated that a box of gloves lasts less than a couple of weeks. "Incluso el que spraya (el pesticida) no tiene ni el traje (traje de protección) porque el traje ya esta muy viejo.*"["The guy who sprays (the pesticides) doesn't even have the suit (protective suit) because the suit is so old now."]*

Two of the participants pointed out that some nurseries provided very little equipment to workers dealing with the soil, plants and trays. Instead, they provided an array of protective gear to workers dealing with plants that require protection from human contamination.

- *Covering the costs of work-related injuries*

Participants complained that they often pay for their own medical care after being injured at work, because even though the nursery bosses take workers to see the company doctor after an injury, these doctors send workers back to work without proper care. Participants reported several cases where they had to visit an independent doctor to find out what was wrong and to get treatment.

> Marianna saw one of her co-workers develop a rash on her face and arms from one of the plants. Marianna learned that the "patron" [*"boss"*] took her co-worker to the company doctor, who assured the co-worker that the rash was not due to the plants there. "(ella) siguio trabajando y ya. Si quiere curarse, tiene que ir al doctor por su propia cuenta." *["(she) continued working and that was that. If you want to be cured, you have to go to the doctor on your own dime."*]

The case below illustrates this pattern of work-related injuries going untreated by company doctors. The participant, Ingrid, worked at a nursery for 10 years.

> "Tambien era pesado, mucho sol, humedad con la lluvia, mucho frio en el invierno… bultos y plantas pesadas, y sobre todo: movimientos rutinarios…Al principio yo lo confundia (el dolor) con cansancio, pero cuando ya no podia con el dolor de las manos fue que empezé a buscar ayuda y ya fue cuando descubrieron que tenía eso (Carpal Tunnel Syndrome)". *["it was also heavy work, lots of sun, humidity with the rain, and very cold in the winter…loads and heavy plants, and most of all: repetitive movements…At first I confused it (the pain) with fatigue, but when I couldn't bare the pain in my hands, I started seeking help and that was when they discovered that I had that (Carpal Tunnel Syndrome)"*] In addition, her back injury evolved into two dislocated disks in her spine and a hernia.
>
> She initially mistook the pain and partial stiffness of her arm to be a sign of heart failure, so she rushed to the hospital on several occasions. Ingrid's doctor suggested that she rest for a few months. But Ingrid and her husband simply couldn't afford it because her medical bills had gotten them $7000 into debt. She tried to manage the pain with over-the-counter medications for approximately four years. Ingrid and her husband covered all the costs.
>
> When asked why she didn't ask her employer to give her time off or to cover some of the medical expenses Ingrid replied: "Es que quejarse que algo le duele es como firmar su renuncia en este tipo de trabajo. Entonces, le aseguro que todos los que sienten dolor pues se lo aguantan." *["The thing is that saying that something is hurting is like signing your resignation letter in this type of work. So I assure you that those who feel pain try to put up with it."]*
>
> Nevertheless, Ingrid reached a point of desperation and decided to take the doctor's report of her lumbar disk and carpal tunnel condition to her boss; she asked to be assigned to a different task in the nursery. The boss, then, sent Ingrid to the company doctor, who said she had nothing wrong and instead prescribed four strong pain medications. Ingrid had to stop taking them because they were making her extremely drowsy and nauseous. She went back to the company doctor who again said she had nothing wrong. So, she turned to an independent rehabilitation clinic for another exam, where they confirmed that she did have Carpal Tunnel and back problems. The

company doctor replied by saying she had to return to work. This is when Ingrid sought legal advice at a local community organization. Once, she threatened to sue the nursery's insurance company, the company paid for surgery for one of her hands.

Today, her hands hurt when the weather is cold. At night her hands and forearms tingle with numbness. She has lost all feeling in her right thumb.

Things weren't the same at work after the surgery. "Si uno se lastima, y el patron lo sabe, poco a poco le dan menos horas…No me gusto el trato que me dieron el ultimo año que estuve alli. Querian que yo renunciara." *["If you get hurt and the boss knows it, little by little they give you less work hours…I didn't like the way they treated me the last year I was there. They wanted me to quit."*] Ingrid quit in 2011 after what she described as several incidents of unfair cutting of her hours and general mistreatment. Ingrid explained that they couldn't just fire her like any other undocumented person because she was a US resident since 1998. She claims her employers discriminated against her because of her damaged hands until she finally quit. Ingrid's husband still works for this nursery, and therefore Ingrid decided not to pursue the matter any further. She fears for her husband's job.

- *No overtime*

Farmworkers are often paid minimum wage and do not get an overtime pay rate. However, they often work many more hours beyond the traditional 40-hour work week that is the norm in the United States.

Glorita works with roses seven days a week all year round. (Other types of nurseries require seven days a week of work, but only during certain periods of the year; harvest, for example). She comes into work at 8 am and "no hay hora de salida" *["There's no set time to go home."]*. The longest day she has ever worked was from 8am until the following morning. On such days, she would start work again at 5am and leave at 1pm. The hours of departure depend on the season.

Another participant, Marcela, talked about her work hours:

Lately, there isn't much work available. She exemplified this by saying: "entran a las 7 y salen a las 3! Osea que no hay trabajo." ["They go in at 7 and leave at 3! So there's not much work"] The hours she quoted make for an 8 hour day. Marcela explained that she is used to working more hours than that per day. She got paid a flat hourly rate without adjustment for overtime.

Elias, another participant, who was born and raised in the United States, described the lack of benefits at his job, in comparison with other jobs, with much surprise:

He has been working at the nursery for the past year and a half. The nursery has 6 employees who receive annual pesticide trainings. They spray pesticides on Saturdays, so that no one is exposed for 48 hours after application…They also provide safety equipment. However, Elias highlighted "they don't offer medical coverage, overtime, paid sick leave, no paid vacation!"

- *Pesticide application practices*

Other participants often mentioned that they were not protected from pesticides at all times. Sometimes they were exposed by momentarily walking into a greenhouse that was recently sprayed in order to complete an order (as mentioned in one excerpt above). Other times they

came into contact with pesticides because the "sprayadores", or people in charge of spraying the chemicals, would spray in close proximity to the workers inside a greenhouse.

> Marcela recounted that when spraying fertilizers, the "sprayadores" wore mouth and nose covers as well as gloves. They sprayed pesticides while the rest of the workers were in the same room. Non-sprayadores did not receive protective gear during or after spraying. Marcela also explained that there were no signs to explain to workers that they should leave the room and come back at a later time. Marcela and her co-workers at this nursery never received any pesticide training or information about the dangers of pesticides during the 10 years that she worked there.

Similarly, another participant, Rosa Maria, described the pesticide safety practices at the nursery where she worked:

> Pesticide safety was not strictly practiced but Rosa Maria managed to protect herself, "yo siempre he sido resongona, no me dejaba esprayar encima. Cuando el (sprayador) echaba (pesticidas) yo me salía…el esprayador si se protegía pero a nosotros nos echaba encima". [*"I have always been rebellious, I wouldn't let myself get sprayed on. When the sprayador sprayed, I would get out…the sprayador did protect him/herself, but would spray right on top of us."*] Rosa Maria decided to help make signs in Spanish, telling workers not to enter the nursery after spraying.

Another participant, Melisa, explained that in 13 years of working at that nursery, she never saw any videos on pesticides, and her employers or supervisors never explained anything about the dangers of using them.

> "Aveces sprayaban a dos líneas de uno y con el movimiento del aire igual nos caía todo el spray…antes (personas externas) iban a chequear las nurserias, entonces ponían los avisos de no entrar despues de sprayar. *["sometimes they would spray two rows from you and with the movement of the air, all the spray would still land on us…before, (people from outside) would come to check on the nurseries, so they would put up the signs saying not to enter because they had just sprayed"*] But now, since no one has come to check whether nurseries follow the regulations set for pesticide use, the safety practices at this nursery have been widely ignored.

Luis, another participant, described a similar scenario:

> "La gente se quita cuando el sprayador pasa, pero igual quedan a tan solo 5 metros del area sprayada". *["People move over when the sprayador passes by, but they're still at only 5 meters from the area that was sprayed."]* Luis added that in any case, they don't spray very strong chemicals. Luis continued: "vienen a chequear que los químicos se usen bien, chequean la tierra, chequean la limpieza." *["they come to check that the chemicals are properly used; they check the soil, the cleanliness."]* However, he couldn't recall when was the last time he saw people coming to check.

Another participant, Glorita, described what happened where she worked:

> The nursery showed their staff videos about pesticide safety and began posting signs in English and Spanish. Still, she remembers that sometimes they did not put up the signs that keep people away from closed off areas after a chemical has been sprayed. In addition, people sometimes ignored the instructions and precautions on the labels. She feels that people have a lax attitude toward chemicals.

But many other participants reported that nursery bosses scheduled pesticide spraying to happen during the weekends, so that greenhouses could be closed off for more than 24 hours until the following weekday. For example, Camila explained:

> "Cuando se sprayaba allí, no nos dejaban entrar. Siempre nos decían que no entramos allí…Tambien, trataban de sprayar el fin de semana, a menos que hubieran animalitos, entonces sprayaban durante la semana." *["When they sprayed there, they wouldn't let us inside. They always told us not to enter…they also tried to spray on the weekends, unless there were little critters, then they would spray during the week."]*

Similarly, another participant, Juanita, explained how her employers protected workers:

> The nursery is a large operation that includes approximately another 10 nurseries. The management rotates the workers throughout the different nurseries in order to close down operations in each nursery after it has been sprayed with pesticides. In this way, workers can avoid being exposed to the pesticides before they settle on the ground and other surfaces. Juanita added that the nursery provides its workers with protective gloves and scissors.

However, as mentioned in the introduction, pesticide exposure can potentially occur after the chemicals have settled on plant surfaces. Thus, even if nurseries try to protect their employees by spraying pesticides on the weekends, it is important to issue protective gear to employees or, alternatively, to eradicate the use of certain hazardous chemicals.

- *Cases of pesticide exposure*

Many participants discussed cases where they themselves, or someone close to them, experienced adverse health effects due to workplace pesticide exposure. In some cases, company doctors and nursery bosses dismissed workers' health complaints by saying that the chemicals or the plants were not the cause of their health problem. The case of Camila's brother-in-law illustrates this pattern:

> He works at a small nursery. Eight months ago, he developed a severe skin rash, first on one arm, and then it extended to his whole body. He talked to the nursery owner, "pero el le dijo que no le parecía que los químicos fueran la causa" *["but (the owner) told him that he didn't think that the chemicals had caused it"*]. The brother-in-law then reached out to Camila's husband, who told him to ask his doctor for documentation of the rash that proved that it was caused by chemicals at work. Both the doctor in Florida and his doctor in Mexico have independently come to the conclusion that his skin rash was caused by the harsh chemicals with which he works. The brother-in-law continues to work at the same nursery in the same position. Camila explained that the reason he stayed is that he is making approximately $16 per hour and that other types of jobs would not pay as much to someone with his skills. The researcher tried to contact the brother-in-law to document his case in further detail, but he declined to participate in the research out of fear for his job.

It is important to point out that, as it will be explored in the second section of the findings, that having a family to support, as well as other financial pressures, contributes to farmworkers' willingness to protect their employers and their jobs.

Another participant, Flor, explained that she was too afraid to say something about her skin reaction to the pesticides:

> Independent of her fall (referenced above), the skin on Flor's hands was also constantly irritated and peeled. One of her duties was to wash plant trays, which have soil residue. She thinks that the chemicals in the soil caused the skin on her hands to peel off. She never saw the doctor about this, because it was too expensive. Flor explained that pesticides are very strong chemicals and, although nursery bosses sometimes gave out gloves, they didn't give them out often enough. It is because of that, that when the gloves would wear out, people would simply work with their bare hands. Today, she cannot touch household cleaning products (like: Windex or Clorox) because her fingers start to peel. Flor specified: "en Mexico (los productos de limpieza) no me pelaban los dedos" *["Back in Mexico my fingers didn't used to peel"]*. When I asked why she and her family had remained in these nursery jobs for so long, Flor replied: "La necesidad y el miedo de no encontrar otro trabajo. Nos daba miedo hasta pedir un permiso (para ir al medico)" *["The need and the fear of not finding another job. We were even afraid of asking for permission to go see the doctor."]*

Rosa Maria, another participant, explained that whenever someone developed a rash, bosses at her nursery would provide "una pomadita" *[generic word for cream or ointment, "a little cream"]* and that was as far as they helped.

Abigail's husband had a strong reaction to the pesticides:

> He used to get allergies when they asked him to spray pesticides. "…le daba mucha tos y le salían ronchitas con manchas blancas. Llegaba (del trabajo) con la piel llena de ronchas en todo el cuerpo. Los ojos estaban rojos cuando esprayaba. Le duraban las ronchas y los ojos rojos como dos o tres días…Cuando esprayaba le daban mascaras, guantes y trajes que protegen. Pero es tan fuerte el químico, porque le pasaban (*los químicos*). Ahora, que no trabaja en eso, ya no le dan esas alergias. Por eso, me di cuenta yo que era por el químico de la nurseria." *["...I would cough a lot and get little bumps with white blotches on my skin. I would come (from work) with my skin covered in bumps throughout my body. My eyes were red when I had to spray. The bumps and red eyes would last for two or three days…when I sprayed they gave me face masks, gloves and suits to protect me. The chemical is so strong, it would pass through. Now that I don't work in that, I no longer gets those allergies. That's how I realized it was due to the chemical at the nursery.]*

- *Long-term and intergenerational effects of pesticide exposure*

Although the cases above illustrate mostly skin rashes and allergies, there are also long-term and intergenerational effects of pesticide exposure. As outlined in the introduction, pesticide exposure can have effects prior to conception and in-utero. However, these long-term and intergenerational health effects are difficult to document because, throughout their lifetimes, farmworkers can work in different nurseries, engage in different types of farm work, or they may do farm work in other states or in their home country. Therefore, they are exposed to a myriad of different chemicals. This makes it very difficult for any doctor or researcher to accurately pinpoint the source of an illness or the cause of a deformity or illness in a farmworker's child.

The choice to remain silent and to continue working at nurseries

In the "Purpose" section of this paper, we asked: Why aren't real cases of abuse and pesticide exposure being reflected in the official statistics? Fear of getting fired and/or fear of deportation

is the simplistic explanation. This research aims to illustrate the array of factors that lead farmworkers to make the decision to not speak out against instances of abuse or pesticide exposure.

- *Few work alternatives*

Participants often talked about the difficulty of finding work alternatives. This is because the other industries that require unskilled labor are at a significant distance from Apopka. A few of the participants have managed to find work alternatives through employment agencies, which provide transportation to the different work-sites. However, according to two participants, undocumented workers are having a harder time enrolling with these employment agencies. In addition, work availability with these agencies fluctuates, affecting workers' ability to earn money on a daily basis.

> Glorita feels there are only a few other options for work. For example, she worked at a hotel through a cleaning service agency. The pay rate was very low through the agency, and she is not sure how good the pay rate would be if she were to work directly with the hotel as part of their cleaning staff. In addition, she considers that the distance from Apopka and difficulties with transportation are important barriers to this type of job. "Tendría que conseguir el ride." *["You would have to find a ride."]*
>
> Glorita's mother works at a hotel and her father works in a recycling plant. She explained that both of those jobs are only available for people who can drive or have arranged rides with other workers in the area. These driving arrangements are often short lived because of unstable employment conditions.

Another participant, Flor, also tried working through employment agencies:

> Flor started to find jobs through an employment agency that matches workers with labor needs in different industries in the area. She worked at a laundromat, a soda packing factory, and a juice factory. The organization provided transportation to some of these, often distant, factories. Flor explained that it wasn't a good source of work, because there were many days when there was simply no work available. In addition, Flor explained that the employment agency mentioned above, now requires more documentation from its laborers.

Continuing with Flor's case, her family illustrates the importance of driving or having a "steady ride" in order to keep a job that was far away from Apopka:

> Flor's husband and four daughters have all worked at nurseries in the past. All have chosen to take jobs in different industries. Her daughters were able to find jobs in cleaning, in administrative positions, and in retail because they speak English and can drive/own cars. Flor's husband worked at a door factory 45 minutes from Apopka. After that, at a recycling facility, 20 minutes from Apopka. He was able to take these jobs because he can drive and owns a car; he drives without a license, which involves the risk of deportation. Nevertheless, Flor views nursery work as physically demanding and potentially hazardous. She supports her husband's choice of work, even if it means significantly more driving.

Construction work was often mentioned as the key alternative for many male farmworkers. Several of the participants' husbands worked in construction. However, some participants

reported cases of wage theft, where bosses would simply disappear without paying the construction crew for weeks' worth of work. The deed often went unpunished because the workers were often undocumented and were too scared to report the theft to the authorities.

- *Dependents back home*

Participants often mentioned the added financial pressure of having dependents that still lived in their home countries. Participants sent up to one third of their weekly earnings once or twice per month to their children, siblings and/or their parents. The regularity with which farmworkers send money may reflect the degree to which their family members depend on it. This is an added pressure to stay employed.

Rosa Maria explained that a long time ago, she and her children waited for a weekly check from her husband, who worked in the United States:

> Her husband arrived alone to the United States to work in 1983. He was homeless when he first came and ended up sharing an abandoned bus with 6 other men. He would send money back to Mexico. Rosa Maria explained that, even with his American income, "un cheque nos duraba una semana" *["One check would last us one week."]*. He returned to Mexico to be with his family only one month out of the year.

Another participant also talked about dependents back home:

> Miriam and her husband have had to send money back to their relatives in Mexico for a number of years. Her grandparents are very ill, and although her brother returned to Mexico to help them out, his job as a construction worker and as a seasonal farmworker in Mexico, does not pay enough money to support him and the grandparents. Miriam sends them $150 each month. In addition, the couple sends $100 per month to a blind uncle. Miriam explained that life in the United States is full of additional stresses, "el trabajo es estresante, lo que tu ganas no es para tí, es para la renta, las cosas basicas y para enviar (a Mexico)…" *["The work is stressful, what you earn is not for you, it is for rent, the basic amenities and to send (to Mexico)."]*

Abigail's case exemplifies several of the points above. At the time of our interview, she was in the precarious situation that many farmworkers fear:

> Abigail has had difficulty finding jobs that last longer than a few months. The exception was a job at a nursery; it lasted four years. Abigail was forced to quit after the owner sold the nursery, and it has been difficult to find other jobs since then. She only gets hired for short periods of time; "no es nada estable" *["It's not stable at all."]*. Abigail explained that not having a ride to work is another important barrier and further reduced the choices of jobs available to her. Being pregnant has further complicated matters, because it makes Abigail very nauseous. (NOTE: the researcher suspects that it will be harder to get work when her belly starts to show). She had not found any work for the past month at the time of the interview. She worries about not being able to send money to her mother and sons in Mexico. She sends money every two weeks or once per month. "Mi marido si gana y me da dinero. Pero como no es el padre de mis hijos (en Mexico), pues me toca seguir buscando (trabajo) para mandar (dinero a Mexico)" *["My husband does earn money and gives me some. But since he is not the father of my children (in Mexico), well, I have to keep looking (for work) to send (money to Mexico.)"]*

- *Their children's health issues*

Participants often discussed the health issues of their children. It is important to point out that this study does not delve into the causal factors behind the various ailments of farmworkers' children. Whether the children's illnesses were or were not caused by pesticide exposure in-utero, these illnesses add to the set of pressures that push farmworkers to maintain their jobs at any cost.

> Marianna's three children have had a variety of health issues. Her oldest (7 years) has gastrointenstinal issues and cannot ingest tomatoes, spicy foods, orange juice or other acidic foods. He is on medication. He has always had constant allergies and sinus issues. He also had respiratory difficulties when he was two months old and had to be rushed to the emergency room. Her second child (5 years) also had respiratory complications when she was six months old. Doctors had to operate on her nose at age four as part of her treatment for her respiratory condition. She has also developed asthma. Marianna's third child (1.5 years) had a condition in which her cranium closed prematurely. She had surgery at four months old in order to open the cranium. She wore a special helmet for 8 months and must be closely monitored by an ophthalmologist every six months.

Melisa, another participant, has four children:

> They are 11, 8, and 5 years old and 1month old. Her 11 year old son has constant sinus infections. Her 8 year old son had asthma since birth and was recently diagnosed with ADHD (Attention Deficit Hyperactivity Disorder). He takes medication for both conditions and goes to therapy for his ADHD. Her 5 year old daughter was born with a skin rash. Her 1 month old baby also has skin rashes.

Elias has two sons:

> Their oldest son is 8 years old. He had asthma since birth, but in recent months he has improved significantly. Their second son, 5 years old, has had epileptic seizures since he was 9 months old. He has developed a speech impediment associated with the seizures. Elias also had seizures as a little boy, and he also has some difficulties with speech.

As mentioned in earlier excerpts, Rosa Maria said that her work was dangerous because of pesticides, that bosses sometimes randomly reduced people's work hours, and that people weren't allowed to go to the bathroom outside of break times. However,

> Rosa Maria stayed at this nursery because they gave her more flexible hours in order to spend more time with her eldest son (now 26), who is legally blind. She explained that it is not easy to switch to a new job because the places that hire undocumented immigrants prefer young workers.

- *Their own health issues*

Participants' own health issues are also a burden. None of the participants interviewed have health insurance. Their health issues are not only a physical burden, but also a financial one; they cover their own health costs. In addition, these health issues sometimes impede them from working, thereby putting more pressure on their spouses (who often also work at nurseries) to maintain their jobs.

> Luis is a US resident. He was diagnosed with diabetes 8 years ago. He also has hypertension and is overweight. Luis had to stop working 9 months ago because of the most debilitating of his

> health issues, his vision. He has trouble seeing stairs, sometimes he sees double and, in general, he cannot estimate distance or depth. In the past, he had eye surgery due to internal bleeding in the eye. The most recent operation was to correct what Luis explained as a "fallen retina" in one of his eyes. He describes the pain as high pressure inside his eyes. Luis has not received disability coverage, social security, sick leave, or any form of financial support for his health crisis. This is one of the reasons why his wife continues to work at the nursery. However, Luis is enrolled in a program for blind people and will start therapy that may partially restore his sight. At the time of this interview, he had just received a formal letter from his doctor with which he hopes to start receiving disability money.

Elias and his wife are both US citizens. Both have a US high school education. Elias hurt his knee while playing basketball 5 months prior to the interview:

> Since the family has no health coverage, they opted to see a "sobador" (bone-setter) who re-positioned his knee manually. Elias did not get an MRI to know what exactly happened to his knee, because his family cannot afford it. He continued working with a "busted knee" for several months. His boss tried giving him different jobs within the nursery "but none of them worked out". Three weeks before this interview, his boss told him to go home and rest. Elias realized that his being home meant a huge financial cut, so he immediately went to a local community organization for help. Elias explained that the family is very short on money this month because they are living on his wife's earnings. She also works at a nursery.

The lack of alternative jobs, the responsibility to dependents living in their home countries, the health issues of their children, as well as their own health issues, are among the myriad of factors influencing farmworkers to decide to remain silent and continue in this line of work.

- *Exemplifying rational decisions: working in nurseries while pregnant*

It is clear that many farmworkers live in precarious financial conditions. The following passages illustrate cases in which female farmworkers have made the rational choice to continue to work in nurseries while pregnant, despite knowing pesticides could be dangerous for their babies.

Glorita worked until she was 6 months pregnant with her first child:

> She feels that she should protect herself and her fetus from the pesticides: "Uno debe protegerse. Esos químicos son todos dañinos, especialmente lo que ponen en los rosales, parece que es muy fuerte…uno no va a ser joven toda la vida y los efectos (de los químicos) pueden verse mas tarde…pero igual uno sigue regresando a trabajar allí por el dinero." [*"You have to protect yourself. Those chemicals are harmful, especially the ones they put on roses, it seems that it is very harsh…you are not going to be young all your life and the effects (of the chemicals) may be seen later on…but you still continue going back to work there because of the money."]*

Another participant, Juanita, worked throughout her pregnancy:

> Her husband was deported three months prior to her interview. Juanita was approximately seven months pregnant when this happened. Juanita continued to work in the nursery until the day she gave birth. Juanita explains that she and her baby are both healthy, so they probably were not exposed to pesticides. She added that she had to continue working for the money, particularly after her husband's deportation.

Miriam, another participant, was pregnant and working at a nursery at the time of her interview. As mentioned earlier, the nursery where she works schedules pesticide spraying on the evenings and weekends. However,

> "Nos mandan prestadas." *["They lend us out."]* Miriam and her five co-workers are often sent to other nurseries when work is slow at their usual nursery. She said it's hard to know whether these other nurseries are careful with their use of pesticides. Last year, Miriam participated in focus groups to discuss pregnancy and pesticide exposure. She is four months pregnant and continues to work in the nursery. despite the knowledge she gained at these sessions.

Miriam's choice to work in conditions that may affect the health of her fetus may exemplify the extent to which Miriam's family needs her earnings.

Another participant, Melisa, has also worked in nurseries throughout her pregnancies. She was staying at home with her newborn baby at the time of her interview:

> Melisa worked at the nursery throughout her four pregnancies except for six months during the first pregnancy. She recently took her newborn to the nursery for her co-workers to see the baby, "pero solo al break room, no la iba a meterla la nurseria!" *["but only to the break room, I wasn't going to put him inside the nursery!"]* she exclaimed, acknowledging the dangers of the pesticides. Melisa's husband has asked her to stop working so that she can dedicate more time to the children. Melisa feels that the household finances would simply not be enough without two incomes. She exemplified "hay veces tengo que ir a las Iglesias para que me ayuden con la renta" *["Sometimes I have to go to the churches, so that they can help me with the rent"]*.

- *Exemplifying rational decisions: living on the nursery property*

Nursery employees are sometimes given the option to live with their families in trailers situated on the nursery property, in very close proximity to the greenhouses. In exchange, they are expected to "keep an eye" on the premises and be sure everything is in order throughout the weekends. When discussing pesticides, participants expressed some anxiety about living so close to the greenhouses.

Camila's family lived on a nursery property for a few years:

> When they were still living at the nursery, she sometimes became concerned because of their proximity to all the chemicals. All four of her daughters were diagnosed with asthma; there is no history of asthma on either side of the family. All four girls outgrew their asthma by age three, but two of the girls still have allergies. Camila explained: "esa cosa vuela, quien sabe si uno esta inhalando eso." *["That stuff flies, who knows if you are inhaling it."]*. She thought back and added, "vivíamos al lado cuando las niñas tenian asthma." *["we lived next to the nursery when the girls had asthma."]*

Virginia and her family currently live on a nursery property:

> One of the main reasons why Virginia is not employed at the nursery is that her 10-year old son has muscular dystrophy and requires additional care for everyday tasks, like bathing himself or brushing his teeth. Their second son, age six, is in good health and thriving. Virginia believes that the chemicals sprayed in the nursery are dangerous. Sometimes she can perceive a smell of chemicals in the air around her home; she is not sure if living in such close proximity to the

nursery is a bad thing. Her son's muscular dystrophy requires her full attention and does not allow her to work full-time to contribute to the household finances. Whether living so close to the nursery is dangerous or not, her family chooses to seize the opportunity to live rent-free.

One very illustrative case study

The following case has not been cited in any of the sections above. It is presented separately because it illustrates several of the points made above.

Sandra came from Guatemala 9 years ago. She came because after her father was killed, her mother was alone supporting several young children. As the eldest of her siblings, Sandra had to leave her own son behind so that she could find work in the United States and send money back for everyone else in the family. Her husband came first and worked for a year before she arrived. They chose to come to Florida, because the husband's cousin lived here. Sandra's first son, now age 9, still lives in Guatemala with Sandra's mother. Her other children, ages 6 and 1.5 years, live with Sandra and her husband in Apopka. The thought of her son in Guatemala still brings tears to her eyes.

Sandra always worked for the same Asian family that owns a set of nurseries. Her duties included planting, moving soil, cutting plants, and filling trays with young plants. Sandra described the work environment: "Ellos quieren que uno siempre se apure…y contal que no nos corran, pues dale más, a trabajar más rapido." *["They want you to always rush…and just so that they don't fire you, well you just give more, go and work faster."]* No minute of the day went to waste. For example, there were no bathroom breaks outside of lunch break and one official 15-minute break, except in emergencies. She explained that other nurseries sometimes allow for two breaks in the day and laughed saying that would have made a big difference for her bathroom activities. Sometimes they didn't provide drinking water at the nursery where she worked. On other occasions, the bathroom stopped working, and when they asked the boss to fix it, "el respondió que tomen menos agua para no tener que ir tanto!" *["He answered that you should drink less water, so that you don't have to go so much!"]* Sandra continued to work at the same nursery until one year ago.

Sandra developed a severe rash on her arm while she was still working. They had sprayed pesticides on the plants the day before and the mist on the surface of the plant rubbed off on her arm. Sandra had a burning sensation that very instant. She tried to tell her boss "pero no me hizo caso el patron" *["But the boss just ignored me."]* She continued to work. By evening time, the arm was covered in white bumpy blotches. Again, she went to her boss and he simply dismissed it, saying that the rash couldn't have been from the chemicals in the nursery; those didn't affect the skin. Sandra kept working for the following six months despite the continuing rash and the burning sensation on her arm. She eventually went to the clinic on her own and doctors prescribed medications for her arm. However, her rash was never documented as a work-related injury. Sandra explained that if she had asked for financial help or documentation of her injury, her boss would have fired her. She lied at the clinic, and said the rash "simply appeared". When the clinic staff asked her if she worked at a nursery, she denied it. "Hay muchas cosas que uno se reserva porque uno tiene que seguir trabajando…ni modo. Tenía que seguir, llega el cheque y cada dollar tiene su destino y a uno no le queda nada. Tengo a mi mama allá enferma, tengo a mi nino, los bills…por eso protegemos estos trabajos.*"["There are many things that you keep to yourself because you have to keep working…there is no other way. I had to go on, that check arrives and every dollar has its purpose and you are left with nothing. My mom is sick over there, I have my little boy, the bills…that's why we protect these jobs."]*

She waited until her brother arrived from Guatemala, and, when he found a job at a mushroom farm, she decided it was time to quit. Now that her brother was making money, he could help Sandra support their

family in Guatemala. Three months ago, the rash finally started to fade. At the time of the interview, she still had discolored patches on her hands and forearms.

Sandra explained that nursery work is very hard. She has cousins and aunts who also work at nurseries. She feels bad for them and tells them to get out of these jobs, "pero no hay otra opción, no hay mas trabajo." *["But there is no other option, there isn't any other work."]* The cousins' and aunts' work environments echo the reasons why Sandra left her own job at the nursery: the chemicals are dangerous, the work is very physically demanding, and the bosses want fast-paced labor.

When discussing alternative work options, Sandra explained that there are jobs in the hotel cleaning industry where one can make between $250 and $300 per week, depending on the hours. "Pero los hoteles piden papeles, piden que tu leas, escribas, hables un poquito de ingles." *["But the hotels ask for papers, they require you to read, write and speak some English."]* Those are requirements that many farmworkers cannot meet.

She explained that men have one other option for work, construction. Her husband worked in construction for some time, but chose to stop because of wage theft and instability. Sometimes there wasn't any work, other times the construction boss would disappear at the end of the week without paying his workers, "y no podíamos hacer nada. Como quejarnos? (Si los encontramos) los patrones amenazan con llamar la imigracíon. Entonces, a uno le toca buscar otro trabajo." *["and we couldn't do anything. How could we complain? (if we found them) the bosses threatened to call immigration. So you just have to find another job."]*

Sandra and her husband live with their two children (1.5 and 6 years), with Sandra's brother, who arrived from Guatemala one year ago, with Sandra's cousin, and the cousin's newborn baby. Today, the home also serves as an informal daycare for a few moms in the community. Sandra charges $12 per day per child. She sees this as a way to help other moms, who work in nurseries. She started this informal daycare six months ago, when a cousin asked Sandra for help with her kids. Sandra explained that people really need the money and mothers try to arrange affordable care for their kids, so that they can work at a nursery. Sandra sometimes gives the kids baths and dinner, so that their mothers can rest after they pick them up. Money from the informal daycare now contributes to the $100 that Sandra sends for her family every two weeks.

Sandra feels that farm work has affected her and her husband's health. Her husband's eyes are constantly burning and tearing up. It started approximately two years ago, but they haven't seen the doctor - too expensive. Sandra notices that he now blinks very often. She attributes his eye problems to the constant brightness inside the greenhouses.

When I asked Sandra "this sounds like a life of hardship, why come to live this way?" She responded "Aquí nos alcanza un poquito más. Hemos pasado tanta necesidad (en nuestros paises) que aquí ya aguantamos todo para seguir adelante…lo aguantamos todo por conservar nuestro trabajo. No nos importa que no nos den tantos breaks, lo que queremos es ese cheque cada viernes." *["Here money lasts a bit more. We have been through so much need (in our countries) that here we put up with everything just to get ahead…we put up with everything to keep our jobs. We don't care that they don't give so many breaks, what we want is that check every Friday."]*

CONCLUSION

The first part of this paper explored various cases of farm worker abuse and pesticide exposure. These cases included: issues with sanitation at the work sites; the constant rushing of employees

who are working with heavy objects and dangerous chemicals; the lack of safety equipment; the lack of coverage for workers injured on the job; the lack of an overtime pay rate; the dangerous practices associated with pesticide application; and multiple cases of pesticide exposure.

The second part of this paper explored the reasoning behind people's choices to remain silent about abuses and to remain in these jobs. Some of the reasons include: the lack of other job opportunities; the financial responsibility to multiple dependents back home; the costs and pressures associated with their children's health issues; and the costs associated with their own health issues.

Understanding the context in which farmworkers make these decisions for the wellbeing of their families is the beginning to understanding their plight. They are people trying to escape poverty through hard work.

APPENDICES

Glorita

Glorita came to Florida because she had an aunt and an uncle living here. She started to work at a nursery because she knew people working there. Glorita worked with the same nursery for 10 years. She is currently 8 months pregnant with her third baby. She has a 5 year old boy and one 10 year old girl. She worked until she was 6 months pregnant with her first child.

Glorita's English is not proficient. She tried to learn English by taking her baby to a motherhood center (centro para mamas) where women could come to learn English and teach English to their babies. She maintained this until she had to return to work.

<u>WORK</u>

Most of her work has been in roses. She works seven days a week all year round. Unlike other nurseries, the rose nurseries require seven days a week of work, but only for specific seasons. She comes into work at 8am and "No hay hora de salida." *["There's no set time to go home."]* The longest day she has ever worked was from 8am until the following morning. On such days, she would start work up again at 5am and leave at 1pm. The hours of departure depended on the season.

Glorita quit her job 1 year ago. One of the reasons for quitting her job was to spend more time with her two children. She also felt constantly exhausted due to her anemia and the work pace, which has long hours of intense physical labor and no resting days (7 days per week). She also explained that she was tired of the repetitive nature of the work. Finally, she feels that she should protect herself and her fetus from the pesticides: "Uno debe protegerse. Esos quimicos son todos dañinos, especialmente lo que ponen en los rosales, parece que es muy fuerte…uno no va a ser joven toda la vida y los efectos (de los quimicos) pueden verse mas tarde…pero igual uno sigue regresando a trabajar allí por el dinero." ["You have to protect yourself. Those chemicals are harmful, especially the ones they put on roses, it seems that it is very harsh…you are not going to be young all your life and the effects (of the chemicals) may be seen later on…but you still continue going back to work there because of the money."] Glorita often considers going back for a season or two, because she believes the money is good if one is willing to put in the hours.

In addition, she feels there are only a few other options for work. For example, she worked at a hotel through a cleaning service agency. The pay rate was very low with the agency, and she is not sure how good the pay rate would be if she were to work directly with the hotel as cleaning staff. In addition, she considers that the distance from Apopka and difficulties with transportation are important barriers to this

type of job. "Tendría que conseguir el ride." *["You would have to find a ride."]* Glorita has spent the last year enjoying her children and working sporadically at the hotel (through a temporary employment agency).

PESTICIDES

Glorita thinks all chemicals (pesticides) used at the nurseries are bad for people's health. She thinks the worst chemicals come from nurseries that grow roses. The nursery where Glorita worked showed their staff videos about pesticide safety and began posting signs in English and Spanish. Still, she remembers that sometimes they wouldn't put up the signs that keep people away from closed off areas, after a chemical has been sprayed. In addition, people sometimes ignore the instructions and precautions on the labels. She feels that people have a lax attitude toward chemicals.

Glorita explained that people from Central America (Guatemala) don't seem to care about health; they may be more used to "el campo mas agresivo… no se preocupan por los pesticidas." *["rougher, more aggressive field work… they don't worry about the pesticides."]* (NOTE: This behavior may reflect the lack of awareness and education, as well as the immediate necessities of people who work in these conditions.)

She has seen cases of other nursery workers, who have had negative skin and eye reactions to the exposure to certain chemicals in the nursery. "Simplemente te mueven de una casa para otra con diferentes tipos de planta." ["They simply move you from one greenhouse to another one with different types of plants."]

Glorita also cited high temperatures inside the nursery as another important hazard of working in the nurseries.

HEALTH

Glorita developed anemia 5 years ago. She often feels dizzy, weak and tired. Her two children are in good health. Her children have access to clinics and government services. Glorita also has access to some of these services for the time being because she is pregnant.

FINANCES

Glorita started making minimum wage in 2001. Her bosses gave salary increases to those who continued to work season after season as an incentive. Her last year's pay rate was $8 per hour. (NOTE: minimum wage that year was at $7.31 per hour. After 10 years of working for this nursery, Glorita managed to increase her pay rate by only 69 cents per hour). Glorita used to buy food from a lady who comes to the nursery to sell lunches. These lunches were much like a simple home-cooked meal consisting of rice, meat and soup, costing Glorita $6 every day. In addition, on the days that she was needed at the nursery until late, she had to pay her sister-in-law to cook for her two children when they came home from school. Despite this "grim" financial picture, Glorita explained that she feels no financial pressure to return to work. She explains that when they are making less money, then they just try to cut down on expenses.

HOUSEHOLD MEMBERS

Glorita's husband works in construction. He leaves home at 5am and returns at 6pm. Glorita's parents live in the house as well. Her mother works at a hotel, and her father works in a recycling plant. She explained that both of those jobs are only available for people who can drive or have arranged rides with other workers in the area. These driving arrangements are often short lived because of unstable employment conditions.

Marcela

Marcela arrived in the United States at age 20 and has been living in the United States for 25 years. She had three daughters and one son, all adults. They have given her 9 grandchildren. Marcela is married and her husband works in construction.

WORK

Marcela worked with a nursery for 10 years. At the time, this was a small nursery with only 10 other employees. Marcela quit working at the nursery three years ago because she went to Mexico for 3 months, and when she returned, they said they no longer had jobs available. She also agrees that lately there isn't much work available. She exemplified by saying: "entran a las 7 y salen a las 3! Osea que no hay trabajo." *["They come in at 7 and leave by 3! There is not much work."]* The hours she quoted make for an 8-hour day[2]. Marcela explained that she is used to working more hours than that per day. She got paid a flat hourly rate without adjustment for overtime.

Marcela planted and weeded plants using her own protective gear: purple latex gloves "como los del doctor" *["Like doctors' gloves."]* Marcela had to buy the gloves for herself and replaced them often, because they tore easily. She recounted that when spraying fertilizers, the sprayers wore mouth and nose covers as well as gloves. The "esprayadores" as they call them, sprayed pesticides while the rest of the workers were in the same room. Non-esprayadores do not receive protective gear during or after spraying. Marcela also explained that there were no signs to explain to workers that they should leave the room and come back at a later time. Marcela and her co-workers at this nursery never received any pesticide training or information about the dangers of pesticides during the 10 years that she worked there.

Nevertheless, Marcela explained that she is aware that sometimes the health effects of pesticides come later. However, she says that Apopka offers little choice of work; the majority of employment is either in construction or in nurseries. One of her daughters worked in a nursery on two occasions for brief periods. It is possible that she used these "bouts of hard work" to save money for a specific purpose.

FAMILY

One of Marcela's daughters has worked at nurseries on and off and is currently staying at home with her four year old son and 14 month old baby girl. Marcela stays with her to help out with the kids. The boy is barely able to speak a few Spanish words. Marcela says he speaks very little in comparison to the other grandchildren of his same age. Marcela hopes he'll start speaking when he starts school, which may be next year. Still, they have not taken him to a speech specialist nor have raised questions as to why he does not speak a fraction of what other children his age can speak.

Her younger daughter lives 20 minutes from Apopka and recently stopped working; she is approximately 7 months pregnant. Her son works in construction.

Juanita

Juanita came to the Unites States two years ago. She left her three children in Guatemala with her mother. They are eleven, nine, and seven years old. Her husband also came to the United States a few years ago and was deported three months prior to this interview. Juanita was approximately seven months pregnant when this happened. One of her nephews came from the Miami area to Apopka to stay with her and help her during this difficult time. Leaving the US to be with her husband was out of the question. First, she was too pregnant to safely withstand the journey. Second, coming into the US was a significant investment and involved significant danger; she did not want to give up so easily. In addition, "aquí rinde mas el dinero (que en Guatemala.)" ["*The money we earn here lasts a bit longer than the money we earn in Guatemala lasts there."*]

[2] Nine hours minus two 15 minute breaks and one 30 minute lunch break.

HOUSEHOLD

Juanita is currently living with her newborn baby, nephew and three other men. They split the cost of rent and utilities. Her husband is already on his way back to the United States through Mexico, and Juanita is extremely worried for his safety. She hopes to hear from him sometime in his two-week journey.

Juanita and her husband initially came to work in Kentucky, because her sisters live there. She and her husband got jobs in the restaurant business, but only stayed in Kentucky for one year. They were dissatisfied with the pay rate and came to Florida in search of better pay in jobs at a nursery. In Kentucky, Juanita made only $300 after working seven full days a week, whereas the nursery jobs in Florida offered $7.31 per hour. Working 9 hours per day, she managed to make $329, working only Monday through Friday.

WORK

Juanita became pregnant soon after arriving in Florida. She worked in the packing station, standing in front of a conveyor belt. It made her very dizzy, so she asked her supervisor to move her to another section. They moved her to the planting section. Both jobs involved constant standing and offered two 15-minute breaks and one 30-minute lunch. Juanita continued to work in the nursery until the day she gave birth.

When I asked about the nursery's practices around pesticides, Juanita explained: The nursery is a large operation that includes approximately another 10 nurseries. The management rotates the workers throughout the different nurseries in order to close down operations in each nursery after it has been sprayed with pesticides. This way, workers can avoid being exposed to the pesticides before they settle on the ground and other surfaces. This nursery provides its workers with protective gloves and scissors. Juanita explains that she and her baby are both healthy, so they probably were not exposed to pesticides. She added that she had to continue working for the money, particularly after her husband's deportation.

Juanita started working at another nursery approximately two months after giving birth. She says she plans to return to Guatemala with her new baby by the end of the year.

Virginia

Virginia came to the United States 12 years ago. She came to join her husband, who had started working in Florida nurseries with his brother three years earlier. Virginia and her husband have two boys, ages 10 and 6. The owners of the nursery agreed to house the family for free in a trailer home a few yards from the nursery. In exchange, Virginia and her husband are in charge of the nursery at night and on the weekends.

WORK

When Virginia arrived, she went straight to work at the nursery, where their home is now located. She worked for a little over a year and then quit because she was pregnant and felt very nauseous. At that time, she did not know the dangers of pesticides.

Some of her duties at the nursery included the following: preparing the orders for clients, putting soil in planting cups, making seed dishes, spacing plants, or cleaning the nursery. When she first started working, management gave them two 15-minute breaks and one 30-minute lunch break. She explained that people didn't want to take their second 15-minute break, so management took it away. Then added, "but now you can go to the bathroom whenever you want."

HOUSEHOLD

Today, she is a homemaker, occasionally helping her husband on the weekends, when there is additional work to do at the nursery. One of the main reasons why Virginia is not employed at the nursery is that her 10-year old son has muscular dystrophy. He requires additional care for everyday tasks, like bathing himself or brushing his teeth. Their second son, age six, is in good health and thriving.

Virginia does not think that working at the nursery affected her first pregnancy. She explained that it couldn't have affected her, because she quit working soon after she got pregnant. However, Virginia believes that the chemicals being sprayed in the nursery are dangerous. The nursery management has given workshops about pesticide safety twice since her husband started working there. She doesn't know the specific ways in which these chemicals are harmful, but she knows that the 12 hour waiting period for entering a room after spraying is very important and must be respected. Sometimes, she can perceive a smell of chemicals in the air around her home and is not sure if living in such close proximity to the nursery is a bad thing.

Virginia emphasized the great advantage of living on the nursery property; no monthly rent payments. Her son's muscular dystrophy requires her full attention and does not allow her to work full-time to contribute to the household finances. Whether living so close to the nursery is dangerous or not, her family chooses to seize the opportunity to live rent-free. However, Virginia was quick to point out that the bosses expect her husband to spray pesticides on the weekends, water plants when needed, and care for the property in general on evenings and weekends without paying for the extra hours of work.

HEALTH

She has no ailments of her own, but her husband sometimes complains of strong headaches. They attribute the headaches to the sun and the heat inside of the nurseries. On particularly hot days, the nursery management tries to provide extra water for the workers. Her husband also has high triglycerides and complained of chest pains in the past. Nothing has come of either condition; he has not addressed either health issue.

Virginia finds herself very disconnected from the community because of their living conditions. She keeps to herself in the home and doesn't interact much with workers in the nursery. There are no "neighbors" living next to the nursery.

Camila

Camila arrived in Arizona in 1987 with her parents. She was a teenager when she arrived and was able to learn English with ease. She was 14 when she stopped attending school in Mexico. Her parents and other relatives still live in Arizona.

Camila and her husband have been married for 20 years; they moved to Florida soon after their marriage. They have four daughters, ages 18, 15, 12 and 4, who still reside with them.

WORK

Camila's first job in Florida was at a nursery planting gardenias. She worked there for two months. Her next job was at another nursery in Apopka, which was Chinese-owned and the working conditions were very bad. There were no toilets in the nursery, so workers were obliged to ask for permission to use the toilet inside the owner's home. The boss often asked Camila to wait or to "go outside of the nursery, instead of walking all the way to the house." Camila refused to do this on several occasions. She quit after three months.

Her next job was at the nursery, where her husband has worked for the past 16 years. They lived on the nursery property at the time of her first and second pregnancies. She worked at this nursery for several months, but quit after her first month of pregnancy because she was too nauseous and because, as she put

it, "we could afford it." There was a lapse of about a year without working because she was at home with her first daughter. Camila went to work at a fourth nursery and stayed there for a couple of years. She left that nursery when she was seven months pregnant with her second daughter. She generally enjoyed the work at the fourth nursery, but left because she could no longer lift heavy things and did not want to burden her co-workers.

Today, Camila works sporadically at the same nursery as her husband. For example, she worked full-time at the nursery over the summer vacation while her 15 and 12 year-old daughters cared for the littlest one at home. Meanwhile, her eldest daughter attends college full-time; she is studying to become a pediatrician. Camila has opted for staying home with her youngest daughter throughout the rest of the school year. She sells Mary-Kay products to supplement her husband's income.

PESTICIDES

Camila is very familiar with pesticide-related issues because her husband has been in charge of spraying at the nursery for the past 10 years. "Cuando se esprayaba allí, no nos dejaban entrar. Siempre nos decían que no entraramos allí…También, trataban de esprayar el fin de semana, a menos que hubieran animalitos, entonces esprayaban durante la semana." *["When they sprayed there, they wouldn't let us inside. They always told us not to enter…they also tried to spray on the weekends, unless there were little critters, then they would spray during the week."]* When they were still living on the nursery property, she sometimes became concerned because of their proximity to all the chemicals.

When thinking about the health effects of pesticides, Camila brought up the case of her brother-in-law; he works at a small neighboring nursery. Eight months ago, he developed a severe skin rash, first on one arm and then it extended to his whole body. He talked to the nursery owner, "pero el le dijó que no le parecía que los químicos fueran la causa." [*"but (the owner) told him that he didn't think that the chemicals had caused it."*] The brother-in-law then reached out to Camila's husband, who told him to ask his doctor for documentation of the rash that proved that it was caused by chemicals at work. Both the doctor in Florida and his doctor in Mexico have independently come to the conclusion that his skin rash was caused by the harsh chemicals with which he works. The brother-in-law has continued to work at the same nursery in the same position. Camila explained that the reason he stayed is because he is making approximately $16 per hour and that other types of jobs would not pay as much to someone with his skills. [NOTE: There are two issues here: First, this "high" paying job is the only job where the brother-in-law will be paid as much. Second, the brother-in-law may feel that it is acceptable to have a direct adverse impact on his health because he is being paid well.]

HEALTH

When I asked directly about the effects of pesticides on her family's health, Camila quickly responded with confidence that they had not been affected by it. However, we later discussed her daughters' health and Camila revealed that all four of her daughters were diagnosed with asthma; there is no history of asthma on either side of the family. All four girls outgrew their asthma by age three. They have also outgrown their eczema. However, two of the girls still have allergies. Camila explained: "esa cosa vuela, quien sabe sí uno está inhalando eso." *["That stuff flies, who knows if you are inhaling it."].* She thought back and added "vivíamos al lado cuando las ninas tenían asthma." *["We lived next to the nursery when the girls had asthma."]*

FINANCES

As of late, Camila's husband has been earning less and less money, because the nursery bosses continue to reduce his work hours (he makes $15/hour). Camila explained that it is due to the decrease in plant sales, which was caused by the slow economy elsewhere. The family recently had to lower their house

payments. They have a 30-year mortgage. They've been living in this house for six years. It is possible that Camila will return to work in a nursery after her youngest daughter is of age to attend a public school.

NOTE: The researcher tried to contact the brother-in-law to document his case in further detail, but he declined to participate in the research out of fear of losing his job.

Rosa Maria

Rosa Maria has been in the United States for 22 years. She is married and has three sons, ages 26 (math teacher), 25 (works in stock market) and 19 (will start college). The whole family has legal documented status within the US.

Her husband arrived alone in the United States to work in 1983. He was homeless when he first came and ended up sharing an abandoned bus with 6 other men. He would send money back to Mexico, but even with his American income, the family was living week to week. Rosa Maria explained, "un cheque nos duraba una semana." *["One check would last us one week."]* He returned to Mexico to be with his family only one month out of the year.

It was after a couple of years of living this way that Rosa Maria and her husband decided to move the family to the US. They settled in an old empty trailer without AC and heat, nor a single mattress. Rosa Maria vividly remembers the three weeks they slept together on the floor and saw cockroaches roaming about on the same floor. Their situation improved with time and they eventually moved into a home set inside a nursery property; they lived there for five years.

<u>WORK</u>

Rosa Maria started to work at the nursery when her youngest son was of preschool age. She worked at one nursery for five years, working mostly with the soil in the greenhouse. Her second job was at another nursery owned by an Asian family and she worked there for another five years. Rosa Maria explained that there was an advantage to working for her Asian bosses. First, they use a lot of hand gestures to make themselves understood in English. Second, her bosses have a strong accent in English and, according to Rosa Maria, Americans pretend not to understand them. There was a niche for someone who spoke English. Despite her imperfect English, Rosa Maria quickly moved into a sales and shipping job at the nursery. She clarified that the work still took place inside the nursery (hot) and it was still very physically demanding (preparing the orders and packing plants). But it was because of her English skills that she became indispensable to her Asian bosses, and for this reason they allowed her more flexible working hours.

Work at this nursery was not ideal. Pesticide safety was not strictly practiced, but Rosa Maria managed to protect herself, "yo siempre he sido resongona, no me dejaba esprayar encima. Cuando el (esprayador) echaba (pesticidas) yo me salía…el esprayador si se protegía pero a nosotros nos echaba encima" [*"I have always been rebellious, I wouldn't let myself get sprayed on. When the sprayador sprayed, I would get out…the sprayador did protect him/herself, but would spray right on top of us."*]. Rosa Maria decided to help make signs in Spanish telling workers not to enter the nursery after spraying. Rosa Maria also remembers that they were not allowed any bathroom breaks outside of the official break times. "La gente se aguanta por la falta de papeles y la necesidad." *["People put up with it because they are undocumented and in need."*]There were also multiple incidents where the bosses randomly subtracted hours from people's weekly checks. "si (los trabajadores) reclamaban porque le quitaron horas, el patron les pasaba la tarjeta y no explicaban" *["If (workers) asked why they subtracted hours, the boss would simply hand them the card without explaining."*]. If workers arrived five minutes late, bosses would subtract half an hour from the time card. "Si la secretaria era hispana, pues cuidaba su puesto y no ayudaba a los trabajadores con las quejas. Si era Americana, simplemente decía que esas son las reglas" [*"If the secretary was*

Hispanic, she would safeguard her job and wouldn't help the workers with the complaints. If she was American, she would simply say that those were the rules."]. Whenever someone developed a rash, bosses would provide "una pomadita" *[generic word for cream or ointment, "a little cream"]* and that's as far as they helped.

Nevertheless, Rosa Maria stayed at this nursery because they gave her more flexible hours in order to spend more time with her eldest son (26), who is legally blind. She explained that it is not easy to switch to a new job, because the places that hire undocumented immigrants prefer young workers.

HEALTH

Rosa Maria and her husband were able to give their eldest son medical services for his eye condition while they were in Mexico. However, the family could not afford the same medical services in the United States and opted to stop the treatment. The boy received treatment again at age 9, when he gained his "papeles" or legal migratory status. Rosa Maria explains that despite his blindness, her son is able to do many things that other kids do, like play basketball. Her son is now a math teacher and Rosa Maria drives him to and from work every day.

The family's health status changed dramatically after arriving in the United States, not only because of the lack of access to medical services (due to cost, unfamiliarity, and linguistic barriers), but also because of the well-documented dietary trap of cheap, convenient, processed foods. Her husband developed high cholesterol; Rosa Maria developed diabetes (after gaining approx. 100lbs); one of her sons has high triglycerides "Yo no sabía que la hamburguesa hacía daño, las papas fritas, la leche entera…" *["I didn't know that hamburgers could be harmful, that fries could be harmful, whole milk..."]* Despite her sixth grade education, Rosa Maria decided to arm herself with information and learned to balance her blood sugar through diet and exercise. She now follows a vegetarian diet and has slowly introduced healthy alternatives to unhealthy foods in her family pantry.

(NOTE: Rosa Maria is an empowered woman and her story is one of hardship and success. She often reminds her sons: "acuerdate que vinieron de la nada, de lo mas bajo. Nunca olviden eso (referring to the three weeks when they slept on the floor of a roach-infested trailor) porque el día en que lo olviden, ese día van a pasar por encima de todo el mundo sin importarles." ["remember that you came from nothing, from the lowest. Never forget that (referring to the three weeks when they slept on the floor of a roach-infested trailer) because the day that you forget that, that day you will step over everyone else without caring."])

Flor

Flor first came to the United States in 1999 to join her husband, who had been going back and forth since 1992. She left her daughters in Mexico in the care of her parents. Less than a year after her arrival, Flor sent for her daughters because she missed them terribly. However, in 2002, Flor and her second daughter returned to Mexico because Flor's father died. Flor and her daughter returned to the US in 2004. The family chose to settle in Florida, because Flor's eldest daughter has lived here with her husband since 1997.

WORK

Flor started working at nurseries when she arrived. The work pace would vary with the season. The regular schedule was from 7am to 4:30pm, with two 15-minute breaks and one 30-minute lunch, Monday through Friday. She made $600 every two weeks. Flor remembers working seven days a week during the "temporada" [*high season for work, it can refer to planting or harvest season*]. She stayed for 2.5 years at her first nursery job, until they closed it down.

"De alli salí acabada." *["I left that place physically deteriorated."]* Flor slipped while rushing to turn off a water hose. She scraped her hands and one arm, her elbow and shoulder were also injured. "Me llevaron al médico y luego me llevaron a trabajar." ["*They took me to the doctor and then they took me back to work*"]. Flor did not want to lose her hours of work from earlier that day so she continued to work that day. The nursery covered the visit to the doctor. "Alguien me dijó que iba a recibir terapias (para rehabilitar el codo y hombro) pero nunca dijeron nada más. Y yo no dijé nada para que no me corrieran, mi necesidad era grande." *["Someone told me that I would get physical therapy for (my elbow and shoulder), but they never said anything else. I didn't ask, so that they wouldn't fire me. I was in great need"*]. Flor still feels pain in her arm and shoulder when she moves them in a particular way; her elbow still hurts on cold days.

Independent of her fall, the skin on Flor's hands was also constantly irritated and peeled. One of her duties was to wash plant trays, which have soil residue. She thinks that the chemicals in the soil caused the skin on her hands to peel off. She never saw a doctor about this because it is too expensive. Flor explained that pesticides are very strong chemicals and, although nursery bosses sometimes gave out gloves, they didn't give them out often enough. The gloves would wear out and people would simply work with their bare hands. Today, she cannot touch household cleaning products (like Windex or Clorox), because her fingers start to peel. Flor specified: "en México (los productos de limpieza) no me pelaban los dedos." *["Back in Mexico, my fingers didn't used to peel"]*.

Her subsequent nursery jobs were short term and mostly as an extra employee during the "temporadas" *["high seasons"]*. Flor's last job at a nursery was four years ago. She started working there with her daughter, Marianna. However, Flor had to quit after only eight days, because there was no one to care for Marianna's baby. Since Flor can't drive and Marianna can, the rational decision was for Flor to stay with the baby.

<u>OTHER WORK</u>

Flor's husband and four daughters have all worked at nurseries in the past but have found jobs in different industries. Her daughters were able to find jobs in cleaning, administrative positions, and retail because they speak English and can drive and own cars. Her husband worked at a door factory 45 minutes from Apopka, and after that, at a recycling facility 20 minutes from Apopka. He was able to take these jobs because he can drive and owns a car. However, he drives without a license, which involves the risk of deportation. Nevertheless, Flor views nursery work as physically demanding and potentially hazardous and supports her husband's choice of work even if it means significantly more driving.

When asked why she and her family had remained in these nursery jobs for so long, Flor replied: "La necesidad y el miedo de no encontrar otro trabajo. Nos daba miedo hasta pedir un permiso (para ir al médico)." *["The need and the fear of not finding another job. We were even afraid of asking for permission to go see the doctor"]*.

After a year of caring for Marianna's baby, Flor started to find jobs through an employment agency that matches day laborers and temporary workers with labor needs in different industries in the area. She worked at a laundromat, a soda packing factory, and a juice factory. The organization provided transportation to some of these, often, distant factories. Flor explained that it wasn't a good source of work because there were many days when there was simply no work available. (NOTE: earning money on a daily basis is very important to these families because they literally live from paycheck to paycheck.) In addition, Flor explained that the employment agency mentioned above now requires more documentation from its laborers.

Today, Flor cares part-time for her youngest granddaughter and cares for her other eight grandchildren after school.

Marianna

Marianna arrived with her two sisters in 2000. Her parents and eldest sister awaited them in Florida. Marianna was 16 years old and started working right away.

WORK

Her first job was in a nursery in Apopka. Her duties included setting plants onto a moving belt with empty pots and prepping orders of large pots (carrying up to three large pots in each hand). She pointed out that although she was on her feet all day, the worst pain was in her hands.

In describing the work atmosphere, Marianna explained that workers were constantly rushed as if they were paid "por contrato" (by contract, that is, per X units of plants or trays) instead of by the hour. Marianna knows about that form of payment because her husband is a seasonal farmworker picking cucumbers and apples during six months each year. He is paid by the bucket and makes $100 per day. (NOTE: In contrast, nursery workers make an average of $300 per week and work at a similar pace.) She remembers that workers were so rushed, that there wasn't any conversation among them.

Despite the lack of conversation, Marianna saw one of her co-workers develop a rash on her face and arms from one of the plants. Marianna learned that the "patron" took her co-worker to the company doctor, who assured the co-worker that the rash was not due to the plants there. "(ella) siguió trabajando y ya. Si quiere curarse, tiene que ir al doctor por su propia cuenta." *["(she) continued working and that was that. If you want to be cured, you have to go to the doctor on your own dime."*]

Marianna worked in the nursery for a few months. She quit to join her father, working at a door factory. (NOTE: It was easier for Marianna to transition into a different type of job, 40 minutes from Apopka, because she could catch a ride to and from work with her father, who had been working there for some time before Marianna's arrival in the U.S.) She worked alongside her father at the door factory for several months. Unfortunately, Marianna's maternal grandfather died, so she and her mother went back to Mexico. They remained in Mexico for two years.

Upon her return to the U.S. in 2004, Marianna worked at a nursery again, but only for a few months until she managed to get a job alongside her father once more. This time, they worked in a recycling plant, 20 minutes from Apopka. Marianna explained that recycling work is better because they pay overtime. (NOTE: In contrast, nurseries pay a flat rate regardless of the number of hours worked per week.) She pointed out that in addition, they increase workers' pay rate by 50 cents every year. Marianna left this job after a couple of years, because she and her husband were expecting a baby.

After some time, Marianna went back to work at a nursery. Her job was to prepare chemicals inside an air-conditioned lab in the nursery. It involved working with large trays holding dozens of small glasses filled with a hot substance that would later be added to soil. They had to shake the trays in order to mix the substance while it was still hot. The nursery provided gloves for everyone working there. The liquid would sometimes splash onto her clothes. There was a book in the lab indexing the different chemicals in the lab. She was having a lot of pain in one of her arms, so one day, Marianna snuck in to read the book. She learned that the chemicals were quite toxic and had to be handled with a lot of protection. Since then, she would put her shirt over her nose and mouth. She remarked that the nose and mouth covers were administered only to the lab staff that worked with plants that need to be protected from human contamination. When her bosses found out that she was pregnant, they moved her outside of the lab, to the planting area. She worked at that nursery for three years, but quit at the end of her last pregnancy.

Today, Marianna works part-time as a clerical/administrative staff at a local organization.

HEALTH

The family has had a variety of health issues. During her second pregnancy, Marianna developed a rash on her entire body. Marianna attributes it to the chemicals on her husband's clothes when she washed them. The rash continued for over two years. The doctors did not know what to do when the different medications didn't work. Marianna opted for homeopathic medicine (form of alternative medicine). The 20-day treatment cost her over $400, but it finally took the rash away.

Marianna's husband also suffers from severe allergies. Medications, like Allegra, do not have any effect. When picking apples last year, one of his hands became so swollen that he could not move it; he was unable to work for over a week. He also complains about his back, especially after working in cucumber farms.

Marianna's three children have had a variety of health issues. Her oldest (7 years) has gastrointenstinal issues and cannot ingest tomatoes, spicy foods, orange juice or other acidic foods; he is on medication. He has always had constant allergies and sinus issues. He also had respiratory difficulties when he was two months old and had to be rushed to the emergency room. Her second child (5 years) also had respiratory complications when she was six months old. Doctors had to operate on her nose at age four as part of her treatment for her respiratory condition. She has also developed asthma. Marianna's third child (1.5 years) had a condition in which her cranium closed prematurely. She had surgery at four months old in order to open the cranium. She wore a special helmet for 8 months and must be closely monitored by an ophthalmologist every six months. (NOTE: It is not the role of this research to determine what caused the various health issues that Marianna's children face. What's important is to understand the role of these health issues in Marianna's decision to return to work at nurseries time and again.)

FINANCES

The family finances are very unstable. Marianna pointed out that, although her husband could make $100 per day, his job was very unstable because of its migratory nature. In addition, his absence takes a toll on the family unit. It is because of this that he decided to take this year off from migrant farm work. Instead, he has found a part-time job in trailer maintenance.

In addition to the decreased income, the family is in debt. It all started when Marianna's husband got pulled over and had no driver's license. As a result, the family had to pay several hundred dollars in fees and immigration sent Marianna's husband to Miami to await his fate. Marianna got a lawyer to plead their case asking law enforcement not to deport him, based on the children's various health conditions that require specialized treatment. Currently, they are $6,000 in debt. The lawyer will cost them another $12,000.

Abigail

Abigail arrived in 2002. After her husband died, she decided to leave her three sons with her mother in Mexico, in search of better opportunities in the United States.

Her brother was living in Michigan at the time and offered her a place to stay. He helped her find a job at a restaurant. She didn't like life there and quickly ran out of money. She decided to join a group of people from her hometown who were headed to Florida. She initially stayed with her cousin, but the arrangement didn't last. Abigail then lived with different people a few months at a time. Today she lives with her second husband, their son (1.5 years old), and the husband's nephew (adult). She is pregnant with her fifth child.

WORK

Abigail has worked in nurseries and as a cleaner in restaurants. Abigail has had difficulty finding jobs that last longer than a few months. The exception was a job at a nursery; it lasted four years. Abigail was

forced to quit after the owner sold the nursery. It has been difficult to find other jobs since then. She only gets hired for short periods of time, "no es nada estable" *["It's not stable at all"]*. Abigail explained that not having a ride to work is another important barrier that further reduced the choices of jobs available to her. Being pregnant has further complicated matters, because it makes Abigail very nauseous. (NOTE: It will be harder to get work when her belly starts to show.) She had not found any work for the past month at the time of the interview. She worries about not being able to send money to her mother and sons in Mexico. She sends money every two weeks or once per month.

Abigail's second husband also worked in nurseries and mushroom farms for approximately five years. He used to get allergies when they asked him to spray pesticides. "…le daba mucha tos y le salían ronchitas con manchas blancas. Llegaba (del trabajo) con la piel lleno de ronchas en todo el cuerpo. Los ojos estaban rojos cuando esprayaba. Le duraban las ronchas y los ojos rojos como 2 o 3 dias…Cuando esprayaba, le daban mascaras, guantes y trajes que protegen. Pero es tan fuerte el químico, porque le pasaban (los químicos). Ahora, que no trabaja en eso ya no le dan esas alergías. Por eso me di cuenta yo que era por el químico de la nurseria." *["…he would cough a lot and get little bumps with white blotches on his skin. He would come (from work) with his skin covered in bumps throughout his body. His eyes were red when he had to spray. The bumps and red eyes would last for 2 or 3 days…when he sprayed they gave him face masks, gloves and suits to protect him. But the chemical is so strong, it would pass through. Now that he doesn't work in that, he no longer gets those allergies. That's how I realized it was due to the chemical at the nursery."]*

Her husband stopped working at the nursery because the owner started requiring social security numbers. Abigail explained, "pero el se sabe defender, el habla inglés y asi logró conseguir algo más" [*"but he knows how to handle himself, he speaks English and that's how he was able to find something else"*]. Two years ago, he found a job doing the maintenance of the apartment buildings in which they live. Abigail emphasized that the job worked out because her husband can communicate with the owners and the tenants who speak English. She feels that he is at a great advantage because of his English.

LEARNING ENGLISH

Abigail explained that most people don't speak English and don't have much choice. "Uno busca como pasar la necesidad, como mandar dinero para su familia. Por eso es que la gente soporta eso (trabajo en nurserias)…Entre trabajadores se pregunta uno: Si te gusta tu trabajo? Pues no! pero hay la necesidad. Si nos salimos de aquí (la nurseria), batallamos para encontrar otro trabajo. Lo primero es aprender el inglés." [*"One looks for ways to get through the needy times, ways to send money home to the family. That is why people put up with this (nursery work)…Amongst workers we ask ourselves: you like your job? Well no! but there is the need. If we get out of here (the nursery), we'll struggle to find another job. The first thing is to learn English."*]

FINANCES

Abigail's husband makes $400/week. The nephew is a gardener, but has also had financial difficulty because his crew gets fewer jobs than previously. When employed, Abigail manages to earn between $280 and $300 per week working at a nursery. She pays one of the neighbors $65 per week to babysit her 1.5 year old son while she works. Her rent costs $650/month. "Mi marido si gana y me da dinero. Pero como no es el padre de mis hijos (en Mexico), pues me toca seguir buscando (trabajo) para mandar (dinero a México)." *["My husband does earn money and gives me some. But since he is not the father of my children (in Mexico), well, I have to keep looking (for work) to send (money to Mexico)."]*

HEALTH

Abigail sometimes has "blood pressure problems." She often feels hot, sleepy, tired, and with a dry mouth. She used to blame it on her last pregnancy, but since her fourth son was born, she decided to control the problem by drinking Coke or Pepsi. She had tuberculosis in 2004 and claims that one of her

arms still hurts (since the TB illness). She also has a pain which she describes as, "something that gets pinched between the womb and the spine," when she bends over. She thought that it was her IUD (Intra Uterine Device), and therefore, had it removed. She switched to the contraceptive injection for one year. She stopped taking the contraception for one year while she was in Mexico, and then became pregnant three weeks after her return to the US. She gave birth and went back on the contraceptive injections, but stopped after a year because they were making her gain weight. She and her second husband then started using condoms.

Abigail also has a problem with her eye. She doesn't know the medical term for it, but her parents explained it to her as the result of a childhood illness: "Cuando tenía 2 o 3 años me dío sarampion. En el rancho no había cuidado médico. Y a mi no me toco las vacunas de bebe." [*"When I was 2 or 3 years old I had measles. There wasn't any medical care at the ranch. And I didn't get any of the baby vaccinations"*]. She explained that indigenous moms and their babies would hide from vaccination campaigns, because they heard that vaccines gave the babies fever. "Eran muy indígenas la gente en esa epoca." [*"People were very indigenous back then." The connotation on "indigenous" in this instance being ignorance*]. The doctors in Mexico said there was a treatment for her eye, but she didn't have the money for it. The Farmworker Association staff gave her the contact information of a place where she could be helped. She hasn't looked into it because she has no money, no car, and until recently had no time to take off from work. (Their car broke down over a year ago).

The unit where they live is very dilapidated, and the sheet rock is heavily damaged by humidity. The paint on every wall is stale, and the vinyl floors look old and used.

Miriam

Miriam arrived with her husband in the United States, 8 years ago. They have two children, ages 6 and 2, and were expecting their third child at the time of this interview. The couple came straight to Florida.

Miriam's husband began working in nurseries right away. However, he soon switched to work in construction because it pays a little better. He was able to find a more stable job with a particular construction crew.

<u>WORK</u>

Miriam didn't work for the first two years. She explained that she has always worked in nurseries and that her duties have included: cutting plants, sweeping the floors, cleaning mud off of surfaces and floors and weighing plants. All of these activities take place inside the nursery, where it is significantly hotter than the ambient air. She specified that bosses provided water and allowed workers to get out for fresh air.

At the nursery where Miriam currently works, they spray pesticides in the evenings and weekends, when the workers are not inside the nurseries. They also use a fertilizer that turns the water blue and is not harmful to people, according to her bosses. Miriam and her five co-workers are often sent to other nurseries when work is slow at their usual nursery. She said it's hard to know whether these other nurseries are careful with their use of pesticides. Last year, Miriam participated in focus groups to discuss pregnancy and pesticide exposure. She is four months pregnant and continues to work in the nursery, despite the knowledge she gained at these sessions. (NOTE: The choice to work in conditions that she knows may threaten the health of her fetus may exemplify the extent to which Miriam's family needs her earnings.)

"Nos mandan prestadas". *["They lend us out."]* She used these words to highlight that they feel very used, but that bosses do not see things this way because the nursery pays them what it deems "fair wages". She added: "no reconocen que uno les está sirviendo a ellos…pero igual nosotros les estamos trabajando, les estamos sirviendo así que nos deben respetar." *["they don't realize that we are being*

used…but nevertheless we continue to work for them, we continue to be of use to them so they should respect us."] Her tone was one of indignation at the fact that bosses "lent" them out to other nurseries.

Miriam explained that part of the reason why people don't say anything about the abuses or unsatisfactory working conditions is that they are afraid. However, she added that at this particular nursery, employees can express themselves with their bosses. But then added, that one of the things that make Latinos so good for this industry, is that they are hard workers and they never complain.

FINANCES

Miriam and her husband have had to send money back to their relatives in Mexico for a number of years. Her grandparents are very ill, and although her brother returned to Mexico to help them out, his job as a construction worker and as a seasonal farmworker in Mexico does not pay enough money to support him and the grandparents. Miriam sends them $150 each month. In addition, the couple sends $100 per month to a blind uncle. Miriam explained that life in the United States is full of additional stresses, "el trabajo es estresante, lo que tú ganas no es para ti, es para la renta, las cosas básicas y para enviar (a Mexico)…" *["The work is stressful, what you earn is not for you, it is for rent, the basic amenities and to send (to Mexico)."]* Her sister, the sister's husband and their children returned to Mexico voluntarily after working 7 years in a chicken factory in Michigan. Then, she added, "Ahora se sienten mejor, no tienen la presión que tenían aquí. Pero en México también esta difícil." *["Now they feel better, they don't have the pressure that they had here. But things in Mexico are also tough."]*

Fear of deportation is an additional stress, because it constantly threatens the lives that they worked so hard to build in the United States. She explained that, although immigration laws are not as fierce in Florida as in other states, deportation is still a possibility that plants a constant fear in their minds and hearts.

Miriam's husband makes an average of $400 per week; she makes $200 per week. This puts them right above the bracket of eligibility to receive Medicaid for their children.

We had to end the interview because Miriam had to see the doctor.

Liliana

Liliana came to the United States 18 years ago. She came with the father of her three children (17, 16 and 14 years old). They came directly to Florida.

WORK

Liliana worked in different kinds of farm work, during the first few years of coming to the U.S. She spent a few months picking carrots, other months working with cactus growers, other months in ferneries and nurseries. It was difficult to work for long periods of time in a single place, because the work availability was not predictable, and because it was hard to find caregivers for her children. After a couple of years of constant instability, Liliana and the father of her children decided that it was best if she stayed at home with the young children. Her husband was able to move on from nursery work into transport of produce. Today, he works as a delivery man to supermarkets for various kinds of fresh produce.

(NOTE: The interview was interrupted here because it was finally time for Liliana's medical appointment. She had been waiting for 2.5 hours. She was worried because she asked for the day off at work in order to complete multiple errands. It would be difficult to complete the rest of the errands after spending so much time at the clinic. She needed to sort out something with her food stamps. She also wanted to meet with a lawyer about processing her residency.)

In addition, she pointed out with a little anger that she had participated in a focus group study about pregnancy and pesticides. Her tone demonstrated that she felt that she had already responded to questions about pesticides and nothing changed; now I was here asking more questions.

It is hard to ask people whose livelihood depends on every minute that they are working, to spend time answering questions, for which they will see no immediate reward.

Melisa

Melisa and her sister have been in the United States for 13 years. They came directly to Florida and Melisa went straight to work at a nursery. She remained working there for 13 years. She was staying at home with her newborn baby at the time of this interview.

WORK

Melisa has always worked from Monday through Saturday, from 7am to 5pm, with two 15-minute breaks and one 30-minute lunch break. Her duties at the nursery include: weeding, cleaning plants, cutting plants, planting, watering, fertilizing and preparing orders. She explained that it is very hot inside the nursery, so it is imperative to drink lots of water. It's also important to bring good shoes, because the floor is slippery with mold and water. Her mother-in-law was present during the first 20 minutes of the interview. She recounted a few of her own experiences while working at nurseries. Her mother-in-law fell several times, but they couldn't send her to the doctor because "el patron estaba en quiebra…todavía están en quiebra." [*"The boss was going bankrupt…they are still going bankrupt."*] The mother-in-law chose to clean the nursery floors voluntarily on the weekends, so that no one else would slip and fall anymore.

Melisa explained that the nursery has been kept in worsening conditions for many years, under the pretext that they are going bankrupt. "Hubo un tiempo en que ni agua nos daban. Ni papel higiénico!" ["There was a time when they didn't even give us water. Nor even toilet paper!"]

They never provided workers with gloves, so workers had to buy their own. Melisa calculated that a box of gloves lasts less than a couple of weeks.

During the height of the nursery success, the company had two nurseries employing over 80 workers. Melisa's bosses used to offer workers a "special contract" once per week and on the weekends. The "contract" consisted of paying workers based on the number of plants or trays that they produced. This special contract was meant as an incentive to push people to work even faster. They used to offer paid vacation, sick leave, 401K's and even English lessons. However, Melissa said they never showed them any videos on pesticides nor explained anything about the dangers of using them.

"Aveces esprayaban a dos líneas de uno y con el movimiento del aire igual nos caía todo el espray…antes (personas externas) iban a chequear las nurserias, entonces ponían los avisos de no entrar despues de sprayar." *["Sometimes they would spray two rows from you and with the movement of the air, all the spray would still land on us …before, (people from outside) would come to check on the nurseries, so they would put up the signs saying not to enter because they had just sprayed."*] But now, since no one has come to check whether nurseries follow the regulations set for pesticide use, the safety practices at the nursery have been widely ignored. "Incluso el que espraya (el pesticida) no tiene ni el traje (traje de protección) porque el traje ya está muy Viejo."*["The guy who sprays (the pesticides) doesn't even have the suit (protective suit) because the suit is so old now."]*

Today, the nursery is only open for three days per week and the workforce was reduced to 14 employees. Melisa described the nursery as, "very deteriorated." They used to pay someone to clean the workers' toilets. Today, the workers have to take turns cleaning the toilets every week.

HEALTH

Melisa worked at the nursery throughout her four pregnancies except for six months during the first pregnancy. Her children are 11, 8, and 5 years old and 1month old. Her 11 year old son has constant sinus infections. Her 8 year old son had complications during birth (placenta previa). He has had asthma since birth and was recently diagnosed with ADHD (Attention Deficit Hyperactivity Disorder). He takes medication for both conditions and goes to therapy for his ADHD. Her 5 year old daughter was born with a skin rash; her 1 month old baby also has skin rashes. Melisa recently took her baby to the nursery for her co-workers to see the baby, "pero solo al break room, no la iba a meter a la nurseria!" *["but only to the breakroom, I wasn't going to put him inside the nursery!"]*, she exclaimed, acknowledging the dangers of the pesticides.

Melisa was diagnosed with hypothyroid two years ago. Melisa was also diagnosed with "diverticulitis" (condition affecting the large intestine). She attributes this to the stress during a very low point in her life, three years ago. She had no money for rent, her daughter tested positive for the H1N1 flu, her son had an asthma attack, and they had no food stamps - all within the same period of time. (NOTE: As mentioned in other interviews, it is impossible to know whether or not her exposure to pesticides is in any way connected to her and her children's health issues. But these health issues are, nevertheless, an additional strain in Melissa's life, and they incur additional expenses and may help to explain her inability to leave the only job she has had in the US.)

HOUSEHOLD

Melisa lives with her husband and four children. Her husband works in construction and leaves for work for several weeks at a time. Melissa keeps very busy running the household by herself most of the time and caring for her four children. Their health issues and the 8 year old's ADHD are particularly time consuming. The school often calls her with complaints about the boy. Her 11 year old son is in the gifted and talented program in his school, and Melisa tries to be involved in his homework and extra assignments. For example, they surf the internet on her phone, when he needs to do online research. In addition, Melisa is in a legal battle with the father of her 5 year old daughter because he does not pay the child support.

Melisa's husband has asked her to stop working, so that she can dedicate more time to the children. Melisa explained that her husband also has two other children for whom he pays child support, and that she doesn't feel it is right for her husband to completely support the children that are not his. In addition, Melisa feels that the household finances would simply not be enough without two incomes. She exemplified "hay veces tengo que ir a las Iglesias para que me ayuden con la renta." *["Sometimes I have to go to the churches, so that they can help me with the rent."]*

Luis

Luis arrived in the US 24 years ago. He first worked in California as a farmworker and then moved to Florida, where most of his family had already settled. Six of his brothers already worked in nurseries when he arrived. Luis became a US resident over a decade ago.

WORK

Luis worked at the same nursery for the past 23 years. "Al principio, eramos solo unos cuantos trabajadores." *["At first, we were just a few workers."]* Today, the nursery employs over 20 workers. Luis' boss uses a ticket system to help the owners track the exact time required to complete different tasks at the nursery. Luis became the person in charge of giving out the tickets for the tasks that had to be completed each day. His duties included: shifting workers around from task to task as well as planting, moving pots and transplanting plants himself. The boss made him supervisor after 12 years of working in the nursery. Luis has six employees under his supervision. Luis described his relationship with his boss as

follows: “el es el hijo de los dueños. Son suecos, yo le entiendo el ingles, pero no lo hablo mucho…aveces, nos trata mal, aveces bien.” *[“It is the owner’s son. They are Swedish. I understand English, but I don’t speak it much…sometimes he treats us badly, other times well.”]*

Luis explained that the nursery deals with very expensive seeds and very time-sensitive planting processes. He was responsible for ensuring that the seeds and potted plants have the right treatments at the right time. He explained that lagging behind on certain processes or not keeping the plants at the right temperature, could mean a loss of thousands of dollars in ruined seeds or plants.

When discussing pesticides, Luis explained “la gente se quita cuando el esprayador pasa, pero igual quedan a tan solo 5 metros del area esprayada.” *[“people move over when the sprayer passes by, but they still end up only 5 meters from the sprayed area.”]* He added that, in any case, they don’t spray very strong chemicals; that there is some regulation because “vienen a chequear que los químicos se usen bien, chequean la tierra, chequean la limpieza.” [*“they come to check that the chemicals are properly used, they check the soil, they check for cleanliness.”*] However, he couldn’t recall the last time he saw people coming to check.

HOUSEHOLD

His wife started working at the same nursery a few years after Luis, and she is still working there full time. She stopped working for a few years, after she became pregnant, and returned to work after their only son started pre-school. During this time, Luis’ wife complemented his salary by running an informal daycare in their home. Her pregnancy and birth were normal, but the baby had low birth weight, (5.0lbs=2,260g, low birth weight as defined by the World Health Organization is less than 2,500 grams.) Luis’ son is now in seventh grade. Luis is very proud of his son, whom he describes as a skinny, good boy with a good attitude and very “aplicado” [*“applied or dedicated.”*] Luis pointed out that his wife never had any miscarriages but they simply had one son.

Luis and his wife started buying their home over 15 years ago. They live there with their son. Their mortgage is $450 per month with 12 years to go. The home is quite old, but Luis has repaired it significantly.

HEALTH

Luis was diagnosed with diabetes, 8 years ago. He also has hypertension and is overweight. Luis had to stop working 9 months ago because of the most debilitating of his health issues, his vision. He has trouble seeing stairs. Sometimes he sees double and, in general, he cannot estimate distance or depth. Luis started using glasses five years ago. The doctors tell Luis that the vision problems are associated with diabetes. In the past, he had eye surgery due to internal bleeding in the eye. The most recent operation was to correct what Luis explained as the “fallen retina” in one of his eyes. He describes the pain as the feeling of high pressure inside his eyes.

Luis explained that working in the nursery did not help his condition. First, he often strained his eyes when working with very small seeds. In addition, Luis attributes the episode of internal bleeding in the eyes to the heat and the stress he experienced at work. After that, he had difficulty sleeping from the stress of covering medical bills and staying at work: “…no dormía y mi ojo no sanaba.” (…I couldn’t sleep and my eye wouldn’t heal.”)

Luis has not received disability coverage, social security, sick leave or any form of financial support for his health crisis. This is one of the reasons why his wife continues to work at the nursery. However, Luis is enrolled in a program for blind people and will start therapy that may partially restore his sight. At the time of this interview, he had just received a formal letter from his doctor with which he hopes to start receiving disability money.

Luis' wife has not been to the doctor in years, but Luis was quick to clarify that it was because they have no insurance. The thing she complains the about most is the pain in the joints in her hands. Luis suspects it is associated with her work in the nursery.

Ingrid

Ingrid arrived in the United States in 1993 with her husband. They came directly to Florida to work in ferneries and nurseries. They had their US residency by 1998.

WORK AND HEALTH

Ingrid and her husband's first job was at a fernery; they worked there for 6 years. Ingrid explained that it was somewhat dangerous, because they were always bending over or kneeling and there were lots of snakes and critters. She explained that there was a type of infection that caused swelling and worms, inside the skin of the hands. Over the six years, she saw several cases of co-workers who developed this infection. She also remembers running into a rattle snake in the fernery, five days before giving birth. "No avisaban sobre los riesgos y a uno le tocaba sanarse con su (propio) bolsillo." [*"They wouldn't tell us about the risks and you had to cure yourself with your own money or pocket."*] She explained that workers were never told about the employer's responsibility or role, if there was a work injury.

Ingrid developed a serious back injury after six years of working at the fernery. One day, she simply could not bend over anymore; one of her friends had to take her to the hospital. She left the fernery and stopped working for one year.

Her second job was at a nursery. "También era pesado, mucho sol, humedad con la lluvia, mucho frío en el invierno… bultos y plantas pesadas, y sobre todo: movimientos rutinarios." *["It was also heavy work, lots of sun, humidity with the rain, and very cold in the winter…loads and heavy plants, and most of all: repetitive movements."]* Ingrid developed carpal tunnel syndrome from constantly working with a large pair of garden clippers. Another one of her duties was to spray a 5-gallon mixture of water and pesticide. "Ese espray mareaba y te adormecia. No daban nada para protegerse, ni guantes, ni gafas, ni mascara." [*That spray made you dizzy and sleepy. They didn't give you anything to protect yourself, no gloves, no goggles, no facemask."*]

Ingrid remained 10 years at that nursery. She initially mistook the pain and partial stiffness of her arm to be a sign of heart failure, so she rushed to the hospital on several occasions. Ingrid's doctor mistakenly thought the pain was due to fatigue and simple soreness. He suggested that she rest for a few months. Ingrid and her husband simply could not afford it, because her medical bills had gotten them $7000 into debt. She tried to manage the pain with over-the-counter medications for approximately four years. Ingrid and her husband covered all the costs. She explained, "al principio yo lo confundía (el dolor) con cansancio, pero cuando ya no podía con el dolor de las manos fué que empezé a buscar ayuda y ya fué cuando descubrieron que tenía eso (Carpal Tunnel Syndrome)". [*"At first I confused it (the pain) with fatigue, but when I couldn't bare the pain in my hands, I started seeking help and that was when they discovered that I had that (Carpal Tunnel Syndrome.)"*] In addition, her back injury evolved into two dislocated disks in her spine and a hernia.

When asked why she didn't ask her employer to give her time off or to cover some of the medical expenses, Ingrid replied: "Es que quejarse que algo le duele es como firmar su renuncia en este tipo de trabajo. Entonces, le aseguró que todos los que sienten dolor pues se lo aguantan." [*"Complaining that you have some pain is like signing your resignation letter, in this type of job. So I can assure you that everyone who feels pain just puts up with it."*]

Nevertheless, Ingrid reached a point of desperation and decided to take the doctor's report of her lumbar disk and carpal tunnel condition to her boss to ask for a different task in the nursery. The boss sent Ingrid to the company doctor, who said she had nothing wrong and prescribed four strong pain medications. Ingrid had to stop taking them because they were making her extremely drowsy and nauseous. She went back to the company doctor, who again said she had nothing wrong. So, she turned to an independent rehabilitation clinic for another exam. They confirmed that she had Carpal Tunnel and back problems. The company doctor replied by saying she had to return to work. This is when Ingrid sought legal advice at a local community organization. She threatened to sue the nursery's insurance company. The company paid for surgery for one of her hands.

Today, her hands hurt when the weather is cold. At night, her hands and forearms tingle with numbness. She has lost all feeling in her right thumb.

Things weren't the same at work after the surgery. "Si uno se lástima, y el patrón lo sabe, poco a poco le dan menos horas…No me gusto el trato que me dieron el último año que estuve allí. Querían que yo renunciara." ["If you get hurt and the boss knows it, little by little they give you less work hours…I didn't like the way they treated me the last year I was there. They wanted me to quit."] Ingrid quit in 2011, after what she described as several incidents of unfair cutting of her hours and general mistreatment. Ingrid explained that they couldn't just fire her like any other undocumented person, because she was a US resident since 1998. She claims her employers discriminated against her because of her damaged hands, until she finally quit. Ingrid's husband still works for this nursery, and, therefore, Ingrid decided not to pursue the matter any further. She fears for her husband's job.

After 12 years of working in the nursery, Ingrid's husband is also physically deteriorated; he has knee and back pains. Ingrid thinks he feels the financial pressure and is sticking to his job because she has no income. Ingrid explained that if she could get a job, then he could get a lower paying and less physically demanding job. At the same time, she feels that he is scared of changing jobs, because maybe they would fire him more easily at a new place. She emphasized that his job at this nursery is not a "secure" job, but he feels more secure at this nursery because he knows exactly what they expect of him and he can deliver. She added, "(hoy) trabaja como lo hizo el primer día" [*"(Today) he works like he did on the first day."*] Ingrid's husband has been a U.S. citizen since 2006.

FINANCES

Ingrid receives unemployment benefits, totaling $600 per month. Her husband continues to earn a little over minimum wage. The nursery filed for bankruptcy, so what used to be $40,000 of her husband's 401K, suddenly became $10,000 (subtracted by the $5000 going to taxes). Ingrid explained that the family started living on credit since she stopped working. They owe an additional $10,000 of living expenses to a credit card company. They still have 8 years of mortgage payments left on the house.

FAMILY

Ingrid and her husband have three children (19, 15, 9 years of age). She recalls that her pregnancies went well. Ingrid tried to stop working during some parts of her pregnancies, because she feared the pesticides and fertilizers could affect her babies. Her children are relatively healthy, but her 9 year old daughter is very overweight. Ingrid is implementing all of the dietary and exercise guidelines that the pediatrician gave her. Ingrid is glad to be home to dedicate time to her daughter. She regrets the past years, when she spent so much time away from her children to work in the nursery.

"Debemos mucho dinero, pero yo necesito un trabajo que me permita estar aquí cuando (mis hijos) salen de la escuela." *["We owe a lot of money, but I need a job that allows me to be home when (my kids) get out of school."]* It is hard to find a job because the jobs she can get involve physical labor, and she has to report her carpal tunnel and back lesions in the job applications.

Ingrid asked me to specifically put the following remarks in my report:
"Cuando un campesino se siente enfermo, el reportar sus síntomas al patrón es estar firmando su renuncia." *["When a farmworker feels ill, reporting his/her symptoms to the boss is like signing his/her own resignation."]*

"(Yo quiero) que exijan un examen físico del trabajador par aver cual es el impacto de trabajar aquí en el campo." *["(I want) that they demand a physical exam of the worker to see what is the impact of working here on the fields."]*

"Si se enferma, quien va a perder es el trabajador, el patrón no tiene ninguna responsabilidad." *["If you become ill, the one on the losing end is the worker, the boss has no responsibility."]*

Elias

(NOTE: Elias' parents were present for a portion of the interview. They provided a rich background to Elias' life-long link to farm work.)

Elias was born in the United States. His parents migrated from Mexico in 1978. They lived in Los Angeles, but eventually moved to rural Florida after multiple gang shootings in their neighborhood. Elias' uncle, who lived in Florida at the time, helped Elias, his nine siblings, and his parents set up their new lives as farmworkers.

Elias' dad had experience as a mechanic in L.A., but was only able to find farm work. He made less than a third of what he earned in L.A. Elias' father had a variety of jobs when he first arrived. His first job was at a nursery, but he only stayed there one week, after seeing the conditions of the workers. He changed jobs constantly in search of something better. He worked at an orange grove for 1 year, then at a milk factory for 6 months, and then settled into a job at a mushroom farm for 8 years. Elias' father explained that the jobs at the orange grove and the milk factory came to an end after his bosses tried to pay him less than what had been agreed. He added that what lured him to this particular mushroom farm was the hierarchy of jobs that he could potentially attain.

Meanwhile, Elias grew up as a second generation Mexican American. He is bilingual, finished high school, and started working summers and afterschool at age 14. At age 18, he fathered a child with his high school girlfriend (now his wife), and started working fulltime in construction. Elias wanted to develop more skills in the construction business, so he entered part-time classes to become an electrician. However, he was unable to continue his education because the school was very far, the gasoline was expensive, and his pay rate had decreased due of the economic crisis. Elias started getting less and less hours with his construction crew, so he started to work at a nursery.

<u>WORK</u>
"Sin más educación, se me va a ser difícil encontrar un trabajo que no sea en nurseria o en construción." [*"Without further education, it will be difficult for me to find a job that is not in a nursery or in construction."*]

He began working on the nursery floor, but soon became a driver (because he has a license). His job is to distribute large plants to different clients. It entails loading the truck, driving to different areas, and unloading the potted plants. He described the plants as large and heavy.

He has been working at the nursery for the past year and a half. The nursery has 6 employees who receive annual pesticide training. They spray pesticides on Saturdays, so that no one is exposed for 48 hours after application. They also send the manager several times per year to training to learn about the latest on

plant treatments and pesticide safety along with providing safety equipment. However, Elias highlighted "they don't offer medical coverage, overtime, paid sick leave, nor paid vacation!" (NOTE: This was the first time that any interviewee mentioned this with such surprise. It made me realize that having been raised with American standards for quality of life, Elias had different expectations than many of his farmworker peers, who are immigrants.) Elias cannot afford health insurance, and he and his wife do not qualify for government aid because he earns more than the minimum wage.

HEALTH

Five months ago from the time of this interview, Elias hurt his knee while playing basketball. Since the family has no health coverage, they opted to see a "sobador" (bone-setter), who re-positioned his knee manually and on the spot. Elias did not get an MRI to know what exactly happened to his knee, because his family cannot afford it. He continued working with a "busted knee" for several months. His boss tried giving him different jobs within the nursery, "but none of them worked out". Three weeks before this interview, his boss told him to go home and rest. Elias realized that his being home meant a huge financial cut, so he immediately went to a local community organization for help. Elias explained that the family is very short on money this month because they are living on his wife's salary. She also works at a nursery.

Elias' wife is also a second generation Mexican American. She is 26 years old and has a high school diploma. "Trabaja en un laboratorio de nurseria, en un clean room, con mascara y aire acondicionado…ponen muchisimo chloro en el cuarto." [*"She works in a lab in a nursery, in a "clean room" with a mask and AC…they put a lot of chlorine (disinfectant) in the room."*] She started working at the nursery after their first son was five. She worked during her second pregnancy and quickly went back to work after the delivery.

Their oldest son is now 8 years old. He had asthma since birth, but in recent months he has improved significantly. Their second son, 5 years old, has had epileptic seizures since he was 9 months old. He has developed a speech impediment associated with the seizures. Elias explained that he also had seizures as a little boy, and he also has some difficulties with speech. One doctor explained that in relation to the seizures, Elias has a thinner skull than the average man, which makes him very sensitive to sun and heat.

(NOTE: This case reflects the cycle of poverty that even American citizens can fall prey to. Elias chooses to work in conditions of heat and lifting heavy plants despite his neurological disorder and his "busted knee." He sees no other alternatives. Three weeks ago, they entered a desperate economic situation, one that they don't know how to weather unless Elias gets medical attention for his knee.)

REFERENCES

1. Kandel, W. "Profile of Hired Farmworkers A 2008 Update". USDA, ERS Economic Research Report No.60, July, 2008.
2. Goldstein B, Howe B, Tamir I. "Weeding out abuses: Recommendations for law abiding farm labor system" A collaboration between Oxfam America and Farmworker Justice 2010.
3. "Litany of Abuses: More – not fewer - protections needed in the H-2A Guestworker program" Farmworker Justice. December 2008.
4. Environmental Protection Agency Worker Protection Standards for Agricultural Pesticides. http://www.epa.gov/agriculture/twor.html
5. Roka, Fritz M., "Immigration Reform: Implications for Farmers, Farm Workers, and Communities". Labor issues Confronting Florida Tomato and Orange Growers. University of Florida, Southwest Research & Education Center. Immokalee, FL. http://migration.ucdavis.edu/cf/files/2010-may/roka-paper-labor-issues-confronting-florida.pdf
6. Dade County Farm Bureau. Action Center. Legislative Accomplishments 2009. http://www.dade-agriculture.org/old-site-8-3-11/documents/2009countyissues-FINAL.pdf
7. Abell A, Juul S, and Bonde JP: Time to pregnancy among female greenhouse workers. Scand J Work Environ Health 2000; 26:131–136.
8. Idrovo A J, Sanin LH, Cole D, Chavarro J, Caceres H, Narvaez J, Restrepo M: Time to first pregnancy among women working in agricultural production. Intl J Occup Med Environ Health 2005; 78:493–500.
9. Curtis KM, Savitz DA, Weinberg CR, Arbuckle TE: The effect of pesticide exposure on time to pregnancy. Epidemiology 1999; 10:112–117
10. McDonald AD, McDonald JC, Armstrong B, Cherry NM, Cote R, Lavoie J, Nolin AD, Robert D: Fetal death and work in pregnancy. Br J Ind Med 1988; 45:148–157.
11. Savitz DA, Whelan EA, Kleckner RC: Self-reported exposure to pesticides and radiation related to pregnancy outcome—Results from National Natality and Fetal Mortality Surveys. Public Health Reports 1989; 104:473–477.
12. Thomas DC, Petitti DB, Goldhaber M, Swan SH, Rappaport EB, Hertz-Picciotto I: Reproductive outcomes in relation to malathion spraying in the San Francisco Bay Area, 1981– 1982. Epidemiology 1992; 3:32–39.
13. Zhang J, Cai WW, Lee DJ: Occupational hazards and pregnancy outcomes. Am J Ind Med 1992; 21:397–408.
14. Levario-Carrillo M, Amato D, Ostrosky-Wegman P, Gonzalez-Horta C, Corona Y, Sanin LH: Relation between pesticide exposure and intrauterine growth retardation. Chemosphere 2004; 55:1421–1427.
15. Whyatt RM, Rauh V, Barr DB, Camann DE, Andrews HF, Garfinkel R, Hoepner LA, Diaz D, Dietrich J, Reyes A, Tang D, Kinney PL, Perera FP: Prenatal insecticide exposures and birth weight and length among an urban minority cohort. Environ Health Perspect 2004; 112:1125– 1132.
16. Nurminen T, Rantala K, Kurppa K, Holmberg PC: Agricultural work during pregnancy and selected structural malformations in Finland. Epidemiology 1995; 6:23–30.
17. Garry VF, Schreinemachers D, Harkins ME, Griffith J: Pesticide appliers, biocides, and

birth defects in rural Minnesota. Environ Health Perspect 1996; 104:394–399.
18. Shaw GM, Wasserman CR, O'Malley CD, Nelson V, Jackson RJ: Maternal pesticide exposure from multiple sources and selected congenital anomalies. Epidemiology 1999; 10:60– 66.
19. Engel LS, O'Meara ES, Schwartz SM: Maternal occupation in agriculture and risk of limb defects in Washington State, 1980–1993. Scand J Work Environ Health 2000; 26:193–198.
20. Kristensen P, Irgens LM, Andersen A, Bye AS, Sundheim L: Birth defects among offspring of Norwegian farmers, 1967–1991. Epidemiology 1997; 8:537–544.
21. Alexander FE, Patheal SL, Biondi A, Brandanse S, Cabrera ME, chan LC, Chen Z, Cimino G, Cordoba JC, Gu LJ, Hussein H, Ishii E, Kamel AM, Labra S, Magalhaes IQ, Mizutani S, Petridou E, de Oliveira MP, Yuen P, Wiemels JL, Greaves MF: Transplacental chemical exposure and risk of infant leukemia with MLL gene fusion. Cancer Res 2001; 61: 2542-2546.
22. Borkhardt A, Wilda M, Fuchs U, Gortner L, Reiss I: Congenital leukaemia after heavy abuse of permethrin during pregnancy. Arch Dis Child Fetal Neonatal Ed 2003; 88(5):F436-437.
23. V Rauh VA, R Garfinkle, FP Perera, HF Andrews, L Hoepner, DB Barr, R Whitehead, D Rang and RW Wyatt. 2007. Impact of Prenatal Chlorpyrifos Exposure on Neurodevelopment in the First Three Years of Life Among Inner City Children. Pediatrics 118 (6): e1845-e1859. Available from: www.pediatrics.org.
24. Lander F, Hinke K: Indoor application of anti-cholinesterase agents and the influence of personal protection on uptake. Arch Environ Contam Toxicol 1992; 22:163-166.
25. Flocks J et al. Female Farmworkers' Perceptions of Pesticide Exposure and Pregnancy Health. Journal of Immigrant Minority Health 2011

Journal of Agriculture, Food Systems, and Community Development
ISSN: 2152-0801 online
www.AgDevJournal.com

Agricultural exceptionalism at the state level: Characterization of wage and hour laws for U.S. farmworkers

Sarah O. Rodman,[a b] * Colleen L. Barry,[b c] Megan L. Clayton,[d] Shannon Frattaroli,[b] Roni A. Neff,[a b e] and Lainie Rutkow [b d]

Submitted June 8, 2015 / Revised November 6 and December 29, 2015 / Published online February 22, 2016

Citation: Rodman, S. O., Barry, C. L., Clayton, M. L., Frattaroli, S. Neff, R. A., & Rutkow, L. (2016). Agricultural exceptionalism at the state level: Characterization of wage and hour laws for U.S. farmworkers. *Journal of Agriculture, Food Systems, and Community Development, 6*(2), 89–110. http://dx.doi.org/10.5304/jafscd.2016.062.013

Abstract

Despite difficult working conditions, farmworkers in the United States are excluded from many federal-level labor protections. The exclusion of farmworkers from standards that apply to most other workers is referred to as agricultural exceptionalism. This exclusion was born out of the successful efforts of southern agricultural interests to exempt black sharecroppers from the New Deal package of social reforms. Farmworkers continue to belong to particularly vulnerable social and economic groups. U.S. states can establish their own labor protections that go beyond federal laws and regulations. Though agricultural exceptionalism is understood at the federal level, little is known about agricultural exceptionalism in state labor standards. This study is a comprehensive 50-state legal and regulatory mapping of minimum wage, overtime, and rest and meal period standards as they apply to farmworkers. To analyze the extent of agricultural exceptionalism in the states, we performed a search of iteratively defined search terms in WestLawNext. Two researchers

[a] Johns Hopkins Center for a Livable Future; 615 North Wolfe Street; Baltimore, Maryland 21205 USA.

[b] Department of Health Policy & Management, Johns Hopkins Bloomberg School of Public Health; 624 North Broadway; Baltimore, Maryland 21205 USA.

[c] Department of Mental Health, Johns Hopkins Bloomberg School of Public Health; 624 North Broadway; Baltimore, Maryland 21205 USA.

[d] Department of Health, Behavior and Society, Johns Hopkins Bloomberg School of Public Health; 624 North Broadway; Baltimore, Maryland 21205 USA.

[e] Department of Environmental Health Sciences, Johns Hopkins Bloomberg School of Public Health; 615 North Wolfe Street; Baltimore, Maryland 21205 USA.

* *Corresponding author:* Sarah O. Rodman, MPH, PhD candidate, Johns Hopkins Center for a Livable Future; 1545 Sunset Boulevard; Los Angeles, California 90026 USA; +1-310-729-6634; srodman2@jhu.edu

Author Note

Sarah O. Rodman, the primary author of this manuscript, was supported by a Johns Hopkins Center for a Livable Future–Lerner Fellowship for the duration of the study. This study is part of her doctoral dissertation research. Portions of the findings of this study were presented orally at the annual meeting of the American Public Health Association, held in Chicago in November 2015.

independently read and coded identified state laws and regulations in their entireties. Results reveal that agricultural exceptionalism is far-reaching in state-level minimum wage and overtime protections. Exceptionalism is universal in overtime standards. Rest and meal period standards exist less frequently at the state level, and exceptions for agriculture in those standards are rare. The results from this analysis are useful in identifying states and policy areas with strong and weak protections for farmworkers.

Keywords
agricultural exceptionalism, structural inequality, farmworkers, food policy, labor policy, federalism, legal mapping, minimum wage, overtime, United States

Introduction

Most farmworkers in the United States do notoriously demanding work, under trying conditions, for nearly unlivable compensation. Farm work is physically uncomfortable and exposes laborers to often-severe weather conditions and hazardous materials (Getz, Brown, & Shreck, 2008; United Farmworkers & Bon Appetit Management Company Foundation, 2011; Villarejo et al., 2000). Rates of injury and infectious and chronic disease are high among farmworkers. Unstable housing, social isolation, and exploitative relationships with supervisors add to the stressful conditions they face (Getz et al., 2008; United Farmworkers & Bon Appetit Management Company Foundation, 2011; Villarejo et al., 2000). Farmworkers usually do these arduous jobs for poverty-level wages (Robinson et al., 2011; Washington State Farmworker Housing Trust, 2008).

Given the conditions of farm labor, it is no surprise that this work has long been performed by those who are disenfranchised or outside dominant U.S. society. Farmworkers are drawn from shifting groups of people whose vulnerability falls along lines of race, ethnicity, and citizenship status (Gray, 2013; Holmes, 2013). The history of U.S. farmworkers is that of populations that had few options other than agricultural work. Southern plantations relied on enslaved black people and then on mostly black sharecroppers (Farhang & Katznelson, 2005; National Center for Farmworker Health, n.d.). Immigrants from various countries have been hired illegally and under various guestworker programs[1] to meet the demand for those who were willing to do this difficult work (Martin, 2003; National Center for Farmworker Health, n.d.). Currently, farmworkers in the U.S. are largely undocumented workers from Mexico and Central America (Southern Poverty Law Center, 2013).

Over the last century, the U.S. government has created and expanded critical protections for workers. However, strides made in strengthening labor laws and regulations have consistently left farmworkers behind. We refer to the exclusion of farmworkers from standards that apply to most other workers as agricultural exceptionalism. Legal protections concerning minimum wage, overtime pay, unemployment insurance, collective organizing and bargaining, and occupational health all contain exceptions for farmworkers. The original exclusion of farmworkers from U.S. labor protections in the 1930s was driven by agricultural interests' desire to maintain the southern plantation economy that depended on the exploitation of black workers (Farhang & Katznelson, 2005; Linder, 1986; Quadagno, 1995). The National Labor Relations Act of 1935 (NLRA), Social Security Act of 1935, and Fair Labor Standards Act of 1938 (FLSA) all excluded farmworkers from the population of workers given protections via these laws (Ngai, 2004). To this day, several of these exceptions still stand.

This paper investigates agricultural exceptionalism in wage and hour protections, including minimum wage, overtime, rest breaks and meal breaks, at the state level. U.S. states are permitted to create their own wage and hour protections so long as they meet or exceed those of the federal

[1] Growers and labor contractors can hire farmworkers directly or via guestworker programs (United Farmworkers & Bon Appetit Management Company Foundation, 2011). Guestworker programs for temporary farmworkers provide agricultural employers in the U.S. a means of temporarily hiring non-immigrant foreign workers (U.S. Department of Labor, 2013a). When guestworkers' contracts are complete, they must return to their country of origin.

government (United Farm Workers & Bon Appetit Management Company Foundation, 2011). Employers must comply with the stronger of the two laws. Farmworker exceptions at the federal level have been well researched, but little is known about whether the 50 states have enacted increased wage and hour protections for farmworkers. While a 2010 summary exists of six state wage and hour laws as they pertain to farmworkers, a more comprehensive mapping of state laws and regulations offers an important tool for those interested in understanding and improving policy protections for farmworkers (United Farm Workers & Bon Appetit Management Company Foundation, 2011).

This paper addresses the following questions: To what extent do state-level wage and hour protections go beyond federal standards to protect farmworkers? To what extent do those state protections also exempt farmworkers from coverage? In the literature review, we describe the history of agricultural exceptionalism in the U.S., the demographics of farm labor and the forces that influence those demographics, and the health challenges and poverty experienced by farmworkers. The literature review elucidates how agricultural exceptionalism is intertwined with maintenance of social inequalities that fall along lines of race, ethnicity, and citizenship. In the methods and results sections, we describe our comprehensive, 50-state legal mapping study that identifies variations in state wage and hour laws and regulations as they pertain to farmworkers. To conclude, we discuss the implications of the study results and how our findings can inform future study and action.

Literature Review

Historical Background of Agricultural Exceptionalism

Prior to the 1930s, the U.S. did not have national social programs for minimum wage or overtime. The concept of social rights began to emerge after the Depression challenged the foundations of a "rugged individualism" (Quadagno, 1995). In 1938, the U.S. government established a federal minimum wage to stabilize the post-Depression economy and to create a standard of living that would protect the health and well-being of all U.S. workers ("The Minimum Wage: An Overview," n.d.). The federal minimum wage was established by the Fair Labor Standards Act (FLSA), part of the New Deal package of social reforms. The FLSA also contains standards for overtime pay (J. Grossman, 1978/n.d.). Overtime standards protect workers from the adverse societal and individual effects of excessive weekly work hours, including ill health and reduced time for parenting and leisure. The FLSA's overtime standards created, in theory, a monetary deterrent to employers overworking their employees (Golden, 1998). The FLSA did not contain standards for rest breaks or meal breaks and, to date, no federal law mandates lunch breaks or rest breaks for workers (U.S. Department of Labor [U.S. DOL], n.d.).

The sweeping social reforms of the New Deal explicitly excluded farmworkers. During the passage of the FLSA, southern Democrats held control over the most powerful seats in Congress. Those members were beholden to the interests of powerful agricultural employers in their states (Farhang & Katznelson, 2005; Linder, 1986; Quadagno, 1995). If the FLSA did not have an exception for farmworkers, those employers stood to lose not only money, but an entire social and racial plantation system that had long benefitted them and had long rested on the exploitation of black workers. To protect the status quo, agricultural employers, via southern Congressional members, made sure there were exceptions for agriculture before the FLSA could pass (Farhang & Katznelson, 2005; Linder, 1986; Quadagno, 1995). During FLSA debates, some southern members expressed concern that without an exception for farmworkers, wages between black and white laborers would be equalized (Farhang & Katznelson, 2005).

The FLSA still contains explicit exceptions for farmworkers.[2] Initially, all farmworkers were excluded from FLSA minimum wage protections,

[2] While this analysis focuses on labor laws that affect farmworkers, the same laws apply in some states to a broader category of agricultural workers (e.g., livestock workers) at both the state and federal level. States sometimes have differing definitions of what types of workers are considered

but a 1966 amendment extended coverage to farmworkers on large farms (Linder, 1986). Farmworkers on small farms, however, are still exempted.[3] Additional minimum-wage exceptions for farmworkers include workers who are family members of their employer; workers mainly involved in raising livestock; local workers harvesting crops by hand (hand harvesters) who commute from their permanent homes, are paid by the piece for crops harvested (piece-rate), and did not work in agriculture for 13 or more weeks in the preceding year; and nonlocal, piece-rate hand harvesters under 17 years old who work on the same farm as their parents (U.S. DOL, Wage and Hour Division, 2008a). Another agricultural exception in the FLSA is in the area of overtime protection. Farmworkers have no right to overtime pay under federal law.

Farmworker Demographics

During the passage of the New Deal, farmworkers in the South were mostly black and poor laborers who had been politically and economically disenfranchised and effectively stripped of citizenship rights (Gray, 2013). The New Deal provided subsidies to farmers that encouraged them to replace workers with machinery. Increased mechanization prompted the eviction of laborers, resulting in a large migration of black sharecroppers to northern cities (Quadagno, 1995). In the 1960s, public employment opportunities that were created through gains of the civil rights era incentivized further departure of black workers from agricultural labor (Gray, 2013).

On the West Coast over a century ago, immigrants replaced nearly all American-born farmworkers, who mostly abandoned agriculture's poor pay and working conditions for nonfarm jobs. Chinese immigrants who had been "imported" to build the Western railroad made up 75% of seasonal California farmworkers by the 1880s (Martin, 2003). However, the Chinese Exclusion Act of 1882 barred further Chinese immigration, producing a need for another immigrant population to keep farm wages low (Martin, 2003). Chinese immigrants were replaced by Japanese immigrants, who were encouraged by the U.S. government to become farmworkers (London & Anderson, 1970). By 1905 Japanese immigrants made up half of California's seasonal farm labor (Olmstead & Rhode, 1997). Japanese farmworkers, however, were eventually successful at collectively organizing for higher wages. Farmers, therefore, had little objection when the U.S. engaged in an informal agreement with Japan to stop Japanese migration to the U.S. (Martin, 2003). In the 1940s, interned Japanese workers were used as farmworkers, as well as Italian and German prisoners of war (Martin, 2003). Farmworkers in the U.S. today are mainly immigrants from Mexico and Central America (Southern Poverty Law Center, 2013).

The North American Free Trade Agreement (NAFTA), implemented in 1994, required Mexico to allow subsidized food from the U.S. to enter the country while simultaneously eliminating Mexican farmers' subsidies. Mechanized, subsidized, and cheap corn from Canada and the U.S. flooded the Mexican market, and farmers there could not compete with the low prices of the imports (Fernández-Kelly & Massey, 2007). Many Mexican farmers were dispossessed of their lands. At the same time, many low-wage assembly plant jobs were relocating from Mexico to even lower-wage regions like Southeast Asia and China. The resultant dearth of employment opportunities drove a massive increase in migration from Mexico to the United States (Fernández-Kelly & Massey, 2007; Massey, Durand, & Malone, 2002; Polaski, 2004). Many farmworkers in the U.S. today are former farmers who were dispossessed of their livelihoods by these and other international forces (Fernández-Kelly & Massey, 2007).

The majority of farmworkers are not legally unauthorized to work in the U.S. One survey found that 46% of farmworkers hired by growers

agricultural workers.

[3] The FLSA defines small farms as those that use less than 500 "man-days" of employee labor in any calendar quarter (i.e., three months) of the preceding year (U.S. DOL, 2008a). A "man-day" is any 24-hour day in which a farmworker works at least one hour, meaning 500 man-days translate to roughly seven full-time employees working five days a week, so a "small farm" has roughly seven or fewer full-time employees (United Farm Workers & Bon Appetit Management Company Foundation, 2011).

directly and 76% of those hired by farm labor contractors are undocumented (United Farmworkers & Bon Appetit Management Company Foundation, 2011). Immigration status affects farmworkers' abilities to advocate for improvements in wages and working conditions. Employers have used immigration status to thwart farmworkers' attempts to unionize and advocate; organizing drives have been broken when employers threaten to call the Immigration and Naturalization Service (Haus, 2002). Among undocumented workers, the most recent immigrants to the U.S. are the least likely to organize (Moody, 2007).

In her 2013 book *Labor and the Locavore,* Margaret Gray argues that agricultural employers, with assistance from government agencies, have influenced the ethnic succession of farmworkers in order to ensure a workforce made up of the most vulnerable available populations. Gray (2013) shows that:

> Agricultural employers have long deployed ethnic stereotypes to hasten demographic transitions in the work force. Incoming or preferred workers are praised for their strong work ethic, while outgoing workers are castigated as lazy and overly demanding. Race-based characterizations are vehicles for employers' rationalizations about who will be good workers. This kind of racial profiling, which is repeated whenever a new group is introduced, also intersects with employers' ceaseless search for quiescent workers to fill low-paying jobs. (p. 123)

In the late nineteenth century, farm owners called the Chinese ideal workers because they were perceived as not having the same aspirations as white workers and as being better suited to the harsh conditions than European laborers or white American laborers (Fuller, 1939). Farmers in the 1920s argued in official testimony to Congress that Mexican laborers were ideal farmworkers because they lacked the intelligence and skill to try to take on more supervisory, less backbreaking work (Tichenor, 2002). Farm owners and management continue to profile workers according to race and ethnicity. Gray (2013) explains that in the twentieth century black workers, who were gaining rights and opportunities, began to be seen as too demanding and "uppity." In her recent ethnographic work in New York state, Gray found that black workers were characterized by their employers as shiftless and abusive of drugs and alcohol. Puerto Ricans were thought of as lazy. American-born workers were seen as unreliable or unstable. Conversely, Mexicans and new undocumented workers were praised as loyal and having a strong work ethic (Gray, 2013). Marta Maria Maldonado's ethnographic work supports Gray's arguments. Maldonado shows that farm owners allude to the natural tendencies of "Hispanics" to do well in menial agricultural jobs and lack of desire to be bosses (Maldonado, 2009).

When groups of workers gain advantages through changes in citizenship status or other factors, even the most idealized groups can become undesirable (Gray, 2013). The perceived willingness of some laborers to work long hours without objection is unlikely a strong work ethic that falls along lines of race, ethnicity, or citizenship. More likely it represents the desperation of various groups to earn an income and support their families and a fear of retribution for making demands for improved wages or working conditions (Gray, 2013).

It is important to note that present-day farmworkers are not one undifferentiated group of "Latino" or "Hispanic" workers. Farmworkers come from diverse countries and cultural groups. There are categories of farmworkers delineated based on ethnicity and citizenship that determine how employers characterize them and what kinds of work they are assigned to perform. Generally, the more "indigenous" and the more Mexican a farmworker is perceived to be, the further down the ladder he or she is from a white U.S. citizen, and the more physically difficult and degrading his or her work tends to be (Holmes, 2013; Maldonado, 2009). Seth Holmes (2013) has documented this ethnic succession on U.S. farms. The most vulnerable populations perform the most undesirable jobs. As groups advance economically or socially, a more oppressed or vulnerable group replaces them.

Government bodies at various levels facilitate employers' demographic preferences. Through exceptions to restrictive immigration policies and the creation of various guestworker programs, farmworker employers have been guaranteed an ample supply of cheap and disenfranchised labor. The Immigration Act of 1917 contained an exception to restrictive policies for those who were immigrating to do farm work, creating the first *bracero* (Mexican farmworker) program. In the mid-twentieth century, a more formalized bracero contract labor program was initiated through a labor agreement between Mexico and the U.S. In order to facilitate this policy Congress had to remove a ban on contract labor that had existed since 1885 to stem the tide of immigrant workers (Ngai, 2014). The power of Congressional members from agricultural regions trumped evidence from the government that there was no farmworker shortage and other members' concerns about wages, labor standards, and allowing so many foreigners into the country (Ngai, 2014). After the notoriously abusive bracero program was dismantled, farmworkers could still be brought in on H-2A visas (temporary visas to fill seasonal jobs). The H-2A visa program was initially advocated for by the Florida sugar cane industry in order to fulfill its demand for Caribbean workers to cut sugarcane (Southern Poverty Law Center, 2013). Today the H-2A guestworker program is still the program under which farmworkers are brought to the U.S. for legal temporary employment.

Gray (2013) documents how the New York State Department of Labor (NYDOL) Rural Employment Program, which connects farmers with prospective workers, processes job opportunities in a way that bends to the demographic preferences of employers. Specifically, the hiring of domestic, mostly black, workers is minimized by the NYDOL through several hiring processes. Conversely, the department facilitates the hiring of Latino, foreign-born workers (Gray, 2013). In this case, the state aids growers in acquiring a labor force that is perceived to be less likely to demand higher wages or better working conditions.

Farmworker Health and Poverty

Employment conditions have a major effect on health and health inequalities via social, economic, and physical pathways; work can be considered a direct determinant of health disparities (Benach, Muntaner, & Santana, 2007; Lipscomb, Loomis, McDonald, Argue, & Wing, 2006). Farmworkers suffer myriad health consequences of their work. A 2013 report indicated that agriculture is the most hazardous industry for U.S. employees (National Safety Council, 2013). In 2011 agriculture was one of only two private industry sectors to see an increase in occupational injuries over the previous year; this increase was driven specifically by higher rates of injuries in crop production and animal production (U.S. DOL, Bureau of Labor Statistics, 2012).

Much farm labor entails spending many hours each day in uncomfortable physical positions, including performing repetitive motions that cause ergonomic injuries (Getz et al., 2008; United Farmworkers & Bon Appetit Management Company Foundation, 2011; Villarejo et al., 2000). Farmworkers often do their work while exposed to extreme weather conditions that can cause heat stress, which sometimes leads to death. They often lack access to clean water or toilets. Many are also in contact with pesticides, herbicides, sulfur, and dust, and experience elevated risks of respiratory illnesses, skin conditions, cancer, eye and vision problems, and obesity-related chronic diseases. Rates of infectious diseases, including tuberculosis and parasites, are high among farmworkers (Getz et al., 2008; United Farmworkers & Bon Appetit Management Company Foundation, 2011; Villarejo et al., 2000). In addition, farmworkers experience job and housing insecurity, isolated social conditions, and relationships with supervisors that can be exploitative or abusive (Getz et al., 2008). Despite their responsibility for the nation's food supply, farmworkers suffer from food insecurity at disproportionately high rates as compared to the rest of the U.S. (Minkoff-Zern, 2014a).

Many farmworkers work long enough hours that, in other industries, would grant them legal access to overtime pay. According to the most recent data available from the National Agricultural Workers Survey, 50% of farmworkers work over 40 hours per week. That statistic includes both workers hired directly by farm owners and those

hired by intermediary labor contractors. A quarter of farmworkers work 50 hours per week or more (U.S. DOL, 2004).

Low income and unpaid income are major issues for U.S. farmworkers. Data from the National Agricultural Workers Survey (NAWS) shows that between 2005 and 2009, about half of farmworkers who had worked in the U.S. for an entire year or more made under US$20,000 per year from all sources of income, including nonfarm employment (United Farmworkers & Bon Appetit Management Company Foundation, 2011). A study in Washington state showed that in 2006, fewer than 7% of farmworkers in the state made more than US$20,000 per year. The study reported that the average annual income of farmworkers in Washington state in 2006 was US$12,327 (Washington State Farmworker Housing Trust, 2008). Minimum wage violations are common among farm employers. A 2011 study in North Carolina showed that 45.3% of farmworkers without H-2A visas had experienced wage violations (Robinson et al., 2011). Income to a large degree determines the level of health care, shelter, nutrition, and transportation to which one has access. The ability to meet these basic needs has myriad effects on mental and physical health.

As the previous passages have established, farm work is often performed by the most marginalized groups of available workers. Social and structural inequalities suffered by these groups make them willing to do farm jobs. The health and economic consequences of this work are thereby a result of social inequalities, which fall along lines of race, ethnicity, and citizenship. Holmes (2013) calls the physically and emotionally injurious effects of social inequalities on farmworkers "structural violence." In his 2013 book, *Fresh Fruit, Broken Bodies*, Holmes elucidates structural violence by exploring the physical suffering of several farmworkers, including Abelino:

> The social and political genesis of Abelino's knee pain could not have been clearer. His pain was caused unequivocally by the fact that he, as an undocumented Triqui man, had been excluded by both international market inequalities and local discriminatory practices from all but one narrow and particularly traumatic labor position. This occupation required him to bend over seven days a week, turning back and forth, in all kinds of weather, picking strawberries as fast as he possibly could. (Holmes, 2013, p. 94)

Agricultural exceptionalism in wage and hour protections, collective bargaining rights, and occupational health protections and enforcement creates lower standards for farm work than for most other forms of work in the U.S. In providing fewer protections for those who are already socially unequal, it contributes to structural violence against farmworkers and further entrenches social inequalities. In order to begin addressing this problem, it is important to fill gaps in our understanding of how agricultural exceptionalism operates in the U.S.

Methods

In this study, we aim to improve understanding of how farmworkers are excluded from wage and hour protections at the state level. We conducted a comprehensive search to identify state labor laws and regulations related to the following topics: (1) minimum wage; (2) overtime; (3) required rest periods; and (4) required meal periods. For all 50 states, and for each of these topics, we identified laws and regulations for the general population of workers, as well as for any exceptions or special laws for farmworkers. The Robert Wood Johnson Foundation's Public Health Law Research Program has developed best practice principles for the systematic identification, collection, and analysis of laws and regulations. These principles guided our approach to data collection and analysis (Anderson, Tremper, Thomas, & Wagenaar, 2012).

Data Collection

To begin data collection, we defined a set of search terms based on the categories of law of interest. Initial search terms included "minimum wage," "maximum hours," "overtime pay," "rest period," and "meal period." We refined these search terms during early data collection through an iterative process, based on the language found in relevant laws and regulations. The final set of search terms included "minimum wage," "maximum hours,"

"overtime," "rest period," "rest&period," "meal period" and "meal&period."

We conducted searches using the above terms in WestLawNext between March and August 2014. This legal database allows researchers to search statutes and regulations for all 50 states. We ran searches within the statutory and administrative codes for each state. As a quality control measure we compared the identified state laws and regulations to publicly available materials created by the U.S. Department of Labor (U.S. DOL or DOL) (U.S. DOL,Wage and Hour Division, n.d.-b, n.d.-c, n.d.-d). The DOL materials contain information on general labor laws and regulations as they pertain to the majority of workers. These materials do not contain information specific to farmworkers. For the very few discrepancies that were identified between DOL materials and the laws and regulations searched, we consulted the text of the relevant law or regulation. These quality control measures were particularly important in confirming negatives (e.g., some states, such as South Carolina, did not have their own wage or hour laws) (U.S. DOL, Wage and Hour Division, n.d.-b). When states do not have their own wage or hour laws, they default to the federal standard (U.S. DOL, Wage and Hour Division, n.d.-b). When no state-level law or regulation could be located, we verified its absence through secondary sources. As an additional quality control measure, we used publicly available information from the National Conference of State Legislatures to confirm whether new state labor laws had been enacted, but not yet documented in WestLawNext (National Conference of State Legislatures, 2014). For the three states that had enacted laws not yet in WestLawNext, we consulted the state legislature websites to obtain the full text of the newly enacted laws.

Because the search terms were designed to be broad, with the goal of capturing all relevant laws and regulations, the search at times retrieved hundreds or thousands of laws and regulations. We developed a set of exclusions to ensure that the final set of laws and regulations included only those relevant to the research question. For example, we applied exclusions to laws or regulations related to unemployment insurance, workers' compensation, and child labor. Though these exclusions apply to labor protections with degrees of agricultural exceptionalism, this analysis focuses on laws and regulations that affect the payment and working hours of adult, currently employed farmworkers. See Appendix A for a full list of exclusions.

For the relevant laws and regulations retrieved via WestLawNext, we captured the full text. A second researcher used the search protocol to independently capture laws and regulations for a randomly selected 10% subsample (i.e., five states). The findings of the two researchers were in agreement, save for one instance, which was resolved through discussion.

Data Analysis

We organized the laws and regulations we had identified in a spreadsheet, with a separate sheet for each of the following topics: minimum wage, overtime, rest periods, and meal periods. For each topic, the spreadsheet organized the data into four variables: continuous (e.g., dollar amount of state minimum wage), categorical (e.g. explicit, non-explicit, or no exception for farmworkers), dichotomous (e.g., whether there is a state law or regulation), and qualitative (e.g., description of exceptions for farmworkers) variables. Within each topic, we organized results by state.

We read each law and regulation in its entirety. When coding for whether a law or regulation contained an exception for farmworkers, we used the following four categories:

- "N/A": no relevant law or regulation in general for the state.
- "N": a relevant law or regulation, but no exception was included for farmworkers.
- "Y": a relevant law or regulation that contained an explicit exception for farmworkers. Explicit exceptions could be made clear via a statement within the text of a law (e.g., clarifying that the law did not apply to employers in agriculture). Frequently, exceptions were found in a law's definition of "employee." States were coded as "Y" even when there are protections for farmworkers, if the protections were weaker than those for workers in general.

- "NE" (non-explicit): a law or regulation that indirectly exempted all farmworkers or much of the agriculture industry. For instance, if a law or regulation applied only to specific sectors of workers (e.g., miners) that were not in agriculture, it was coded as "NE" because it excluded agriculture (along with other industries) by default. States were coded as "NE" if they referred to federal law.

A second researcher independently coded a randomly selected 10% subsample of laws and regulations (i.e., for five randomly selected states). The two researchers' coding matched for all but one variable for one state. That instance was clarified through discussion.[4] Throughout both data collection and coding, we maintained a detailed research protocol.

Results

States vary widely in terms of their legislation and regulations for minimum wage, overtime, rest periods, and meal periods. The following 11 states have laws or regulations governing all four categories: California, Colorado, Illinois, Kentucky, Maine, Minnesota, Nevada, New Hampshire, Oregon, Vermont, and Washington. In contrast, the following four states have no laws or regulations for any of the four categories: Alabama, Louisiana, Mississippi, and South Carolina. Table 1 displays the states with and without their own labor standards in the categories of interest for this analysis.

Of the four categories examined, states most frequently have laws or regulations pertaining to minimum wage (n=45 states) and overtime (n=32 states). Minimum wage and overtime are also the types of laws that most frequently contain explicit exceptions for farmworkers. Less than half of all U.S. states have laws or regulations pertaining to required meal periods for laborers, and less than one-quarter of states have standards pertaining to required rest periods. Table 2 shows the numbers and percentages of states that have their own standards with exceptions for farmworkers.

Table 1. States With and Without Their Own Labor Standards, by Category of Standards

Labor standard category	States with own standards	States without own standards
Minimum wage	All states other than those listed at right	Alabama, Louisiana, Mississippi, South Carolina, Tennessee
Overtime	All states other than those listed at right	Alabama, Arizona, Delaware, Florida, Georgia, Idaho, Iowa, Louisiana, Mississippi, Nebraska, Oklahoma, South Carolina, South Dakota, Tennessee, Texas, Utah, Virginia, Wyoming
Rest periods	California, Colorado, Kentucky, Maine, Minnesota, Nevada, Oregon, Pennsylvania,[a] Tennessee, Vermont, Washington	All states other than those listed at left
Meal periods	California, Colorado, Connecticut, Delaware, Illinois, Kentucky, Maine, Massachusetts, Minnesota, Nebraska, Nevada, New Hampshire, New York, North Dakota, Oregon, Pennsylvania,[a] Rhode Island, Tennessee, Vermont Washington, West Virginia	All states other than those listed at left

[a] Pennsylvania: The general population of workers in Pennsylvania do not have rest and meal period protections. These standards have an exception for female farmworkers, who are provided rest and meal period protections. Male farmworkers are not provided these protections.

[4] Specifically, there was disagreement on whether or not Pennsylvania should be coded as having its own rest and meal period standards for the general population of workers, as the state only provides that protection to female workers. The coders resolved to consider the state as having those standards, but explained that particular outcome in the results section below via footnotes in the tables.

Minimum Wage

The FLSA mandates that the workers it covers receive a minimum of US$7.25 per hour (U.S. Department of Agriculture [USDA], 2009). When a state law specifies a different amount, employers must abide by the more generous of the two laws. Forty-five states have their own standards for minimum wage. The majority of those states establish minimum wages that either match (*n*=18) or exceed (*n*=19) the federal standard. Some states have minimum wage standards that differ based on the gross sales of businesses (*n*=4), or on whether or not the business provides health insurance (*n*=1). For the states whose laws or regulations establish a minimum wage lower than US$7.25 per hour (i.e., Arkansas, Georgia, and Wyoming), the federal standard supersedes the state standard. (See Figure 1.) At the time of data collection, Washington had the highest state minimum wage at US$9.32 per hour (National Conference of State Legislatures, 2014).

Among the states with their own minimum wage laws or regulations, two-thirds have explicit exceptions for farmworkers. Sixteen states specify that minimum wage standards do not apply to individuals employed in agriculture, usually under certain specific conditions (e.g., individuals working for employers who did not use more than 500-man days of labor in any calendar quarter of the

Figure 1. Minimum Wage Agricultural Exceptions by State, U.S.

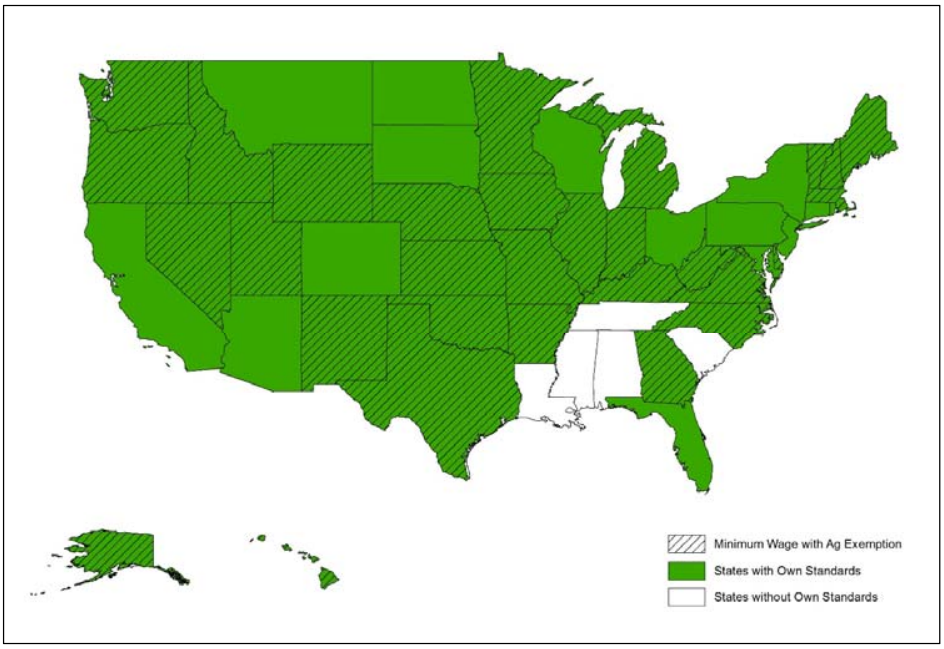


Image created by Johns Hopkins Center for a Livable Future.

Table 2. Number and Percentage of States with Their Own Labor Standards and Exceptions for Farmworkers

Labor standard category	States with own labor standards *n* (% of all 50 states)	States with explicit[a] exceptions for some or all farmworkers *n* (% of states with standards)	States with explicit or non-explicit[b] exceptions for some or all farmworkers *n* (% of states with standards)
Minimum wage	45 (90%)	30 (67%)	34 (76%)
Overtime	32 (64%)	30 (94%)	32 (100%)
Rest periods	11 (22%)	2 (18%)	3 (27%)
Meal periods	21 (42%)	2 (10%)	4 (19%)

[a] Exceptions were considered explicit if they were made clear via text in the body of the law or regulation (e.g., clarifying that the law did not apply to agriculture or excluding farmworkers from the definition of employee).
[b] Exceptions were considered non-explicit if a law or regulation indirectly included an exception for farmworkers (e.g., if a law or regulation applied only to a specific sector of workers [e.g., miners] that were not in agriculture). States were coded as non-explicit if they referred to definitions in federal law.

preceding year, or individuals who are employed as hand-harvest laborers and paid on a piece-rate basis) (Ark. Admin. Code § 010.14.1-106, 2014). For example, in Maine, employees exempt from the minimum wage law include "any individual employed in agriculture as defined in Maine Employment Security Law…except when that individual performs services for or on a farm with over 300,000 laying birds" (Maine Rev. Stat. Ann. § 26.663(3)(A), 2014).

Exceptions for farmworkers are also found frequently in the minimum wage laws' or regulations' definitions of terms. In many states' minimum wage laws, farmworkers are explicitly left out of the definition of "employee." States that exclude farmworkers from the definition of, and therefore the minimum wage rights given to, employees include Delaware, Hawaii, Indiana, Kansas, Kentucky, Massachusetts, Minnesota, Nebraska, New Mexico, Ohio, Oklahoma, Vermont, Virginia, Washington, West Virginia, and Wyoming.

Three states have non-explicit exceptions for farmworkers in their minimum wage laws. Florida uses the FLSA's criteria for who is covered by minimum wage standards (Flor. Stat. Ann. § 448.110(3), 2014). Arizona similarly does not cover employees exempted by the FLSA if they work at a small business grossing less than US$500,000 in annual revenue (Ariz. Rev. Stat. § 23.362(B), 2014; Ariz. Rev. Stat. § 23.362(C), 2014). Colorado's Minimum Wage Order only applies to certain industry sectors (not including agriculture) and those covered by the FLSA (Colo. Code Regs. § 7.1103-1:1, 2014).

Some states have minimum wage standards without exceptions for farmworkers that are equal

Table 3. States with Their Own Labor Standards, With and Without Exceptions for Farmworkers, by Category of Standards

Labor standard category	With exceptions (explicit)	With exceptions (non-explicit)	Without exceptions
Minimum wage	Alaska, Arkansas, Delaware, Georgia, Hawaii, Idaho, Illinois, Indiana, Iowa, Kansas, Kentucky, Maine, Massachusetts, Michigan, Minnesota, Missouri, Nebraska, Nevada, New Hampshire, New Mexico, North Carolina, Oklahoma, Oregon, Texas, Utah, Vermont, Virginia, Washington, West Virginia, Wyoming	Arizona, Colorado, Florida, Ohio	California, Connecticut, Maryland, Montana, New Jersey, New York, North Dakota, Pennsylvania, Rhode Island, South Dakota, Wisconsin
Overtime	Alaska, Arkansas, California,[a] Connecticut, Hawaii, Illinois, Indiana, Kansas, Kentucky, Maine, Maryland,[a] Massachusetts, Michigan, Minnesota, Missouri, Montana, Nevada, New Hampshire, New Jersey, New Mexico, North Carolina, North Dakota, Ohio, Oregon, Pennsylvania, Rhode Island, Vermont, Washington, West Virginia, Wisconsin	New York, Colorado	None
Rest periods	Maine, Minnesota	Colorado	California, Kentucky, Nevada, Oregon, Pennsylvania,[b] Tennessee, Vermont, Washington
Meal periods	Maine, Minnesota	Colorado, Nebraska	California, Connecticut, Delaware, Illinois, Kentucky, Massachusetts, Nevada, New Hampshire, New York, North Dakota, Oregon, Pennsylvania, Rhode Island, Tennessee, Vermont, Washington, West Virginia [c]

[a] California and Maryland both have overtime protections for farmworkers, but they are lesser protections than those given to most workers.
[b] In Pennsylvania, the rest and meal period protections for farmworkers stem from specific laws for that group, in addition to protections specifically for female workers, whereas the general population of male workers in Pennsylvania does not have rest or meal period protections.
[c] Wisconsin gives migrant workers their own specific standards for meal periods, an exception over the general population of workers in the state. Wisconsin is not listed in this row because it does not provide a meal period standard for workers generally.

to or greater than the federal standards. Those states are listed in Table 3 and shown in Figure 1, which shows all states that have their own labor standards relevant to this analysis and whether they have explicit, non-explicit, or no exceptions for farmworkers.

Overtime

Unless exempt, employees in the U.S. are entitled to overtime pay if they work more than 40 hours in any one workweek under the FLSA. The FLSA defines a workweek as seven consecutive 24-hour periods. For hours worked beyond 40 hours in one workweek, employees are entitled to overtime pay at a rate no less than time and one-half of their normal pay rate (U.S. DOL, Wage and Hour Division, n.d.-a). The FLSA exempts all farmworkers from overtime pay (U.S. DOL, 2008a).

As Table 3 and Figure 2 indicate, 32 states have their own standards for overtime pay. Every state with its own standard for overtime pay has an exception for farmworkers. Nearly all of them (*n*=30) contain explicit exceptions for farmworkers. Colorado and New York have non-explicit exceptions; Colorado grants the right to overtime pay to specific industry sectors, of which agriculture is not included, while New York refers to federal law, which excludes farmworkers from overtime protections. California and Maryland both have overtime protections for farmworkers, but they are lesser protections than those given to most workers. In California, most workers are entitled to overtime if they work more than eight hours in one day or over 40 hours in one workweek (Calif. Code Ann. §510(a), 2014). Farmworkers in California, on the other hand, are entitled to overtime if they work over 10 hours in one day or more than six days in a workweek (Calif. Code Regs. § 8.11140 (3)(A), 2014). Farmworkers who work seven consecutive days are entitled to overtime for all hours worked on the seventh day (Calif. Code Regs. § 8.11140(3)(A), 2014). Most Maryland workers are entitled to overtime pay after 40 hours of work in a week, whereas Maryland farmworkers are entitled after 60 hours of work in a week (Maryland Code Ann. § 3-420(c), 2014; Maryland Code. Ann. § 3-415(a), 2014.).

As with state standards for minimum wage, some states create an explicit exception for overtime pay for farmworkers by leaving the whole agriculture industry out of the definition of employee. States that exclude farmworkers from the definition of employee as it pertains to overtime pay are Indiana, Kansas, Kentucky, Minnesota, Maine, New Mexico, Vermont, West Virginia and Washington. The majority of these exceptions are written clearly into the laws. For example, Illinois' overtime standards are not applicable to "any employer of agricultural labor, with respect to

Figure 2. Overtime Agricultural Exceptions by State, U.S.

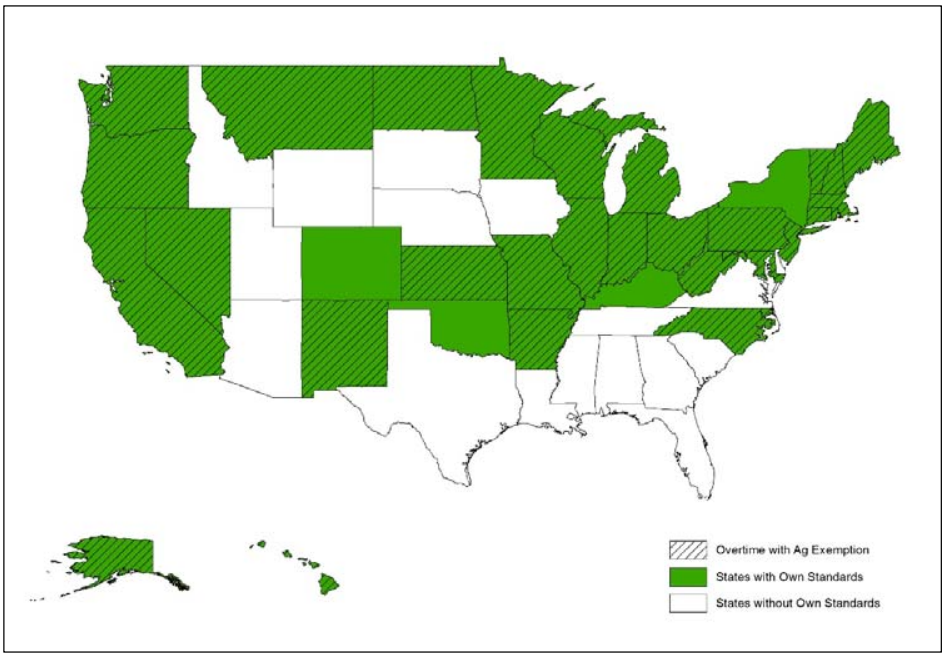


Image created by Johns Hopkins Center for a Livable Future.

agricultural employment" (Ill. Comp. Stat. Ann. § 820.105/4a.(2)(C), 2014).

Rest Periods

Federal law does not require that employers give employees rest or meal periods. However, when employers do offer break periods between five and 20 minutes, federal law requires those breaks to be compensable time (U.S. DOL, n.d.).

A minority of states (*n*=11) have official standards for rest periods. In six states (California, Colorado, Kentucky, Nevada, Oregon and Washington), for every four consecutive hours of work, laborers must be given 10 minutes of paid rest time. Maine and Minnesota have explicit exceptions for farmworkers in their rest period standards (Maine Rev. Stat. Ann. § 26.663(3)(A), 2014; Maine Rev. Stat. Ann. § 26.601, 2014; Minn. Stat. Ann. § 177.23(7)(1-3), 2014; Minn. Stat. Ann. § 177.253 (1), 2014). (See Figure 3 and Table 3.)

Pennsylvania's standards for rest periods are anomalous, as there is a standard only for female laborers, in that they cannot legally work more than five consecutive hours without a rest period (Penn. Stat. § 43.107, 2014). In general, male laborers are not entitled to a rest period in Pennsylvania. However, Pennsylvania has the same standard for seasonal farmworkers, regardless of gender, as it does for women (Penn. Stat. § 43.1301.207(c), 2014). In the case of Pennsylvania's rest period standards, female farmworkers appear to have a favorable exception compared to male laborers in general.

Meal Periods

Meal periods of 30 minutes or more are not required to be compensable under federal law (U.S. DOL, n.d.). Twenty-one states have standards for meal periods (see Figure 3). In most cases, employees are entitled to a 30-minute unpaid meal period for some number of consecutive hours worked. Maine and Minnesota have explicit exceptions for farmworkers in their meal period standards (Maine Rev. Stat. Ann. § 26.663 (3)(A), 2014; Maine Rev. Stat. Ann. § 26.601, 2014; Minn. Stat. Ann. § 177.23 (7)(1-3), 2014; Minn. Stat. Ann. § 177.254 (1), 2014).

For meal period standards, Pennsylvania and Wisconsin stand out. Pennsylvania's meal period standards apply to the same workers as do the standards for rest periods, described above. While Wisconsin has no strict standards for meal periods for the general population of workers (meal periods are merely recommended), migrant workers are entitled to an unpaid period of at least 30 minutes for more than six hours of consecutive work (Wisc. Ann. Stat. § 103.935(2), 2014).

Several states with meal period standards have exceptions for employers with a small number of employees. States with such exceptions

Figure 3. Rest Period Agricultural Exceptions by State, U.S.

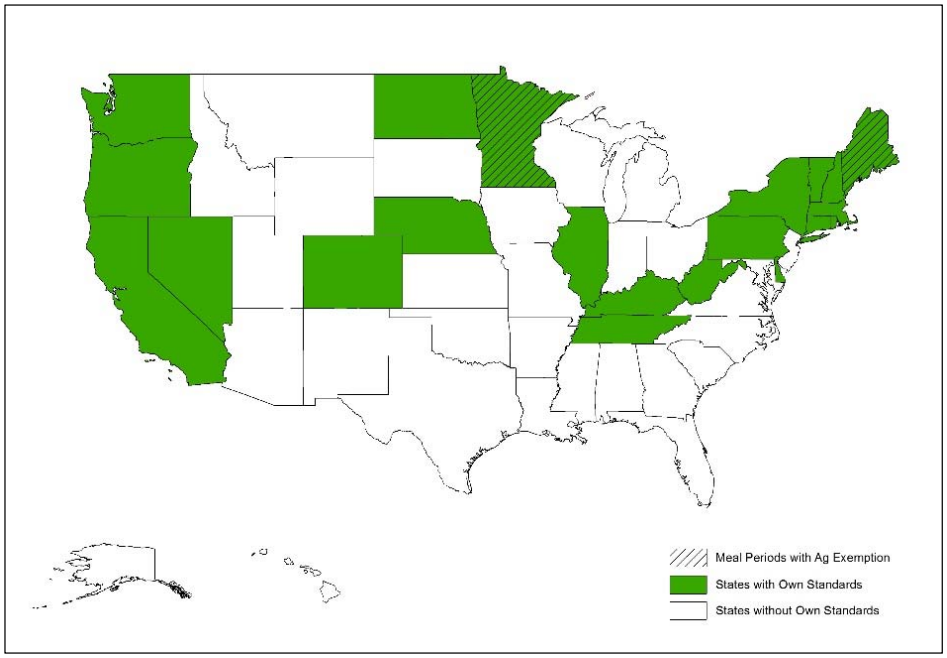


Image created by Johns Hopkins Center for a Livable Future.

include Connecticut, Delaware, Nevada, and Rhode Island (Conn. Gen. Stats. Ann. § 31-51ii(c)(3), 2014; Del. Code Ann. § 19.707(a)(3), 2014; Nev. Rev. Stats. Ann. § 608.019 (3)(a), 2014; Rhode Island Gen. Laws § 28-3-14(b), 2014). While these exceptions may include many farms, this type of exception for small businesses was not counted as an agricultural exception.

Figure 4. Meal Period Agricultural Exceptions by State, U.S.

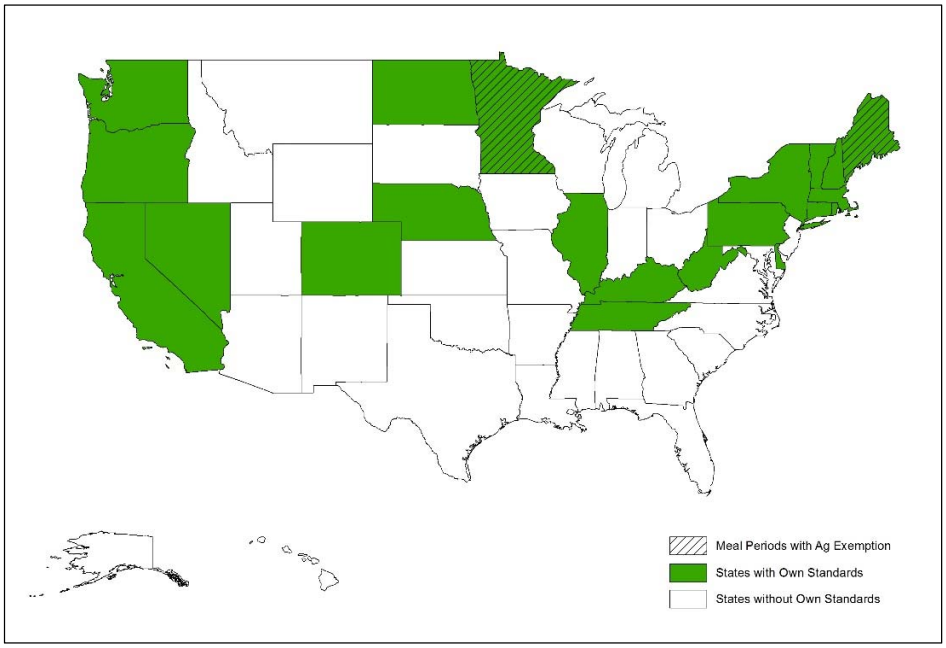


Image created by Johns Hopkins Center for a Livable Future.

Discussion

Laws and regulations for working conditions and labor standards—including minimum wage, overtime pay, and rest and meal periods—exist to minimize occupational hazards and to establish compensation that is sufficient to meet workers' basic economic needs (Bhatia, Gaydos, Yu, & Weintraub, 2013). Though several of these basic labor protections have been societally recognized as important through federal codification, many exclude farmworkers from coverage. The original exceptions for farmworkers in U.S. labor law were grounded in agricultural employers' attachment to a system that economically disadvantaged non-white farmworkers (Linder, 1986). Today, most farm owners are still white, while most farmworkers are still people of color. The USDA reports that according to the 2012 Census of Agriculture, although the diversity of farm operators is growing, the primary operators of 96% of farms in the U.S. are white (USDA, 2014). Over the past several centuries, the racial composition of farmworkers has gone from being mostly black to mostly foreign-born Latino workers (Linder, 1986; United Farm Workers & Bon Appetit Management Company Foundation, 2011).

Our analysis shows that agricultural exceptionalism at the state level is far-reaching. Many states have established labor protections that are equal to or more rigorous than the minimum standards set by the federal government. In the areas of minimum wage and overtime, most of these state laws and regulations have exceptions for farmworkers that look much like the federal exceptions. Over two-thirds of the 45 states with their own minimum wage standards exclude some farmworkers from protection. Every state with its own overtime standard has an exception for farmworkers. The adverse health effects of long work hours and low pay are a concern. Given the long hours worked by many farmworkers, overtime protection is an important area for future legislative and regulatory efforts and for public health advocacy.

State standards in the areas of meal and rest breaks were less common than for minimum wage and overtime, as were exceptions in those areas. Less than half of states have meal period requirements, and less than one-quarter of the states have rest period requirements. A minority of state meal and rest period requirements have exceptions for farmworkers.

Several factors determine whether states enact

policies that go beyond standards set by the federal government. States' policy priorities are determined by myriad internal characteristics, including citizen demands, interest group demands, the political ideology of elected and appointed officials, and a state's resources and obstacles that can support or hinder the policy (Whitaker, Herian, Larimer, & Lang, 2012). Legislators in states with dominant economic interests such as agriculture or organized labor tend to protect those interests (Hamm & Moncrief, 2012).

The history of agricultural exceptionalism reveals the strong power of grower interests to influence legislation affecting farmworkers (Farhang & Katznelson, 2005; Linder, 1986; Quadagno, 1995). Interest groups continue to be influential in the areas of agriculture and labor policy in the twenty-first century (M. Grossmann, 2012): U.S. agribusiness has contributed financial resources to politicians and political parties at the federal level. For instance, in the 2012 election cycle, agribusiness contributed over US$92 million, mostly to Republicans (Center for Responsive Politics, 2013a). Crop producers contributed nearly US$29 million of that total (Center for Responsive Politics, 2013b). Growers, including organic growers, have successfully opposed labor legislation at the state level, including minimum wage standards and workplace health and safety standards (Getz et al., 2008).

Of the laws and regulations of interest in this analysis, those that place the greatest economic demand on employers tended to have the highest rate of exceptions for farmworkers. The ubiquitous exceptions for farmworkers in overtime may be due to the increased economic demand that overtime requirements place on employers. Minimum wage laws set a standard that overtime protections build on, by requiring more pay for more work. Agricultural employers have a strong incentive to fight state policies that would interfere with federal overtime exemptions for their employees. In the same vein, the relative lack of exceptions in meal period requirements may be attributed to the lack of economic burden on employers and farms created by these protections. Meal periods are generally unpaid nonwork time and, therefore, agricultural interest groups have relatively little motivation to lobby against such protections.

Rest periods are nonwork time that an employer must generally pay for, which makes the relatively low rate of exceptions for farmworkers in this area stand out. Only two of the 11 states with rest period standards have explicit exceptions for farmworkers. This result may be because many of the farmworkers in states with rest period standards are paid on a piece-rate basis, not hourly. Under piece-rate payment, a worker is rewarded for the volume of crops picked, rather than the number of hours worked. This system incentivizes workers to skip rest periods (Cornish, 2015; Gallant, 2015). Agricultural employers thus have had little incentive to fight for exceptions to rest period standards. However, in July 2015 Washington state's supreme court ruled that piece-rate farmworkers must be paid separately for their rest periods at a rate not lower than what they are making when they are working (Rowe, 2015). This ruling may open the door to similar rulings in other agriculture-oriented states with rest period standards and no exceptions for farmworkers (Cornish, 2015).

California and New York have had vibrant farmworker organizing movements in recent decades that have won legislative victories in farmworker protections (Gray, 2013; Martin, 2003). The strength of farmworker interest groups may explain why these states stand out as having fewer exceptions for farmworkers than most other states. For the four labor protections included in this analysis, California, New York, Pennsylvania, and Wisconsin have relatively strong protections for farmworkers. California has its own protections for minimum wage, overtime, and rest and meal periods, with exceptions for farmworkers only for overtime. New York has standards for minimum wage, overtime, and meal periods, with no exceptions for farmworkers for minimum wage or meal period standards. California, New York, Pennsylvania, and Wisconsin could serve as case studies to understand why and how these states have become good examples for protecting laborers in agriculture.

The states with no standards for any of the examined labor protections share some similarities that may merit further exploration. For instance, as

of early 2015 they are all southern states with Republican governors, House, and Senate majorities (The Henry J. Kaiser Family Foundation, 2015). These characteristics and perhaps other similarities in these states may contribute to their lack of labor protections. The strength of the Republican party in these states may, for instance, contribute to legislatures' relative lack of support for labor issues. Democrats generally have a more favorable view of the interests of organized labor than do Republicans (Newport & Saad, 2011). The South's particular history of labor and politics, explored earlier in this paper, may also contribute to these similarities.

States that have several of their own labor standards and also several exceptions may present opportunities for advocates, in that labor protections have already been codified; removing a farmworker exception may prove easier than passing new labor laws entirely. On the other hand, these states may face powerful influences from agricultural employers or a lack of organized farmworker interest groups, which may explain why they have exceptions for farmworkers for every protection. The same two states with exceptions for farmworkers in meal period standards, Maine and Minnesota, have exceptions in rest period standards. Maine and Minnesota may therefore serve as interesting case studies as states that have gone farther than most other states in codifying agricultural exceptionalism in their labor protections and why that may be.

Lack of citizenship and documentation make it difficult for farmworkers today to become priorities for policymakers who could remedy agricultural exceptionalism. Agricultural employers outweigh farmworkers in economic resources and in their rights to vote or organize (Delgado, 1993; Haus, 2002; Kammer, 2009; Moody, 2007). Under federal law, a farmworker can be fired for joining a labor union (National Labor Relations Board, n.d.). States can go above the federal NLRA, which sets a policy floor, but only California does so (Agricultural Labor Relations Board, 2013; United Farmworkers & Bon Appetit Management Company Foundation, 2011). Data from the most recent 10 years of the National Agricultural Workers Survey showed that only one percent of farmworkers have worked under a union contract in the previous two years (United Farmworkers & Bon Appetit Management Company Foundation, 2011). Even farmworkers with collective bargaining rights may be fearful of organizing because of their lack of citizenship status (Haus, 2002).[5]

The growing alternative food movement has the potential to serve as a strong ally to labor in improving farmworker conditions (Sbicca, 2015). However, the movement has historically been more focused on environmental sustainability and increasing consumption of good food than on labor issues and economic justice (Myers & Sbicca, 2015). Despite evidence that limited income is a critical barrier to consumption of certain foods, many alternative food movement projects that aim to improve diets do so via education or by increasing availability of good food (Minkoff-Zern, 2014b; Myers & Sbicca, 2015). Trends in the alternative food movement indicate that the movement tends toward white and upper-middle-class biases, which often exclude the voices and visions of food workers (Sbicca, 2015). In order to better the lives of communities facing poverty and diet-related diseases and to improve their purchasing power, distribution of wealth must be addressed (Myers & Sbicca, 2015). The unlivable wages earned by farmworkers and other food workers should be key targets for movements concerned with food justice and food sovereignty (Minkoff-Zern, 2014a). Some groups working on improved conditions for food workers understand that fighting racism is critical to ending economic inequality (Sbicca, 2015). Increased cross-movement alliances between labor

[5] Despite challenges to organizing for improved labor rights and conditions, there have been notable successes among farmworkers. The United Farm Workers and other farmworker unions have gained successes in collective bargaining legislation and improved grower contracts (United Farm Workers, n.d.). In more recent years, the Coalition of Immokalee Workers (CIW) has drawn attention to the poor conditions of farmworkers in the Southeastern U.S. via collective organizing, strikes and boycotts. CIW's efforts have accomplished several wins in raising wages and improving conditions for the farmworkers involved (Coalition of Immokalee Workers, 2012).

and the alternative food movement are now growing and have the potential to improve the lives of workers in agriculture and other areas of the food system. Addressing the state-level agricultural exceptionalism that is revealed by this study should be one such effort toward strengthening structural protections for farmworkers.

Limitations

The search process for this study was comprehensively implemented in accordance with best practices for legal mapping studies. However, it is possible that some relevant laws and regulations were unintentionally excluded in the search process. This analysis does not consider the extent to which the laws and regulations identified are enforced. For those farms that are legally required to provide the labor protections examined in this analysis, how many are in compliance is not known. Record-keeping of regulatory enforcement is poor at the federal and state levels, and monitoring efforts lack transparency and traceability (United Farm Workers & Bon Appetit Management Company Foundation, 2011).

Finally, based on the results of this analysis, it is difficult to quantify the full reach of agricultural exceptionalism in U.S. labor policies. Although the U.S. DOL defines small farms in terms of "man-days," public data sources do not measure labor or farm size in this way (United Farm Workers & Bon Appetit Management Company Foundation, 2011). The incongruence of how farm size and labor are measured makes it challenging to understand the true impact of exceptions for agricultural labor. The exact number of farms and farmworkers that are not under state and federal labor protections remains unclear. However, based on this analysis, it is still evident that the number of farmworkers affected by exceptionalism is significant.

Future Research

Due to the general paucity of data related to farmworkers in the U.S., there is a need for future research in several areas. More systematic legal research is needed regarding other types of farmworker protections. Understanding the state-level legal and regulatory landscape for farmworkers in the U.S. is an important first step in identifying protective laws and areas to target future efforts. Case studies and legislative histories of states with both strong and weak protections can help identify best political strategies and important pitfalls in making legal progress. Future studies that investigate these protections in terms of the states' social conditions at the time of enactment or promulgation would be particularly helpful in revealing variables that have led to agricultural exceptionalism at the state level.

Conclusion

Labor protections have been enacted at the federal and state levels in the U.S. to ensure a standard of living and working for laborers. However, since the enactment of several of those protections, farmworkers have been given categorically fewer rights than workers in other industries. Farmworkers have been excluded from federal protections considered basic and crucial in the U.S. for nearly a century. This analysis reveals that many states also fail to give farmworkers the protections granted to most other laborers, especially with regards to overtime and minimum wages. This state-level agricultural exceptionalism perpetuates the historical pattern of farm work being performed by only the most marginalized populations of available workers. The information in this study may be used to support future efforts at strengthening protections for farmworkers, in terms of helping both to identify specific states' model policies and geographic priorities for intervention.

References

Agricultural Labor Relations Board. (2013). Agricultural Labor Relations Board. Retrieved January 28, 2013, from http://www.alrb.ca.gov/

Anderson, E., Tremper, C., Thomas, S., & Wagenaar, A. C. (2012). *Measuring statutory law and regulations for empirical research: A methods monograph*. Philadelphia: Public Health Law Research Program, Temple University. Retrieved from http://publichealthlawresearch.org/sites/default/files/downloads/resource/MeasuringLawRegulationsforEmpiricalResearch-Monograph-AndersonTremper-March2012.pdf

Ariz. Rev. Stat. § 23.362(B) (2014).

Ariz. Rev. Stat. § 23.362(C) (2014).

Ark. Admin. Code § 010.14.1-106 (2014).

Benach, J., Muntaner, C., & Santana, V. (Chairs). (2007). *Employment conditions and health inequalities: Final report to the WHO*. Geneva: Employment Conditions Knowledge Network, World Health Organization. Retrieved from http://www.who.int/social_determinants/resources/articles/emconet_who_report.pdf

Bhatia, R., Gaydos, M., Yu, K., & Weintraub, J. (2013). Protecting labor rights: Roles for public health. *Public Health Reports*, *128*(Suppl. 3), 39–47. Retrieved from http://www.pubmedcentral.nih.gov/articlerender.fcgi?artid=3945448&tool=pmcentrez&rendertype=abstract

Calif. Code Ann. § 510(a) (2014).

Calif. Code Regs. § 8.11140(3)(A) (2014).

Center for Responsive Politics. (2013a). Agribusiness: Top contributors to federal candidates, parties, and outside groups. Retrieved August 13, 2013, from OpenSecrets.org website: http://www.opensecrets.org/industries/contrib.php?ind=A&cycle=2012

Center for Responsive Politics. (2013b). Crop production & basic processing: Top contributors to federal candidates, parties, and outside groups. Retrieved August 13, 2013, from OpenSecrets.org website: http://www.opensecrets.org/industries/contrib.php?ind=A01

Coalition of Immokalee Workers. (2012). About CIW. Retrieved July 30, 2013, from http://ciw-online.org/about/

Colo. Code Regs. § 7.1103-1:1 (2014).

Conn. Gen. Stats. Ann. § 31-51ii(c)(3) (2014).

Cornish, A. (2015, April 15). Washington Supreme Court to review changes to farm worker rest breaks [Radio broadcast]. National Public Radio. Retrieved from http://www.npr.org/2015/04/15/399937686/washington-supreme-court-to-review-changes-to-farm-worker-rest-breaks

Del. Code Ann. § 19.707(a)(3) (2014).

Delgado, H. L. (1993). *New immigrants, old unions: Organizing undocumented workers in Los Angeles.* Philadelphia: Temple University Press.

Farhang, S., & Katznelson, I. (2005). The southern imposition: Congress and labor in the New Deal and Fair Deal. *Studies in American Political Development, 19*(1), 1–30. http://dx.doi.org/10.1017/S0898588X05000015

Fernández-Kelly, P., & Massey, D. S. (2007). Borders for whom? The role of NAFTA in Mexico-U.S. migration. *The Annals of the American Academy of Political and Social Science, 610*(1), 98–118. http://dx.doi.org/10.1177/0002716206297449

Flor. Stat. Ann. § 448.110(3) (2014).

Fuller, L. V. (1939). *The supply of agricultural labor as a factor in the evolution of farm organization in California* (Unpublished doctoral dissertation). University of California, Berkeley.

Gallant, A. (2015, August 3). Beat the heat: How workers survive brutal farm summers. *Modern Farmer*. Retrieved from http://modernfarmer.com/2015/08/farmworkers-survive-heat-stress/

Getz, C., Brown, S., & Shreck, A. (2008). Class politics and agricultural exceptionalism in California's organic agriculture movement. *Politics & Society, 36*(4), 478–507. http://dx.doi.org/10.1177/0032329208324709

Golden, L. (1998). Working time and the impact of policy institutions: Reforming the overtime hours law and regulation. *Review of Social Economy, 56*(4), 522–541. http://dx.doi.org/10.1080/00346769800000048

Gray, M. (2013). *Labor and the locavore: The making of a comprehensive food ethic.* Berkeley: University of California Press.

Grossman, J. (1978/n.d.). Fair Labor Standards Act of 1938: Maximum struggle for a minimum wage. Retrieved December 4, 2014, from http://www.dol.gov/dol/aboutdol/history/flsa1938.htm

Grossmann, M. (2012). Interest group influence on US policy change: An assessment based on policy history. *Interest Groups & Advocacy, 1*(2), 171–192. http://dx.doi.org/10.1057/iga.2012.9

Hamm, K., & Moncrief, G. (2012). Legislative politics in the states. In V. Gray, R. L. Hanson, & T. Kousser (Eds.), *Politics in the American states: A comparative analysis* (10th ed.) (pp. 163–207). London, England: Sage Publications.

Haus, L. A. (2002). *Unions, immigration, and internationalization: New challenges and changing coalitions in the United States and France.* New York: Palgrave Macmillan.

Henry J. Kaiser Family Foundation, The. (2015). *State political parties* [Table]. Retrieved February 18, 2015, from http://kff.org/other/state-indicator/state-political-parties/

Holmes, S. M. (2013). *Fresh fruit, broken bodies: Migrant farmworkers in the United States*. Berkeley: University of California Press.

Ill. Comp. Stat. Ann. § 820.105/4a.(2)(C) (2014).

Kammer, J. (2009). Immigration raids at Smithfield: How an ICE enforcement action boosted union organizing and the employment of American workers. Retrieved March 5, 2012, from the Center for Immigration Studies website: http://cis.org/SmithfieldImmigrationRaid-Unionization

Linder, M. (1986). Farm workers and the Fair Labor Standards Act: Racial discrimination in the New Deal. *Texas Law Review, 65*, 1335–1393. Retrieved from http://papers.ssrn.com/abstract=2205898

Lipscomb, H. J., Loomis, D., McDonald, M. A., Argue, R. A., & Wing, S. (2006). A conceptual model of work and health disparities in the United States. *International Journal of Health Services*, *36*(1), 25–50. http://dx.doi.org/10.2190/BRED-NRJ7-3LV7-2QCG

London, J., & Anderson, H. (1970). *So shall ye reap*. New York: Thomas Y. Crowell Company.

Maine Rev. Stat. Ann. § 26.601 (2014).

Maine Rev. Stat. Ann. § 26.663(3)(A) (2014).

Maldonado, M. M. (2009). 'It is their nature to do menial labour': The racialization of 'Latino/a workers' by agricultural employers. *Ethnic and Racial Studies, 32*(6), 1017–1036. http://dx.doi.org/10.1080/01419870902802254

Martin, P. L. (2003). *Promise unfulfilled: Unions, immigration, and the farm workers*. Ithaca, New York: Cornell University Press.

Maryland Code Ann. § 3-415(a) (2014).

Maryland Code Ann. § 3-420(c) (2014).

Massey, D. S., Durand, J., & Malone, N. J. (2002). *Beyond smoke and mirrors: Mexican immigration in an era of economic integration*. New York: Russell Sage Foundation.

Minimum wage. (n.d.). In *Wex Legal Dictionary*. Retrieved from http://www.law.cornell.edu/wex/minimum_wage

Minkoff-Zern, L.-A. (2014a). Hunger amidst plenty: Farmworker food insecurity and coping strategies in California. *Local Environment, 19*(2), 204–219. http://dx.doi.org/10.1080/13549839.2012.729568

Minkoff-Zern, L.-A. (2014b). Knowing "good food": Immigrant knowledge and the racial politics of farmworker food insecurity. *Antipode, 46*(5), 1190–1204. http://dx.doi.org/10.1111/j.1467-8330.2012.01016.x

Minn. Stat. Ann. § 177.23(7)(1-3) (2014).

Minn. Stat. Ann. § 177.253(1) (2014).

Minn. Stat. Ann. § 177.254(1) (2014).

Moody, K. (2007). *US labor in trouble and transition: The failure of reform from above, the promise of revival from below*. New York: Verso Books.

Myers, J. S., & Sbicca, J. (2015). Bridging good food and good jobs: From secession to confrontation within alternative food movement politics. *Geoforum*, *61,* 17–26. http://dx.doi.org/10.1016/j.geoforum.2015.02.003

National Center for Farmworker Health. (n.d.). About America's farmworkers. Retrieved July 24, 2013; archived at http://web.archive.org/web/20130731050947/http://www.ncfh.org/?pid=4&page=2

National Conference of State Legislatures. (2014). State minimum wages | 2014 minimum wage by state. Retrieved November 10, 2014, from http://www.ncsl.org/research/labor-and-employment/state-minimum-wage-chart.aspx

National Labor Relations Board. (n.d.). National Labor Relations Act. Retrieved July 29, 2013, from http://www.nlrb.gov/national-labor-relations-act

National Safety Council. (2013). *Injury facts, 2013 edition*. Retrieved from http://www.mhi.org/downloads/industrygroups/ease/technicalpapers/2013-National-Safety-Council-Injury-Facts.pdf

Nev. Rev. Stats. Ann. § 608.019(3)(a) (2014).

Newport, F., & Saad, L. (2011, March 11). Republicans negative, Democrats positive in describing unions. Retrieved from http://www.gallup.com/poll/146588/republicans-negative-democrats-positive-describing-unions.aspx

Ngai, M. M. (2014). *Impossible subjects: Illegal aliens and the making of modern America*. Princeton, New Jersey: Princeton University Press.

Olmstead, A., & Rhode, P. (1997). An overview of the history of California agriculture. In J. Siebert (Ed.), *California agriculture: Issues and challenges* (pp. 1–27). Berkeley, California: Giannini Foundation.

Penn. Stat. § 43.107 (2014).

Penn. Stat. § 43.1301.207(c) (2014).

Polaski, S. (2004). Mexican employment, productivity and income a decade after NAFTA. Retrieved from http://carnegieendowment.org/2004/02/25/mexican-employment-productivity-and-income-decade-after-nafta

Quadagno, J. (1995). *The color of welfare: How racism undermined the war on poverty*. New York: Oxford University Press.

Rhode Island Gen. Laws § 28-3-14(b) (2014).

Robinson, E., Nguyen, H. T., Isom, S., Quandt, S. A., Grzywacz, J. G., Chen, H., & Arcury, T. A. (2011). Wages, wage violations, and pesticide safety experienced by migrant farmworkers in North Carolina. *New Solutions, 21*(2), 251–268. http://new.sagepub.com/content/21/2/251.abstract

Rowe, S. (2015, July 16). Washington Supreme Court rules farmworkers must be paid separately for resk breaks. Retrieved from http://www.goskagit.com/all_access/washington-supreme-court-rules-farmworkers-must-be-paid-separately-for/article_3b522eae-2be2-11e5-85f7-8f932434e89e.html

Sbicca, J. (2015). Food labor, economic inequality, and the imperfect politics of process in the alternative food movement. *Agriculture and Human Values*, *32*(4), 675–687. http://dx.doi.org/10.1007/s10460-015-9582-2

Southern Poverty Law Center. (2013). Close to slavery: Guestworker programs in the United States (2013 Ed.). Retrieved from https://www.splcenter.org/20130218/close-slavery-guestworker-programs-united-states

Tichenor, D. J. (2002). *Dividing lines: The politics of immigration control in America*. Princeton, New Jersey: Princeton University Press.

United Farm Workers. (n.d.). The 1965–1970 Delano grape strike and boycott. Retrieved July 30, 2013, from http://www.ufw.org/_board.php?mode=view&b_code=cc_his_research&b_no=10482

United Farmworkers & Bon Appetit Management Company Foundation. (2011). *Inventory of farmworker issues and protections in the United States*. Retrieved from http://www.ufw.org/pdf/farmworkerinventory_0401_2011.pdf

U.S. Department of Agriculture [USDA]. (2009). Wages and hours worked: Minimum wage and overtime pay. Retrieved November 13, 2014, from http://www.dol.gov/compliance/guide/minwage.htm#who

USDA. (2014). 2012 Census of Agriculture: Race/ethnicity/gender profile. Retrieved March 25, 2015, from http://www.agcensus.usda.gov/Publications/2012/Online_Resources/Race,_Ethnicity_and_Gender_Profiles/cpd99000.pdf

U.S. Department of Labor [DOL]. (n.d.). Breaks and meal periods. Retrieved November 14, 2014, from http://www.dol.gov/dol/topic/workhours/breaks.htm

U.S. DOL. (2004). The National Agricultural Workers Survey, Chapter 5: Farm job characteristics. Retrieved December 5, 2014, from http://www.doleta.gov/agworker/report9/chapter5.cfm

U.S. DOL. (2009). Work authorization for non-U.S. citizens: Temporary agricultural workers (H-2A Visas). Retrieved July 23, 2013, from http://www.dol.gov/compliance/guide/taw.htm

U.S. DOL, Bureau of Labor Statistics. (2012, October 25). Workplace injury and illness summary [News release]. Retrieved July 29, 2013; archived at https://web.archive.org/web/20130801084354/http://www.bls.gov/news.release/osh.nr0.htm

U.S. DOL, Wage and Hour Division. (n.d.-a). Overtime pay. Retrieved November 13, 2014, from http://www.dol.gov/whd/overtime_pay.htm

U.S. DOL, Wage and Hour Division. (n.d.-b). Minimum wage laws in the states—January 1, 2013. Retrieved August 25, 2013; archived at http://web.archive.org/web/20130911041135/http://www.dol.gov/whd/minwage/america.htm

U.S. DOL, Wage and Hour Division. (n.d.-c). Minimum length of meal period required under state law for adult employees in private sector, January 1, 2014. Retrieved November 10, 2014, from http://www.dol.gov/whd/state/meal2014.htm

U.S. DOL, Wage and Hour Division. (n.d.-d). Minimum paid rest period requirements under state law for adult employees in private sector, January 1, 2014. Retrieved November 10, 2014, from http://www.dol.gov/whd/state/rest2014.htm

U.S. DOL, Wage and Hour Division. (2008a). *Fact sheet #12: Agricultural employers under the Fair Labor Standards Act (FLSA)*. Retrieved from http://www.dol.gov/whd/regs/compliance/whdfs12.pdf

U.S. DOL, Wage and Hour Division. (2008b). *Fact sheet #22: Hours worked under the Fair Labor Standards Act (FLSA).* Retrieved March 19, 2015, from http://www.dol.gov/whd/regs/compliance/whdfs22.htm

Villarejo, D., Lighthall, D., Williams, D. III, Souter, A., Mines, R., Bade, B.,…McCurdy S. A. (2000). *Suffering in silence: A report on the health of California's agricultural workers*. Los Angeles: California Institute for Rural Studies & The California Endowment. Retrieved from http://www.donvillarejo.com/execsum/suffering_in_silence_research_brief.pdf

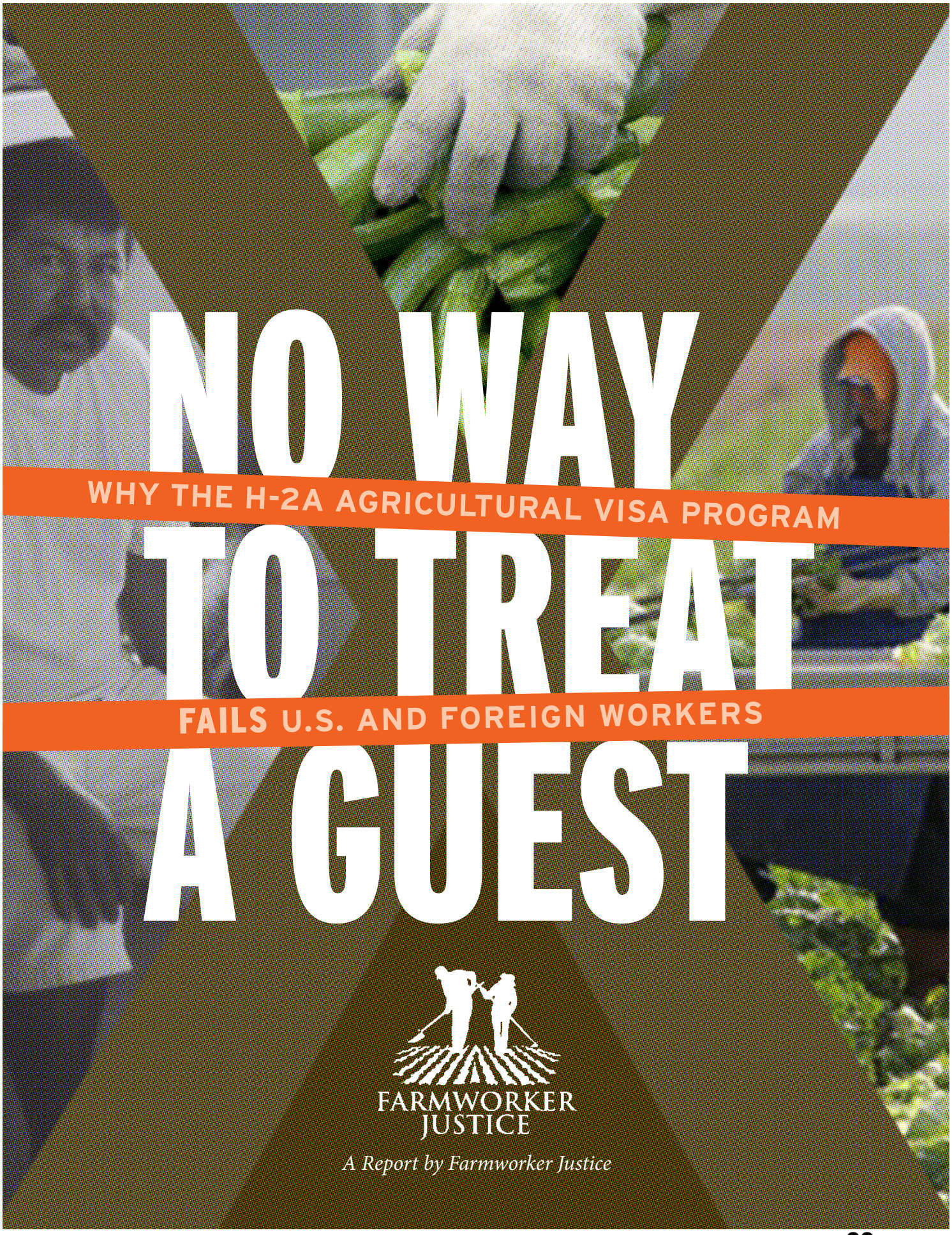
Washington State Farmworker Housing Trust. (2008). *A sustainable bounty: Investing in our agricultural future.* Retrieved from http://www.orfh.org/downloads/SustainableBounty.pdf

Whitaker, E. A., Herian, M. N., Larimer, C. W., & Lang, M. (2012). The determinants of policy introduction and bill adoption: Examining minimum wage increases in the American states, 1997-2006. *Policy Studies Journal, 40*(4), 626–649. http://dx.doi.org/10.1111/j.1541-0072.2012.00467.x

Wisc. Ann. Stat. § 103.935(2) (2014).

Appendix A. List of Terms Excluded from Data Collection

- criminal code
- wage theft and wage boards
- unemployment insurance
- workers compensation
- specific sectors of irrelevant employment or laborers (e.g., disabled, school teachers, domestic workers, etc.)
- child labor and/or labor done by minors (even if relevant to agriculture)
- power of commissioners and/or power of regulators
- standards applicable only to public employees or government personnel
- standards applicable only to meat inspectors
- record-keeping requirements
- enforcement of labor laws
- tipped employees
- deductions for room, board, etc.
- flexible work plans
- requirements for posting anything in workplaces
- preemption and local power



NO WAY TO TREAT A GUEST

WHY THE H-2A AGRICULTURAL VISA PROGRAM FAILS U.S. AND FOREIGN WORKERS

FARMWORKER JUSTICE

A Report by Farmworker Justice

ACKNOWLEDGEMENTS

This report by Farmworker Justice was researched and written by Etan Newman under the guidance of Bruce Goldstein and Adrienne DerVartanian, with assistance from Weeun Wang, Virginia Ruiz, and Jessica Felix-Romero.

Farmworker Justice thanks the following people and organizations who provided assistance in preparing this report and identifying farmworkers who could share their stories: Caitlin Ryland, Elizabeth Floyd, and Mary Lee Hall, Farmworker Unit of Legal Aid of North Carolina; Jennifer Lee and Kyle Endres, Colorado Legal Services Migrant Farm Worker Division; Erik Johnson, Idaho Legal Aid; Valerie Schoneberger, Legal Aid of Wyoming; Roman Ramos, Texas RioGrande Legal Aid, Inc.; Jesus Lopez, California Rural Legal Assistance, Inc.; Leah Lotto and Jordan Cummings, Georgia Legal Services Farmworker Rights Division; Melody Fowler Green and James Hurder, Southern Migrant Legal Services, a project of Texas RioGrande Legal Aid, Inc.; Pamela Bridge and Rosa Varela, Community Legal Services (AZ); Shaundra Young, South Carolina Legal Services; Briana Connors, Farm Labor Organizing Committee, AFL-CIO (FLOC); Carol Brooke, Immigrants Legal Assistance Project, North Carolina Justice Center; Victoria Mesa, Migrant Farmworker Justice Project, Florida Legal Services, Inc.

David Bacon generously donated photos for use. Thanks also to the many advocates from around the country who allowed use of their photos.

Special thanks to: Dagan Bayliss, Rebecca Young, Guadalupe Manriquez, Rodrigo Gonzalez, Silene Ramirez, and Suvimon Pongsiri for help with interpretation.

We are especially grateful to David, Kathern, Mary Jo, Javier, Pedro, Diego, Juan, Chinnawat, Francisco, Gilberto, Gabriel, Ramon, Manuel, and others who shared their stories in the hopes that it would help bring a greater measure of justice to farmworkers in the fields.

We appreciate the financial support of our donors, who make our work possible. Special thanks to America's Voice for providing funding for the design and distribution of this report.

Layout and design is by Kate Tallent Design.

Farmworker Justice is solely responsible for all content.

Learn how you can help empower farmworkers to improve their wages, working conditions, health, safety, immigration status and access to justice by visiting our website, *www.farmworkerjustice.org*; reading our blog, *www.harvestingjustice.org*; and joining us on Facebook at *www.Facebook.com/farmworkerjustice*. Farmworker Justice, founded in 1981 and based in Washington, D.C., is a not-for-profit 501(c)(3) organization. Donations to Farmworker Justice are tax-deductible to the full extent of the law.

TABLE OF CONTENTS

Executive Summary 6

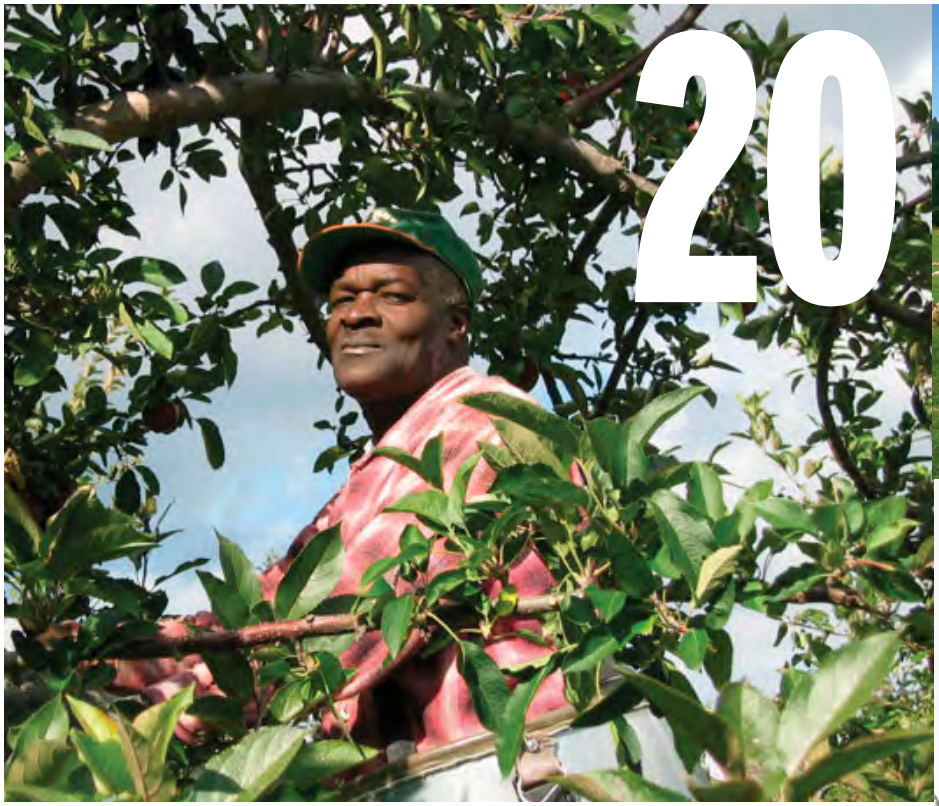
Part I: An Inherently Flawed System 10

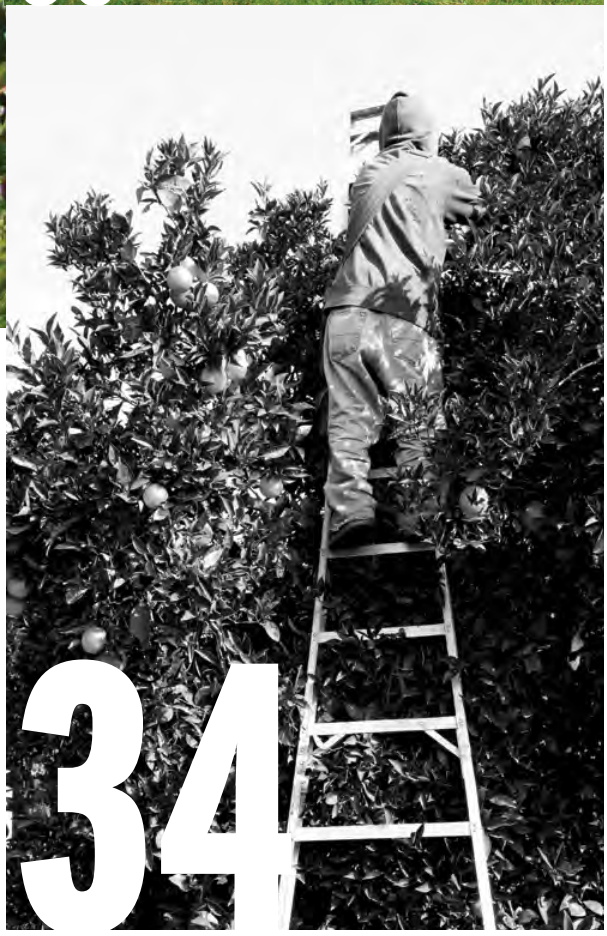
A History of Agricultural Guest Worker Programs. 12

Regulatory Framework: Lessons from Decades of Abuses 14

Why Do Employers Use Guest Workers? 17

Who Uses H-2A? An Analysis of DOL Data. 17





Part II: The Faces of Abuse 20

Replacement of U.S. Workers 20

Recruitment, Debt, and Human Trafficking . . . 22

Wage Theft. 23

Age, Gender, and Ethnic Discrimination 26

Injured Workers. 27

Unsafe and Unhealthy Housing 28

Retaliation and Labor Organizing 30

Part III: A Program to Fill Seasonal Jobs 32

Sheepherders: A Dangerous Exception 32

Dairy, Mushrooms, Greenhouses:
An Unchecked Expansion of Guest
Worker Industries 34

Part IV: Recommendations 36

Appendix: Resources and Media. 41

EXECUTIVE SUMMARY

What is the problem with a farm labor force composed of temporary foreign guest workers? Just ask Kathern, a truck driver, farmworker, and mother from Moultrie, GA, who knows all too well the abuses suffered by domestic and foreign workers as a result of the H-2A agricultural guest worker program. A lifelong Georgia resident, Kathern was fired in September 2010, after just three days of work, by an employer who primarily hires H-2A guest workers. She explains: ››

"To me, it's just like the farmers can take advantage of the [guest workers], where they can't take advantage of the Americans--you know what I'm saying? Because we know the laws when the [guest workers] don't...It's not fair on their part that they come out here and work like they do and they [abuse] them like that. And it's not fair on our part, the way they treated us."

The H-2A program allows agricultural employers to hire foreign guest workers on temporary work visas to fill seasonal jobs. In order to participate, employers must demonstrate a shortage of U.S. workers and that their wages and working conditions meet certain minimum requirements. Yet, as the stories in this report illustrate, the H-2A program is fundamentally flawed and characterized by rampant abuse of both domestic and foreign workers.

SUMMARY OF FINDINGS

No Way to Treat a Guest: Why the H-2A Agricultural Visa Program Fails U.S. and Foreign Workers, a product of interviews with current and former H-2A workers, information from media exposés, lawsuits against H-2A employers, and the experiences of workers and advocates over the past 30 years, demonstrates that:

➜ Guest worker programs drive down wages and working conditions of U.S. workers and deprive foreign workers of economic bargaining power and the opportunity to gain political representation.

➜ The H-2A program's protections for U.S. workers and against exploitation of guest workers by employers are modest; in fact, they are similar to those in the Bracero program (1942-1964), which was terminated due to its notorious labor abuses.

➜ Once an employer decides to enter the H-2A program, the law creates incentives to prefer guest workers over U.S. workers. For example, the employer must pay Social Security and unemployment taxes on U.S. workers' wages but is exempt from paying these taxes on guest workers' wages.

➜ Violations of the rights of U.S. workers and guest workers by H-2A program employers are rampant and systemic. The U.S. Department of Labor (DOL), which has primary responsibility for administering the H-2A program, frequently approves illegal job terms in the H-2A workers' contracts. U.S. workers who apply for H-2A jobs are rejected or forced to quit. Employees at H-2A employers routinely experience wage theft and other unlawful practices.

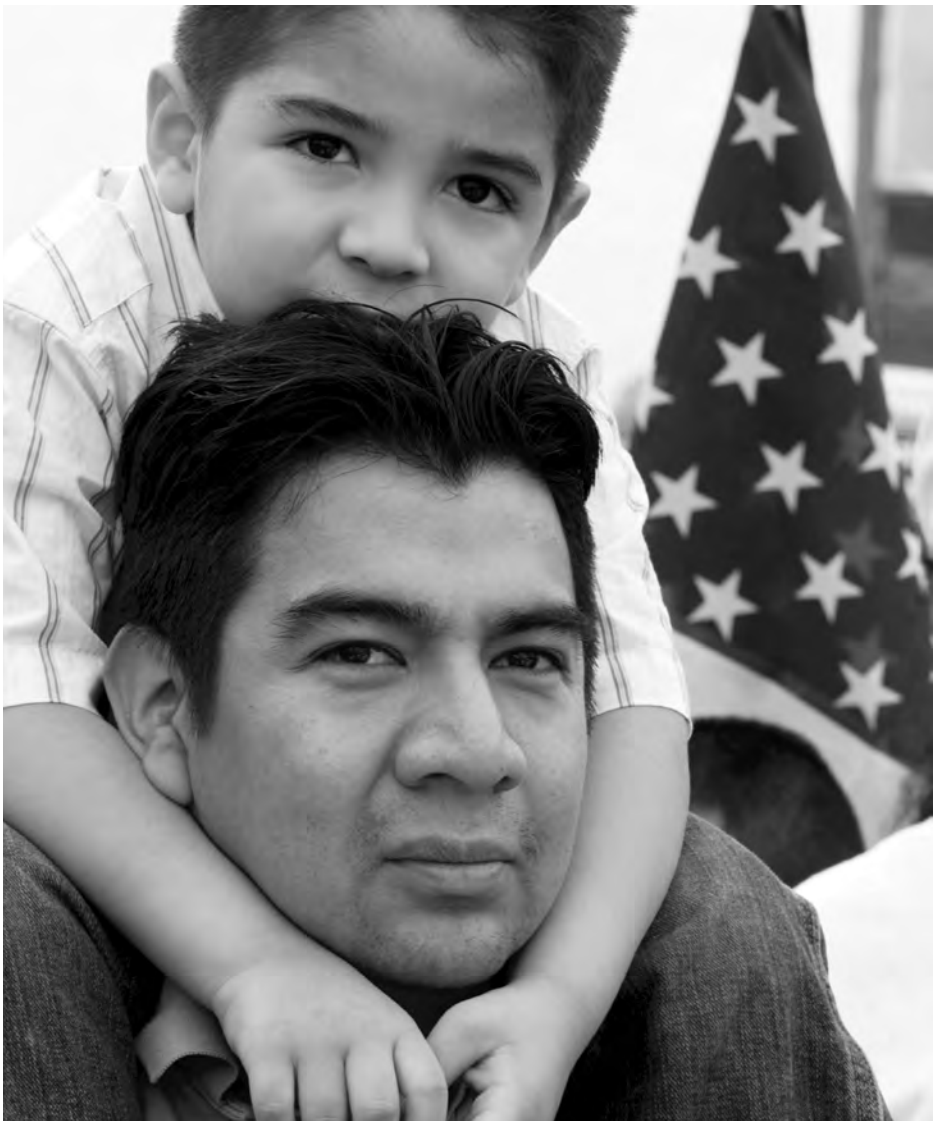
➜ Abuses in the recruitment of foreign workers are endemic. H-2A employers and their recruiting agents in Mexico and other poor countries exploit the vulnerability of foreign citizens. Many guest workers must pay recruiters for H-2A jobs and enter the U.S. indebted, desperate to work, and fearful that the loss of their job will lead to financial ruin. The H-2A recruitment system has led to numerous documented cases of debt-peonage, human trafficking, and forced labor.

➜ More than one-half of the farmworkers on U.S. farms and ranches lack authorized

immigration status. The presence of so many undocumented workers deprives all farmworkers of bargaining power and political influence. Deporting all or most undocumented farmworkers would be costly and impractical, inflict harm on hundreds of thousands of hard-working farmworkers and their families, many of whom are United States citizens, and deprive agriculture of the workforce it needs to produce our fruits, vegetables and livestock.

RECOMMENDATIONS

This report culminates in a series of recommendations to reduce the violations of the modest labor protections in the H-2A agricultural guest worker program, fix our broken immigration system, and empower farmworkers to improve their wages and working conditions, occupational safety, health and access to justice. Foreign guest workers should not be treated as disposable human machines, nor should they be used to deprive U.S. workers of available jobs or to undermine wages and working conditions of U.S. workers. H-2A guest workers should be treated with dignity. Ultimately, the people who put food on our tables should have the opportunity to become full-fledged immigrants on a path to citizenship. Key recommendations include:



➜ Cracking Down on Abusive Employers: DOL should increase oversight and enforcement in the H-2A program. DOL must address illegal job terms and program violations more effectively, including rejecting terms aimed at discouraging U.S. workers, obtaining complete remedies for victimized workers, imposing fines on employers that deter illegal conduct, and barring employers from the program when serious violations occur.

➜ Ending Systemic Abuses During Recruitment: The Administration should exercise jurisdiction over H-2A recruitment abroad and hold employers accountable for the actions of their recruiters. The root of much guest worker exploitation lies in the foreign country when the workers are recruited, yet our government does almost nothing to protect workers during the recruitment process**.** Recruitment practices, including discrimination, that would be illegal if they occurred in the United States should not be tolerated just because they occur abroad. DOL should shine light on the dark world of labor recruitment, examine the international recruitment mechanisms that result in foreign workers' indebtedness, and hold employers accountable when recruiters and contractors acting on their behalf violate the law.

➜ Collaboration with Local Stakeholders: DOL should work closely with farm labor unions and other advocacy organizations to educate and empower workers to prevent and remedy abuses by employers.

➜ Wages and Labor Protections that Protect U.S. and Foreign Workers: H-2A program wage rates and labor protections should be strengthened to improve wages and working conditions to attract and retain U.S. farmworkers and stop abuse of guest workers.

The financial incentives for H-2A employers to prefer guest workers over U.S. workers, including exemptions from Social Security and unemployment taxes, should be removed. Proposals in Congress to reduce H-2A wage rates and labor protections or to create entirely new guest worker programs with little or no protections should be rejected.

➜ Freedom to Change Employers and Become Full Members of Society: Congress should revise the status of H-2A workers to reduce their vulnerability. H-2A workers should be allowed the freedom to change employers and should be given the opportunity to earn immigration status. Guest workers' forced tie to a single employer leaves them reluctant to challenge illegal or unfair employer practices. Similarly, their inability to obtain a permanent immigration status, no matter how many seasons they return to the U.S. on an H-2A visa, deprives them of the opportunity to better their conditions. Congress should apply the concept of a free labor market and our history as a nation of immigrants to the H-2A program.

➜ **A Compromise to Ensure a Stable, Decently Treated Workforce: Congress should pass the Agricultural Jobs, Opportunities, Benefits, and Security Act (AgJOBS).** AgJOBS is a bipartisan compromise between growers and farmworker groups that would allow currently unauthorized farmworkers to earn legal immigration status by continuing to work in U.S. agriculture, make balanced changes to the H-2A program, and provide U.S. growers with a stable, productive, and decently-treated farm labor force.

PART 01

AN INHERENTLY FLAWED SYSTEM

Each year, thousands of workers from countries around the world leave their homes to spend a few months harvesting crops on American soil. Participants in the H-2A temporary foreign agricultural worker program, these "guests" have often paid significant sums to recruiters and government agencies to obtain jobs, visas, and transportation. They expect to work hard at jobs for which American workers are unavailable. They expect to be provided with livable housing and safe working conditions. And they expect to earn enough to return home and feed themselves and their families. ››

Yet when they arrive in the United States, many H-2A workers find a much harsher reality. Social and geographic isolation, lower than advertised wages, less work than promised, dirty and dilapidated housing, dangerous working conditions, and even forced labor or slavery typify the experience of many guest workers. Some have been brought to replace domestic workers who still want the work and are entitled to such jobs. But, allowed to work only for a single employer who can send them home at will, most H-2A workers are too fearful of retaliation to speak out about these harsh (and frequently illegal) working conditions.

This report, *No Way to Treat a Guest*, documents the inherent flaws of the H-2A program and the abuses that result. The H-2A program allows agricultural employers to hire foreign workers on temporary work visas to fill seasonal jobs when they can demonstrate a shortage of U.S. workers and that their wages and working conditions meet certain minimum requirements. Short summaries of the history, legal framework, and current location of H-2A jobs provide the background necessary to understand the program. The bulk of this report explores the various ways in which the H-2A program harms both U.S. and foreign farmworkers, using examples of abuse from recent media and lawsuits. Real-life stories, summarized from interviews conducted by Farmworker Justice with both domestic workers and H-2A workers, illustrate the effects of these abuses on workers.[1]

MORE THAN
50%
of the farmworkers on U.S. farms and ranches lack authorized immigration status. Deporting them all would decimate American agriculture. In fixing our broken immigration system, skilled, law-abiding farmworkers should be given the opportunity to earn legal immigration status and continue their work in agriculture.

These stories are a wake-up call to policymakers and others who are searching for solutions to ensure an adequate supply of farm labor and continued production of abundant, safe, healthy food on the nation's farms and ranches. Currently, the majority—50% to as much as 70%—of the nation's 2 to 2.5 million farmworkers lack authorized immigration status. Many of the rest are U.S. citizens or lawful permanent resident immigrants. Though H-2A guest workers account for only a small percentage of farmworkers in the U.S, their treatment sets the bar low for the entire agricultural industry, and their availability depresses wages and working conditions for U.S. workers.

[1] Workers' last names and the names of their employers have been omitted to protect them from possible retaliation. Some workers have also requested that false names be used to further protect their anonymity.

"The H-2A guest worker program, like the infamous bracero program, is not a practical or humane solution to ensuring a productive and available farm labor force. The H-2A system virtually guarantees foreign workers will be exploited during recruitment abroad and in the fields of this country, and that U.S. farm workers will lose job opportunities and suffer depressed wages. The impact of mandatory E-Verify would be millions of new guest workers in agriculture on top of the millions of undocumented workers already here. The H-2A law and its enforcement should be strengthened to reduce abuses. But the only equitable and practical answer is for Congress to allow farm workers who are currently undocumented to earn legal status by continuing to work in agriculture."

—Arturo Rodriguez, president, United Farm Workers of America

In the ongoing contentious debate about immigration policy in the U.S., some portray guest worker programs as necessary to provide a legal and stable labor force in industries, particularly agriculture, where the work is seen as undesirable to most Americans. Yet the abuses endemic to the H-2A program suggest that guest worker programs cannot and should not be the model for America's farms. The creation of a large temporary workforce with few rights, no freedom to change employers, and no path to permanent status not only harms both U.S. and domestic workers, but also runs contrary to our nation's commitment to economic and political freedom. Ours is a nation of immigrants, not of guest workers.

Instead, Congress should give undocumented farmworkers an opportunity to earn legal immigration status. If allowed to continue at all, the H-2A program should remain a supplementary source of labor in times of bona fide local labor shortages. Some policymakers and employers call for radically de-regulating the H-2A program by slashing wage rates, eliminating housing requirements, weakening labor protections and reducing government oversight. But this report makes clear that, on the contrary, the H-2A program's abuses need to be addressed through increased labor protections, oversight and enforcement.

A HISTORY OF AGRICULTURAL GUEST WORKER PROGRAMS

The search for a cheap, seasonal, farm labor force to produce America's food while maximizing the profits of U.S. agribusiness has nearly always begun abroad. From the beginning of the American colonies, the importation and oppression of **slave labor** allowed growers of cash crops—including tobacco, sugar, and cotton—to minimize labor costs while maintaining a stable, highly productive workforce. Similar concerns led 19th century growers establishing new farms on the frontier to use low-paid seasonal agricultural workers from **China**, the **Philippines**, and **Japan**.[2] The economic desperation and tenuous immigration status of foreign farmworkers, along with racial discrimination, deprived them of bargaining power with their employers and of political power to affect the policies of the U.S. government.

The **first bracero (literally, "strong-arm")** guest worker program was created in 1917 at the behest of growers, who argued that World War I had created a labor shortage crisis in agriculture. The program allowed more than 70,000 Mexican workers to enter the US temporarily for work in cotton and sugar beets.[3] Though it ended in 1921, many workers stayed after their term of employment, some because employers refused to pay for their transportation home. The Great Depression led to a crackdown on immigrant workers, who were seen as a threat to American workers, and many of the former braceros were repatriated to Mexico.[4]

The onset of World War II led to renewed grower complaints of a labor shortage, despite pronouncements by the Secretary of Labor that there were 1.6 million surplus domestic farmworkers.[5] A new **bracero program** was established in 1942 through a bilateral agreement between the governments of the U.S. and Mexico. Over the next 22 years, an estimated two million Mexican men entered the U.S. to work as braceros.[6]

The bracero program became notorious for the rampant abuse of foreign workers, despite significant legal protections for both domestic and foreign workers. For example, workers were guaranteed sanitary housing, access to medical care, round-trip transportation, and the prevailing wage for their task and crop. They were not to be used as strikebreakers.[7] In practice, however, few braceros were willing to speak up to enforce their rights, because they were tied to a single employer, and renewal of their contract depended on the employer's good will.[8] Many were cheated out of wages. Housing conditions were deplorable. Workers were transported in unsafe vehicles and were denied access to healthcare. The

[2] Phillip Martin, Importing Poverty: Immigration and the Changing Face of Rural America (New Haven: Yale University Press, 2009), 20-23.
[3] Martin, 23-24.
[4] Garry G. Geffert, "H-2A Guestworker Program: A Legacy of Importing Agricultural Labor" in The Human Cost of Food: Farmworkers' Lives, Labor, and Advocacy, ed. Charles D. Thompson and Melinda F. Wiggins (Austin: University of Texas Press, 2002), 115.
[5] Deborah Cohen, Braceros: Migrant Citizens and Transnational Subjects in the Postwar United States and Mexico (Chapel Hill, NC: University of North Carolina Press, 2011), 22.
[6] Martin, 28.
[7] Cohen, 22.
[8] Ernesto Galarza, Merchants of Labor: The Mexican Bracero Story (San Jose, CA: The Rosicrucian Press, 1964), 237.

A FARMWORKER'S STORY

David (Salinas, CA)

David, now 80, looks back fondly at the relationships he made as a bracero in the 1950s. "We thought of each other as brothers. We all got along very well," David said of his fellow workers.

Yet his description of his bracero experience makes clear the powerlessness and vulnerability of the men who came north to pick American crops. In large part, this was due to the abundant supply of willing young Mexican men desperate for a job. David fit this bill. A native of Zacatecas, Mexico, he traveled three days to the contracting office in Chihuahua, where he found 20,000 people angling for work. He slept in a ditch near the train station for one month, only to be sent home when they announced that the visas had all been distributed.

But David did not give up, and he finally got a visa and a job to drive tractors in Texas. Once in the U.S., the braceros were fumigated and sprayed with DDT before being shipped off to their workplaces. "We were shoved into the trucks, just like they do with animals," said David.

Like the H-2A program of today, David was tied to a single employer. When the contract was over, he had to return to Mexico. David travelled back and forth a number of times, each time obtaining a new contract, sometimes lasting just 40 days. He worked in Texas, Arkansas, and California. He picked cotton and was a tractor driver in corn, sorghum and other crops.

Living situations varied depending on the employer. During one contract, David lived in crowded tin barracks filled with 40 workers or more. Workers slept in bunk beds in the same room with the stoves and kitchen facilities.

In Texas, David worked 12-hour days and was paid 50 cents an hour. But the desperation for work meant that no one demanded to see a contract or better pay. "No one asked [about wages] because they needed the work," said David.

David returned home after his last bracero contract in 1958. He returned to the U.S. in 1960 on a permanent work visa. David settled down in Salinas, studied welding, and started a family. He now has six children and nine grandchildren.

In the early 2000s, David and other former braceros discovered that the Mexican government had never repaid them the wages withheld in "savings accounts," legally guaranteed to them upon return to Mexico. Though the government agreed in 2008 to pay up to $3,500 to those who could prove they had been braceros, David no longer had any documentation. "I fought and tried to get it," said David. But he ultimately failed to obtain even this token of acknowledgement for the years spent as a low-paid temporary worker in America's fields.

availability of braceros undercut the wages of U.S. workers.[9] In many locations where large numbers of braceros filled jobs, their lack of economic bargaining power meant that they could not seek wage increases; thus, the "prevailing wage" in such places stagnated and became unattractive to U.S. workers. In short, conditions were in many ways similar to today's H-2A workers, but the large scale of the bracero program captured the attention of the labor and civil rights movements and eventually the public.

Congress finally shut down the bracero program in 1964, but left in place another avenue to "import" foreign workers, the **H-2 program**.[10] This program began during World War II and became codified in the immigration law in 1952. For many years, it was used mostly by East Coast apple growers and by Florida sugar cane growers to hire workers from the Caribbean. The H-2 program's provisions were similar to those in the bracero program, but it was not accompanied by government-to-government agreements. Abuses in the sugar cane industry were rampant, generating significant publicity and lawsuits.[11]

The Immigration Reform and Control Act (IRCA) of 1986 separated the H-2 program into two temporary worker programs: **H-2A for agricultural workers** and **H-2B for non-agricultural workers**. Both programs continue to be marked by worker abuses to this day, even as they expand into new industries and sectors. The H-2A program, in

Decades of experience have revealed that guest worker programs DRIVE DOWN WAGES and working conditions of U.S. workers, and deprive foreign workers of economic bargaining power and the opportunity to gain political representation.

[9] "Bittersweet Harvest: The Bracero Program, 1942-1964, Broken Promises," National Museum of American History, online at http://americanhistory.si.edu/exhibitions/small_exhibition.cfm?key=1267&exkey=770&pagekey=780.

[10] The law that governs the H-2A program (8 U.S.C. §1188) uses the term "import" when referring to the human beings who are brought to work in the United States on temporary work visas. While the term "import" is associated with commodities, the U.S. Constitution used that term to refer euphemistically to chattel slavery.

[11] For example, Stephanie Black's film "H-2 Worker" (1990), won awards at the Sundance film festival for its exposé of worker exploitation in the Florida cane industry.

the tradition of the agricultural guest worker initiatives that came before it, provides growers with an endless supply of physically strong, economically vulnerable, politically powerless workers from poor countries, who will work to the limits of human endurance in dangerous conditions for low wages.

REGULATORY FRAMEWORK: LESSONS FROM DECADES OF ABUSES

Recognizing that guest worker programs leave workers—both domestic and foreign—open to exploitation and abuse, policymakers since World War II have instituted procedures and labor protections for workers. The current H-2A regulations were codified by the Reagan Administration in 1987. Yet over the years, employer groups have lobbied hard to "streamline" the program. In the final days of the second term of the George W. Bush Administration, the Department of Labor (DOL) substantially revised the H-2A program regulations, removing many labor protections, slashing wage rates and reducing government oversight. In 2010, the Obama Administration reversed these changes and restored most of these provisions.

The law and regulations governing the H-2A program require that in order to accept an employer into the program, the Department of Labor must certify that (1) there are not enough U.S. workers "able, willing, qualified, and available" to perform work at the place and time needed; and (2) the wages and working conditions of U.S. workers will not be "adversely affected" by the importation of guest workers. In theory, the law means that employers must recruit and hire qualified

A FARMWORKER'S STORY

Gilberto, Francisco, Gabriel, and Ramon (Yuma County, AZ)

These four men, all legal permanent residents of the United States, live in the border region of San Luis, Arizona/Sonora. With more than 50 years of farm work between them, they are hardly the inexperienced Americans that some growers claim are the only alternative to H-2A.

In June, 2009, all four obtained jobs harvesting melons for a farm labor contractor. Every day a bus would pick them up at 1:00 am for the two and a half hour trip. Sometimes they'd have to wait another two hours to enter the fields. Though the work ended around 3:00 pm, often the bus did not arrive for another two hours. The men said they were not paid for the time spent on the bus, nor for the time spent waiting to enter the fields or board the bus.

One afternoon a few weeks into the season, the bus did not arrive to take them home. They heard that their bus had been diverted to pick up H-2A workers. The crew was forced to walk miles in the hot desert to find the nearest phone. Finally, at around midnight, the labor contractor arrived to drive them home.

Sure enough, when reporting to work the next day, the crew was told that they had been fired and replaced by H-2A workers. "They told us there was no work for San Luis people," said Gabriel. But why choose H-2A workers over domestic residents? Gabriel explained that while the domestic workers would finish working in the early afternoon, the employer could make the H-2A workers work longer hours, through the hottest and most dangerous part of the day.

Not only had they been abandoned in the fields, but they were now jobless. Francisco expressed his frustration: "I felt really bad because at that time there was not a lot of work available. I needed work…the contractor should be punished for what he did to us so it will not happen to other workers."

Yet the employer was not punished. Though over 80 complaints of unpaid wages and violations of employment terms for this employer were submitted to DOL during summer 2009, DOL has continued to allow the contractor to employ more H-2A workers, approving its request for nearly 700 workers in the fall of 2009 and more than 1,160 workers in summer and fall 2010.

U.S. workers before hiring guest workers. In addition, the employer must offer and provide wages and other job terms high enough to attract and retain U.S. workers.

The labor *certification* process required by the H-2A law, in theory, demands more government oversight and employer accountability in the H-2A application process than the *attestation* process in place for the H-1B program for higher-skilled jobs, for example.[12] In practice, however, the additional scrutiny of employers and their job terms that should happen under labor certification rarely occurs. In Fiscal Year (FY) 2009, DOL certified 94% of the worker positions requested by growers[13] and routinely approved applications that contained illegal job terms.

Below is a list of the key H-2A program rules that, in theory, are supposed to protect workers. Unfortunately, in practice, many are not adequately enforced, and others have flaws leading to abuses:

Wages offered by H-2A growers must be the highest of: (a) the local labor market's "prevailing wage" for a particular crop as determined by DOL and state agencies; (b) the state or federal minimum wage; or (c) the "adverse effect wage rate" (AEWR), an hourly wage determined by DOL for each state based on the USDA's annual Farm Labor Survey of average regional hourly wages for non-supervisory crop and livestock workers. In most cases, the AEWR is the highest rate.

- ➜ *In theory,* this protects U.S. farmworkers by ensuring that growers cannot undercut their wages, and protects vulnerable foreign workers who would feel compelled to accept a substandard wage.
- ➜ *In practice*, the wage levels are based on surveys of wage rates that are depressed because they include earnings of undocumented workers, not just U.S. workers. The wage rates are also outdated because they are based on the previous year's surveys. In addition, many growers violate the wage requirements.

Recruitment of U.S. workers must occur through the interstate employment service system and through private-market efforts to find and hire farmworkers. Growers must post job orders with the state workforce agency (SWA) between 60 and 75 days before the date of need. Job qualifications and requirements must be reasonable and must not discriminate against U.S. workers.

- ➜ *In theory,* this protects U.S. workers by ensuring that growers attempt to hire U.S. workers first.
- ➜ *In practice,* growers' recruitment of U.S. workers often is inadequate and many employers impose inappropriate job requirements to "scare away" domestic workers.

"Fifty Percent Rule" requires employers to hire any qualified U.S. worker who applies for work until one-half of the season has ended.

- ➜ *In theory,* this protects U.S. workers' jobs by preventing growers from choosing an H-2A guest worker over a qualified U.S. worker and by mandating that farms hiring additional workers for peak harvesting time must continue to accept domestic applicants.
- ➜ *In practice*, many U.S. workers are not offered available jobs at H-2A employers or are quickly forced to quit.

"Three-fourths work guarantee" requires that employers offer recruited workers at least 3/4 of the number of working hours in the work period outlined in the contract (except when impossible due to "Acts of God") or pay wages for any shortfall in work opportunities.

- ➜ *In theory,* this protects U.S. and foreign workers by discouraging over-recruitment and guaranteeing income for migrant workers who have traveled long distances to work.
- ➜ *In practice*, many workers are not paid all the wages they are promised under the three-fourths guarantee.

Housing that meets DOL standards for temporary labor camps must be provided at no cost to the workers who do not live in the local area. Employers must also provide three meals a day (at a cost to the worker) or, alternatively, convenient cooking and kitchen facilities for workers to make their own meals.

- ➜ *In theory*, this serves as an important safeguard against homelessness,

"The treatment of temporary guest workers is of great importance to the civil rights community because guest workers face severe social and economic discrimination as well as a shortage of labor protections. Guest workers have long been the most vulnerable and poorly treated workers among us. Ending the abuse of guest workers in America's fields and giving them a chance to earn legal status is critically important and will also help ensure the fair treatment of America's farmworkers."

—Wade Henderson, president and CEO of The Leadership Conference on Civil and Human Rights

[12] The attestation process allows employers to promise compliance with the H-1B requirements. DOL takes this promise at face value during the application process, with the assumption that it will later audit employers for compliance. By contrast, certification in the H-2A program means that DOL must review employment contracts and verify the employers' compliance before approving H-2A applications.

[13] "The Foreign Labor Certification Report: 2009 Data, Trends, and Highlights Across Programs and States," U.S. Department of Labor, Employment and Training Administration, Office of Foreign Labor Certification (2010), online at: http://www.foreignlaborcert.doleta.gov/pdf/2009_Annual_Report.pdf

Growers complain that government oversight makes the H-2A program too difficult and costly for them to use. But they bring scrutiny upon themselves by routinely failing to comply with rules designed to protect workers. Growers' H-2A applications far too often contain ILLEGAL OR QUESTIONABLE job terms that would be easy to correct before submission to DOL. Troubling job terms that H-2A growers have frequently sought to impose include, for example, past experience or employer references for entry-level field work (aimed at discouraging U.S. workers from applying); inflated "productivity" requirements (to provide excuses for firing workers); and demands that workers agree to give up their rights to pursue legal remedies in court.

acknowledging that both foreign and U.S. workers would have trouble finding temporary accommodations in rural areas with limited housing.

➜ *In practice*, housing is often appallingly substandard, oversight is lax, and farmworker advocates have been prevented from meeting workers in their homes, which growers claim is their private property. In some locations, employers claim that workers are "local" and can commute to their own homes each day, even when they have overly long commutes.

Transportation costs incurred by the worker to arrive at the place of employment must be reimbursed by the employer after workers complete half the season. Employers must pay the cost of returning home for those who complete the full season.

➜ *In theory,* this facilitates recruitment of migrant domestic workers from outside of an employer's immediate location,reduces the debts incurred by foreign workers on their way to the U.S., and ensures that foreign workers can afford to return home.

➜ *In practice*, workers are routinely fired or coerced to sign voluntary quit forms before the end of the contract to subvert this requirement.

Workers compensation must be provided for occupational-related injuries.

➜ *In theory,* this protects both U.S. and foreign workers by ensuring medical care for injured workers and that the cost of health care for work-related injuries will not be borne by the worker.

➜ *In practice*, employers send injured foreign workers home after being injured, making it very difficult to access workers' compensation.

The modest legal protections put into place by DOL, many of which also existed under the bracero program, have not changed the inherent and systemic problems with the H-2A program. DOL oversight is lax, and most applications are approved, even for growers publicly known to ignore the law. The H-2A program continues to displace U.S. workers, and leads to rampant abuses, including wage theft, discrimination, and even debt-peonage. These abuses, with personal examples, are discussed in further detail in the next section.

WHY DO EMPLOYERS USE GUEST WORKERS?

Employers have a long history of advocating for access to temporary foreign agricultural workers. In most cases, once growers enroll in the program, they never return to hiring domestic labor. But why do growers like H-2A workers so much? H-2A workers are an extraordinarily productive labor force employed at relatively low cost, for the following reasons:

1. Foreign workers are economically desperate. Most H-2A workers come from home countries plagued by economic crises and poverty. They are thus willing to accept wages and working conditions that U.S. workers could never afford to accept due to the high cost of living in the U.S.

2. Temporary workers lack full rights. H-2A workers have limited, non-immigrant status, and cannot stay in the U.S. beyond their work term with a particular employer. Workers are tied to the employer who brought them to the country and can only work for that employer. Most are hesitant to report abuses because employers can freely fire (and deport) "troublemakers," or decide not to re-hire them again. H-2A workers are excluded from the main employment law for farmworkers. Additionally, foreign workers generally lack knowledge of U.S. laws and employment norms and may not know when an employer is breaking the law.

3. Employers can "hand-pick" a certain demographic of workers. Our government has not sought to apply U.S. anti-discrimination laws to H-2A employers' recruitment of foreign workers that occurs abroad. Growers thus can pick their ideal workforce—mostly young men removed from daily family obligations who will work long hours for low pay.

4. H-2A employers are exempt from paying Social Security and unemployment taxes on guest workers' wages. Since H-2A employers must pay federal social security and unemployment taxes if they hire U.S. workers, they can save substantial money by hiring guest workers.

5. Employers can avoid the wage demands of the labor market. Once an employer receives approval of its job offer from the Department of Labor, it may reject qualified U.S. workers who seek a higher wage or an extra benefit, such as paid sick days, and fill the slot with a guest worker willing to accept the approved terms. Similarly, a demand for higher wage rates by a labor union can be easily rejected. Thus, the minimum wage rates and other job protections required by the H-2A program usually become the maximum that a worker can hope to attain and that an employer need offer.

"Everyone is hurt when growers abuse the guestworker program…Not only do the guestworkers suffer, but U.S. workers are cut out of the labor market, and the growers gain an unfair advantage over their competitors."

—Mel Fowler-Green, Southern Migrant Legal Services, Texas RioGrande Legal Aid, quoted in Southern Migrant Legal Services, Press Release: Workers Sue East Tennessee Tomato Farm For Discrimination and Retaliation (Apr. 12, 2011)

It is clear that a vulnerable foreign labor force allows employers to squeeze out maximum productivity at minimal labor cost. But an important question remains: Why can agricultural employers access unlimited numbers of foreign guest workers while employers in other industries must compete for workers in the labor market?

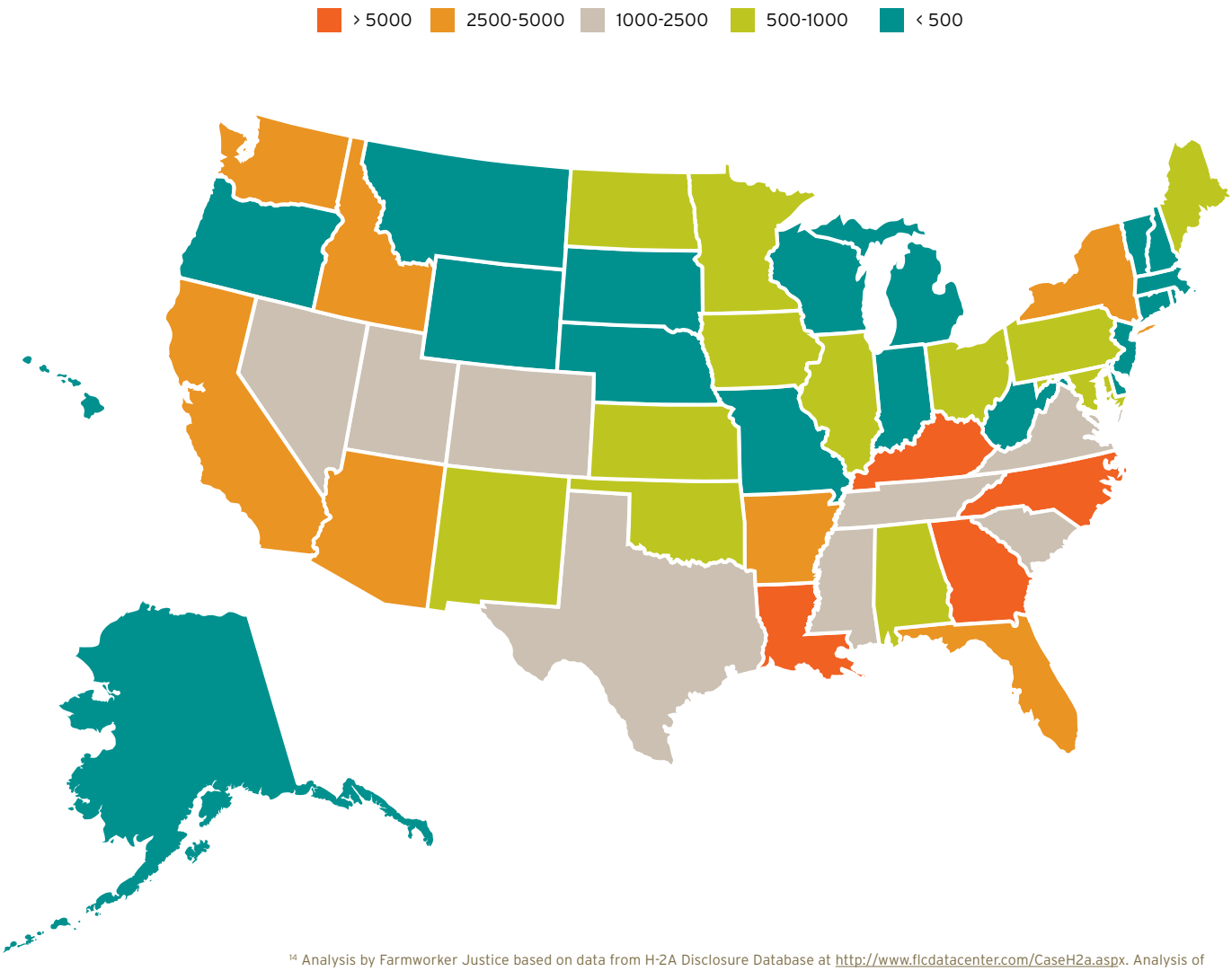
WHO USES H-2A? AN ANALYSIS OF DOL DATA

The H-2A program historically has been concentrated in particular geographic areas and crops, but it has spread to new states and crops in the last decade. Every state had H-2A

workers in fiscal year (FY) 2010 (see Figure 1). H-2A workers make up a significant section of the workforce in North Carolina tobacco, New York apples, Louisiana sugarcane, and Florida citrus. They pick strawberries in California, harvest onions in Georgia, and cut lettuce in Arizona. Some H-2A workers even labor in the wheat fields of Texas and the corn fields of Minnesota. In short, H-2A workers are involved in nearly every segment of the agricultural industry in the United States. Still, at approximately 80,000 certified positions, the H-2A program represents only a small percentage of the nation's 2 to 2.5 million agricultural workers.

North Carolina has been the state most heavily invested in the H-2A program during the last 15 years, with 9,387 positions certified in FY 2010, comprising nearly 12% of the national H-2A workforce. Other states with more than four thousand H-2A positions in FY 2010 included Louisiana, Georgia, Florida, Kentucky, and Arizona (see Figure 2).

Figure 1: Number of H-2A Workers Certified by State (FY 2010)[14]



[14] Analysis by Farmworker Justice based on data from H-2A Disclosure Database at http://www.flcdatacenter.com/CaseH2a.aspx. Analysis of the H-2A disclosure data file requires careful assessment, as the database contains some duplicate records for the same application. This occurs when a master application is submitted by a grower association filing as joint employer with its members, and both the master application and employers' requests are entered into the data file separately using the same case number. Therefore, to avoid double counting, we used only the record with the largest (summary) number from the column, "Number of Workers Requested" for records with the same case number. Source: Personal email from Charnessa Hanshaw, Program Management Analyst, Office of Foreign Labor Certification.

The expansion of the H-2A program has continued during an economic downturn and high unemployment (see Figure 3). In FY 2005, the DOL's Office of Foreign Labor Certification (OFLC) approved 48,336 H-2A positions. In FY 2009, OFLC approved 86,014, an increase of nearly 80% in just four years.[16]

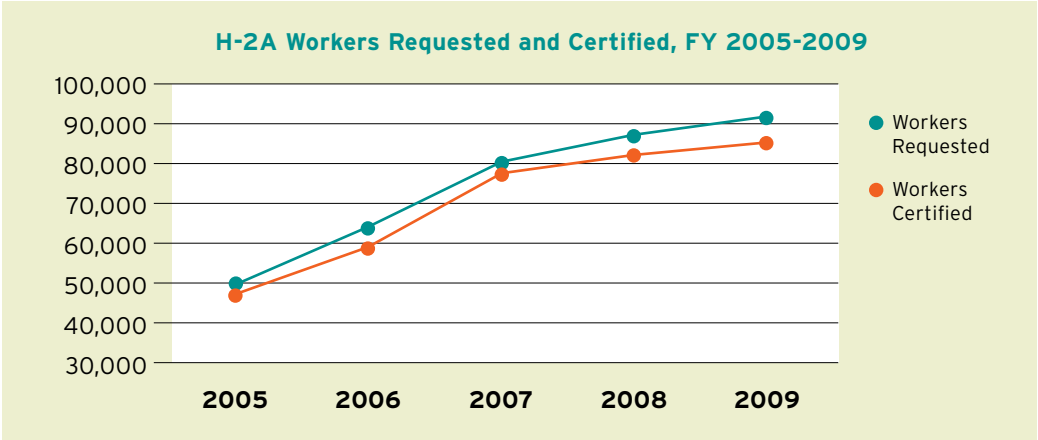
There are U.S. workers who want agricultural jobs, but the H-2A program often allows employers to avoid hiring them. All the top six H-2A states, with the exception of Louisiana, had a 2010 average unemployment rate higher than the U.S. average of 9.6%. In North Carolina, for example, the 2010 average unemployment rate was 10.6%.[17]

Yet, because the H-2A program lacks an adequate test of the labor market, employers who could have recruited and hired U.S. workers were permitted by DOL to hire foreign guest workers instead.

Figure 2: Top 15 H-2A States (FY 2010)[15]

STATE	Workers Certified	% Certified
North Carolina	9,387	95.0%
Louisiana	6,981	93.3%
Georgia	5,561	69.8%
Kentucky	5,455	98.7%
Florida	4,510	92.7%
Arizona	4,309	86.0%
New York	3,858	94.1%
Washington	3,014	94.8%
Arkansas	3,006	86.9%
California	2,629	94.5%
Idaho	2,547	89.2%
Virginia	2,455	97.6%
Texas	2,319	75.3%
South Carolina	2,247	91.5%
Tennessee	2,183	96.5%

Figure 3: Increase in H-2A Requests and Certifications (FY 2005-2009) [18]



The H-2A program's protections for U.S. workers' job preference and against exploitation of guest workers by employers are modest; in fact, they are similar to those in the bracero program (1942-1964), which was terminated due to its NOTORIOUS LABOR ABUSES.

[15] "% Certified" is N*100, where N = (the number of workers certified by DOL/number of workers requested by employers).

[16] U.S. Department of Labor, Office of Foreign Labor Certification, Foreign Labor Certification Performance Reports, FY 2006 and FY 2009. Online at: http://www.foreignlaborcert.doleta.gov/

[17] "News Release: Regional and State Unemployment – 2010 Annual Averages," U.S. Department of Labor, Bureau of Labor Statistics (25 February 2011), online at http://www.bls.gov/news.release/pdf/srgune.pdf.

[18] Data from Foreign Labor Certification Performance Reports, FY 2006, FY 2007, FY 2009. Online at: http://www.foreignlaborcert.doleta.gov/

PART 02

THE FACES OF ABUSE

REPLACEMENT OF U.S. WORKERS

Though the regulations governing the H-2A program require employers to give job preference to qualified U.S. workers, in practice the H-2A program puts U.S. workers out of work. Growers can often be heard chanting the chorus that U.S. workers "just don't work as hard" or are "not as loyal" as foreign workers. But rather than prove the inherent laziness of all Americans, these claims simply reveal the disproportionate power that employers hold over a foreign labor force with few rights. >>

U.S. workers have alternatives and can change jobs if they are unhappy with their workplace—a freedom not allowed H-2A workers. Additionally, H-2A growers can save money by hiring guest workers; they do not have to pay Social Security and unemployment taxes on the wages paid to H-2A workers, but must do so for U.S. workers. Growers have thus gone to great lengths to unlawfully exclude qualified U.S. workers in favor of guest workers.

The gimmicks used to deny employment to qualified U.S. workers are plentiful. Real-life examples include interviews scheduled at inconvenient times or locations; hiring that occurs too early in the season, leading workers to arrive for work when there is none; limiting domestic workers' hours in order to discourage them from continuing to work; employment contracts demanding that workers give up their right to sue a grower for lost wages; and unrealistic work demands and productivity quotas. Employers know that they can—and often do—chase away willing U.S. workers with such unfair terms.

Other times there is no pretense: Domestic farmworkers are simply turned away or fired in favor of guest workers. For example, in 2006, after harvesting citrus fruit for an Arizona labor contractor for three previous seasons, a crew of domestic employees was told by their foreman that the company would no longer hire domestic labor, but would instead use H-2A. Sure enough, when they arrived at the *corralon* (pick-up spot) the buses previously reserved for them were now filled with H-2A workers "from all over Mexico." Fernando, a U.S. citizen and displaced worker, asserted, "I'm not against H-2A workers, but they should hire us, the experienced workers, first." A complaint alleging discrimination against the U.S. workers is currently pending in federal district court. [19]

"I think it was more or less, they didn't want the Americans out there."

—Kathern (Colquitt County, GA)

A FARMWORKER'S STORY

Mary Jo and Kathern (Colquitt County, GA)

Mary Jo and Kathern are longtime residents of Colquitt County, Georgia. Both have worked in agriculture for much of their lives, and Mary Jo grew up with her grandmother, who worked as the live-in housekeeper for a farm family. She learned to pick vegetables at the age of fourteen. More recently, she was a crew leader on some other farms in the area. "I love to work," said Mary Jo.

In September 2010, both Mary Jo and Kathern were out of work. At the unemployment office they saw an H-2A job-order for zucchini picking advertising $9.11 per hour for 40 hours a week of work. The work was at the same farm on which Mary Jo grew up, which was now owned by the sons of her grandmother's employer. They both signed up.

But when Mary Jo, Kathern, and their coworkers arrived at the farm at 7:00 am, they found that to get the advertised wage, workers would have to meet a production standard of nine buckets an hour. Furthermore, the U.S. workers who arrived were forced to wait until 9:00 am before being allowed into the fields, even though a number of Mexican H-2A workers were already working.

Once in the fields, Kathern and Mary Jo had a hard time making the standard. After filling each bucket, they spent valuable time walking to the tractor—parked across the field—to unload. Meanwhile, the tractor serving the H-2A workers was close by. "They was trying to get us to quit," said Kathern, "[but] I said, 'we need to prove to 'em that we at least want to work.'"

At about 10:30 am, Mary Jo, Kathern, and their co-workers were told their work for the day was done. "They sent all the blacks home," said Mary Jo, while the H-2A workers continued to work.

They were given work only every other day, and experienced the same frustrating routine. Finally, the workers who did not meet the production standard, including Mary Jo and Kathern, were fired. After transportation costs Mary Jo came home with less than $30 for three workdays. "I've never been fired," said Mary Jo. "This is the first time it's ever happened to me."

Kathern explained, "The farmers can take advantage of the [guest workers] where they can't take advantage of the Americans… because we know the laws when [they] don't…I think it was more or less, they didn't want the Americans out there."

[19] Personal phone Interview, 16 May 2011. See Figueroa et al. v. Servicios Agricolas Mex, Inc. et al., No. 2:07-CV-02581-EHC (D. Ariz, Filed 19 December 2007).

A FARMWORKER'S STORY

Chinnawat (Johnston County, NC)

The soft tone of Chinnawat's voice indicates a man who possesses wisdom born of experience. A victim of human trafficking and recruitment fraud, Chinnawat was brought to North Carolina from his native Thailand to do farm work in 2005. He had previously been recruited for temporary work in other countries, including Taiwan, where he had a "good experience." But the U.S. guest worker program would prove much less hospitable.

The H-2A recruiter's promises sounded reliable: $8 an hour; 40 hours a week; free housing and food; a year-long contract, with the promise that it would be extended for two years. Chinnawat took out loans with his house as collateral to pay the approximately $11,250 recruitment fee, figuring that even at 3% interest per month it was a smart investment for three years of "good work, good pay" as an H-2A worker in America's vegetable fields.

On arrival in North Carolina in August 2005, the workers were sent to a motel where they slept as many as 6 or 7 to a room, the first sign, perhaps, that conditions might be different than promised. Chinnawat volunteered to cook for the workers and also worked picking broccoli and potatoes.

Soon they were moved to a barn behind the labor contractor's house, shared with insects and mice. They slept on the dirty vinyl floor and washed their hands and clothes at an outdoor faucet. At first the contractor provided decent food but soon became stingier, giving them only rice and vegetables. Workers had to scrounge for extra food in the fields. But the workers were afraid to complain, explained Chinnawat, because they needed work.

Within weeks, work dried up, and only a few workers were allowed in the fields each day. The rest received no pay. Many "panicked," said Chinnawat, as they had no money to pay interest on their debt. Yet they were told not to leave the farm and feared that the police might arrest them if they disobeyed. The contractor would clean his gun in the workers' presence, an unspoken sign, said Chinnawat, of his power to endanger them and their families.

After Hurricane Katrina, the contractor took Chinnawat to New Orleans to do clean-up work. But this, too, lasted only a few days. Without money for food, Chinnawat was so hungry he caught and cooked a pigeon from the street.

Returning to North Carolina, Chinnawat decided that he could no longer live in these conditions. Fortunately, he met a legal aid attorney, who helped him organize an escape from the farm and connected the workers with an organization in Virginia. Chinnawat obtained a visa reserved for victims of trafficking. He now works in northern Virginia as a chef in a Thai restaurant, and lives with his wife and one of his two children.

Once an employer decides to enter the H-2A program, the law creates incentives to PREFER GUEST WORKERS over U.S. workers. For example, the employer must pay Social Security and unemployment taxes on U.S. workers' wages but is exempt from paying these taxes on guest workers' wages.

As Dawson Morton, a legal services attorney in Georgia, recently said on HDNet's *Dan Rather Reports*, growers are "using the temporary guest worker program not as a temporary replacement but as a permanent workforce."[20] The protections aimed at preventing the H-2A program from replacing U.S. workers are clearly ineffectual. H-2A employers are thus given wide latitude to turn away domestic workers in favor of vulnerable foreign workers.

RECRUITMENT, DEBT, AND HUMAN TRAFFICKING

Temporary workers from Mexico, Jamaica, or Peru do not just happen to appear by magic in places like Moultrie (GA), Red Creek (NY), Petoskey (MI), or Yakima (WA) to take jobs in the fields. Rather, nearly all H-2A employers rely on private recruiters to find available workers in their home countries and arrange their visas and transportation to the fields.

Because it takes place outside the United States, this recruitment network is unregulated and highly exploitative.

Despite recently revised regulations making growers promise that neither they nor their agents have received fees from workers to obtain a job, some growers are quite willfully ignorant of what goes on across the border. With many potential recruits hoping to escape poverty at home, recruiters have a significant incentive to charge recruiting fees at great personal profit.

[20] "All I Want is Work," Dan Rather Reports (HDnet), Episode 532 (12 October 2010), online at: http://www.hd.net/ui/inc/show_transcripts.php?ami=A6680&t=Dan_Rather_Reports&en=532

Thus, most H-2A workers arrive in the United States with significant debt. Some have paid as much as $11,000 for the chance at a job. Others have left the deed to their house or car in the hands of a recruiter as collateral to ensure that they will "comply" with the terms of their contract. Some fear for their own physical safety or that of their family members if they cannot repay their debt. Many have been lied to about the conditions of the work, including wages, crops to be picked, length of their visa, and type of housing. Tied to one employer, workers have no choice but to work at whatever wage the employer offers. In short, the H-2A program creates conditions ripe for debt-peonage, not unlike the labor arrangements suffered by many African Americans in the post-Civil War South.

This system of debt can lead to forced labor as well. The H-2A recruitment company Global Horizons Manpower, Inc. faces well-publicized and documented accusations of human trafficking and enslavement. During 2004-2005, the company allegedly brought more than 400 Thai H-2A workers to farms in Hawaii and Washington with promises of long-term employment, forced them into debt with recruiting fees of up to $21,000, and held them in forced labor conditions. According to an indictment filed by the Department of Justice against the company's CEO and other executives, the object of this scheme was

> **...to obtain cheap, compliant labor performed by Thai H2A guest workers indebted by the defendants' recruiting fees, and to compel the workers' labor and service through threats to have the workers arrested, deported, or sent back to Thailand, knowing the workers could not pay off their debts if sent home, thus subjecting the workers to serious economic harm including loss of their family property.**[21]

The Global Horizons scheme is the largest human trafficking case in U.S. agriculture, but it is by no means a unique case of recruitment abuses. As long as the H-2A program allows growers to rely on unregulated foreign recruiters, worker debt, fear, and illegal human trafficking will be the program's inevitable byproducts.

WAGE THEFT

Foreign workers' vulnerability and lack of knowledge about their rights make them

I'm working, doing my best, feeling the sun on my back, working hard like a donkey, just so I could give my money to these people? How do you think I feel? You just feel like crying.

—Manuel (Okeechobee, FL)

[21] U.S. v. Orian et al., Indictment, No. 1:10-CR-576 (Dist. Hi., filed 1 September 2010), at 4.

"They want to keep the beds filled with hands that can work. They don't care about the people."

—Javier (Yadkin County, NC)

particularly susceptible to wage theft and other labor law violations.

Employers have devised many ways of ducking their obligations to pay workers the DOL-mandated wage, leading to lawsuits compelling H-2A employers to pay workers what they are rightfully owed. For example, in 2007, 80 H-2A workers in Georgia sued their employer for routinely underpaying them and missing paychecks. The employer had allegedly prepared backdated checks to hide late payments and false checks to hide non-payments, and had made the workers endorse blank checks.[22] In another class action suit in 2007 in Florida, an H-2A employer was sued for failing to report all the hours employees had worked, in order to pay them less than required by the AEWR.[23] These are hardly isolated incidents; it is clear that wage theft is rampant throughout the H-2A program.

Some employers pay a piece rate rather than hourly wages. In theory, a piece rate encourages workers to work faster than they would under an hourly rate and produce more for the employer. But when employers set the rate low, and workers' earnings fall below the minimum H-2A rate, H-2A employers are required to supplement piece-rate earnings with "build up" pay to equal the AEWR or minimum wage for every hour worked. Often, however, the opposite happens:

A FARMWORKER'S STORY

Manuel* (Okeechobee, FL)

Manuel, a father of four from Veracruz, Mexico, has been working in citrus orchards since he was a child. But in recent years, Manuel has had trouble making ends meet from work in Mexico. "There's nothing here, nothing to eat," said Manuel, so he looked north for work.

In December 2008, Manuel was able to land an H-2A job picking oranges for a Florida contractor that provides labor for one of the largest citrus companies in the U.S. He was told he'd be making $8.82 an hour. On arrival in Florida, he set out working long, hard days, sometimes 12 hours or more in the fields. But when his first paycheck arrived, Manuel learned that in order to keep his job he would have to kick back some of his promised pay to his employer.

"When we came out of the bank, the boss was already on the bus waiting for us," remembered Manuel. The boss had a "blacklist" in his hand indicating how many tubs of oranges each worker had filled. Workers were forced to pay back the difference between their piece rate earnings and the legally-required Adverse Effect Wage Rate (AEWR)—also known as build-up pay—to the crewleader. "He was robbing us…he stole a lot of money," said Manuel, who had to kick back as much as $130 some weeks.

Though the workers knew that they were legally entitled to be paid the hourly AEWR, their employer took advantage of the fact that their visas were dependent on him. "Many people wanted to complain but they were afraid…to have to come back to Mexico," Manuel explained. In fact, they had been told that anyone who refused to kick back the build-up pay would be sent home.

When it came to the halfway point in the season, the employer decided to change the terms of transportation reimbursement, as well. "The boss said, 'I'll reimburse you [for the cost of getting to Florida], but then you have to pay me for where you live.' But how is that possible? We, the farmworkers, know we have the right to a house, transportation, stove, and a refrigerator. We didn't know why he was charging for that," exclaimed Manuel.

The loss of money for transportation and kick backs left Manuel struggling to feed even himself, much less send money back home to support his family. "I didn't have anything to eat…I was starving," said Manuel. He left to return to Mexico two months before the contract was over, forced out by the employer for daring to voice his concerns.

Manuel spoke passionately about the feeling of being cheated: "I had the money in my hands; I thought it was mine. But I'm working, doing my best, feeling the sun on my back, working hard like a donkey, just so I could give my money to these people? How do you think I feel? You just feel like crying."

**Not real name*

[22] Morales-Arcadio et al. v. Shannon Produce Farms, Inc. et al. 2007 U.S. Dist. Lexis 51950 (S.D. Ga. 2007).
[23] Paseco-Castillo v. N &R Services of Cent. Fla., No. 8:07-CV-01804 (M.D. Fla., filed Oct. 3, 2007).

Employers claim that employees worked fewer hours than they actually did in order to make it appear that the workers averaged the minimum wage per hour. Other times workers are forced to "kick back" the make-up pay to a crew leader, rendering the AEWR meaningless.

Growers have also been known to apply productivity standards, requiring workers to fill a specified number of buckets per hour or day. Often this is another way to weed out American workers; as the productivity demands get harder without a real pay increase, U.S. workers are less likely to apply for the jobs that desperate guest workers will reluctantly accept.

H-2A workers are dependent on employers for their visas and livelihoods. They are often fearful that if they demand the wages owed to them they will be fired and deported or refused re-hire next year. But even when H-2A workers do decide to seek out help to recoup their rightful wages, potential remedies are limited. H-2A workers are excluded from the Migrant and Seasonal Agricultural Worker Protection Act (AWPA), the chief labor law aimed at protecting farmworkers. H-2A workers are thus not entitled to sue in federal court for lost wages, housing benefits, transportation reimbursement, and other requirements of the H-2A contract.

H-2A workers often cannot receive back pay for wage theft because they lack meaningful access to attorneys and the court system. Few private attorneys accept farmworker cases due to language barriers, the low dollar value of cases even when they are egregious, the slim chance that losing employers will pay attorneys' fees (the law usually does not require that they do so), rural isolation of the

"The growers only want single men with no families and the H-2A jobs make it worse."

—Testimony from a female farmworker to the Michigan Civil Rights Commission, quoted in A Report on the Conditions of Migrant and Seasonal Farmworkers in Michigan (2010).

Recruitment abuses are endemic to the H-2A program, and the vulnerability and powerlessness of guest workers has led to numerous cases of debt-peonage,

HUMAN TRAFFICKING AND FORCED LABOR.

clients, conflicts of interests in suing local farmers who they have represented, and the workers' inability to remain in the local area during the litigation. Legal aid programs are permitted to represent H-2A workers, but they are underfunded and cannot reach many of the workers who need help.

AGE, GENDER, AND ETHNIC DISCRIMINATION

Though DOL does not publish statistics on age and gender of H-2A workers, it is well known that women and older adults are basically absent from the H-2A program. That is because the H-2A program allows agricultural employers a luxury denied to all other domestic employers: access to a demographically "ideal" workforce.[24] Since the Civil Rights Act of 1964 and the Age Discrimination Employment Act of 1967, employers in the U.S. have been forbidden to use race, color, religion, sex, national origin, and age as factors in hiring practices. Yet the government refuses to investigate and curb abuses that occur during recruitment abroad.

Consequently, H-2A employers' recruiters often search out a very specific demographic, thought to be perfect for farm work: young single men without family in the United States, who will devote all day every day to work. Workers who don't fit into this category have very little chance of being selected for an H-2A visa. Thus, the H-2A program is fundamentally anti-family. Young men come to the U.S. without their family members, often for separations of many months, causing stress for spouses and children, as well as guest workers.

[24] See Reyes-Gaona v. NCGA, 250 f.3d 861 (4th Cir. 2001).

A FARMWORKER'S STORY

Javier* (Yadkin County, NC)

Javier, 50, has more than 15 years experience as a worker in the H-2A program. Every year, Javier would travel from his home outside Guanajuato, Mexico to North Carolina for a job in the tobacco fields. With few jobs at home, this was the only way he could provide for his wife and four children.

Since the summer of 2010, however, Javier has been physically unable to work. That summer, Javier and his H-2A coworkers were exposed to pesticides on more than one occasion. Once, an employee of the grower was spraying pesticides less than 20 meters from them. Another time, on a hot day in August, Javier and about 18 other workers began to feel sick. Some were vomiting, and many experienced such strong cramps that they couldn't stand up and had to lie down. "We fell. We fell like animals in the field," Javier reported. He reports feeling that he had "chilies all over his body."

Many of the workers returned to the labor camp, but housing conditions were crowded and not suitable for recovery. Sixteen workers were packed into each room, sleeping nearly on top of each other. Javier explained: "I was so close to others, sometimes I'd wake up feeling someone's foot in my back or in my stomach." There were only two showers to use to wash the chemicals off their bodies.

For a few days, Javier felt sick but continued to go to work. "I had to work…for my kids," said Javier. Finally, he felt so bad that he phoned a local clinic outreach worker to take him to the hospital. He was sent back to the camp with a note that he could not work in tobacco.

No longer useful to his employer, Javier was told that he should go back to Mexico to recover. He was encouraged to sign a paper saying that he was leaving, with the understanding that if he signed he'd be allowed back in future seasons. He paid his own bus ticket for the trip home to Mexico.

Nine months later, Javier still has nausea, feels dizzy, and has trouble walking. He feels too sick to work, but still owes the debt he incurred to support his family when he could not finish the season. He cannot afford the necessary specialized medical care and has even had to take one of his kids out of school because he can no longer pay for it. "I am full of outrage that I can't support my family," he said.

Javier succinctly described why H-2A employers dispose of workers injured on the job. "They want to keep the beds filled with hands that can work," he said. "They don't care about the people."

*Not real name

Women constitute more than 20% of farmworkers, yet there are very few, if any, in the H-2A program. Often, women interested in being guest workers are funneled into the H-2B non-agricultural guest worker program, a program with even fewer protections than H-2A. This systematic gender discrimination came to light in a class action lawsuit led by Marcela Olvera-Morales, a Mexican farmworker, against International Labor Management Corporation, Inc. (ILMC), a major labor recruiter connected with the North Carolina Growers' Association. Olvera-Morales contended that ILMC had chosen less-qualified male workers for H-2A jobs, while intentionally sending her and other women to H-2B jobs, knowing that those jobs were less desirable.[25]

The culture of discrimination in H-2A extends to race and national origin as well. Indeed, employers are basically free to act on negative racial and ethnic stereotypes regarding both U.S. and foreign workers. For example, one H-2A employer from North Carolina has explained that he hired Asian workers to "try a new breed" because Hispanic workers had been "Americanizing" and "getting lazy."[26] This kind of explicit racial discrimination, illegal in the rest of the country, seems commonplace in the fruit and vegetable fields of this country.

INJURED WORKERS

Agriculture is one of the most dangerous industries in the United States. According to the Bureau of Labor Statistics, crop production workers had a fatal injury rate nearly ten times the average rate for all industries. Non-fatal injuries are extremely common as well; in 2009,

[25] Olvera-Morales v. Int'l Labor Mgmt. Corp., Inc. et al., 2008 Westlaw 506090, *1 (M.D.N.C. Feb. 20, 2008). See also, "Close to Slavery."
[26] Deposition of Roy Raynor, Volume 1, in *Bracero v. New Tree Personnel Services, Inc.*, 3:05-CV-02074-CCC (D. P.R., 2006) at 226, 320.

there were 4.9 non-fatal work-related injuries for every 100 full-time crop workers.[27]

On paper, the H-2A regulations require employers to provide H-2A workers with workers' compensation insurance to protect them in case of a work-related injury. But in reality, complex workers' compensation rules, which vary from state to state, often prevent H-2A workers from accessing these benefits, especially after they have returned to their home country, which the program demands.[28]

Severely injured workers and their families are thus never compensated for the lost income from their injury. Employers may also encourage workers not to apply for benefits, may simply return injured workers to their home countries, or may get injuries taken care of quietly, in order to prevent a hike in insurance premiums.

The H-2A program does not require employers to provide health insurance, and foreign non-immigrants are not eligible for Medicaid, so few H-2A workers can access health care for non-work-related illnesses or injuries. Though there is no data on the number of H-2A workers with health insurance, a 2003 report estimated that only 5-11% of all farmworkers had employer-provided insurance.[29] Federally funded community health centers are available to H-2A workers at low cost but often are not located near enough to workplaces.

The experiences of injured or ill workers highlight the status of guest workers as disposable commodities to be retained only as long as they are useful to an employer. H-2A workers with health problems are often fired or coerced to sign "voluntary" quit forms in exchange for unenforceable promises that they will be hired the following year. When workers return to their home countries, it is often very difficult for them to pursue their workers' compensation claim, and frequently comprehensive medical care is inaccessible.

UNSAFE AND UNHEALTHY HOUSING

Under the regulations, H-2A employers are required to provide or pay for housing for all guest workers and any domestic workers who are not reasonably able to return home each day.[30] Employer-provided housing must meet DOL safety standards for farm labor camps, including adequate sanitation, water supply, toilet, laundry, bathing facilities, and pest control.

In reality, H-2A workers frequently describe their housing as dirty, cramped, unsanitary,

[27] U.S. Department of Labor, Bureau of Labor Statistics, Census of Occupational Injuries and Illnesses 2009, Hours-Based Fatal Injury Rates, online at http://www.bls.gov/iif/oshwc/cfoi/cfoi_rates_2009hb.pdf; Industry Injury and Illness Data 2009, Summary Table 1, online at http://www.bls.gov/iif/oshwc/osh/os/ostb2435.pdf

[28] "Close to Slavery," at 26.

[29] Villarejo D. 2003. The Health of US Hired Farmworkers. *Annu Rev Public Health* 24: 175-93.

[30] 40 C.F.R. 655.122 (d)

A FARMWORKER'S STORY

Juan (Rockcastle County, KY)

Juan, 30, lives in Hidalgo, a state in central Mexico, where he has two young children, ages four and one and a half. In 2008, he began working in Kentucky tobacco on an H-2A visa. Because he speaks some English, Juan became the leader of his crew, serving as the liaison between his employer and the other workers. Still, Juan's leadership position did not protect him from the poor housing and working conditions faced by H-2A workers on his employer's farm.

In the summer of 2010, Juan's crew was housed by his employer in dilapidated trailers near the fields. According to Juan, the trailers had holes in the roofs, leaky pipes, and were infested with rodents. He and his coworkers were given dirty second-hand mattresses, blankets, and sheets. "The mattresses were in bad shape," said Juan. When it rained, water would leak in from the roof and moisture would infiltrate from below, leaving the trailers damp and moldy.

Juan and his fellow H-2A workers spent their own money and time trying to fix up the trailers, including multiple attempts to repair the water pipes and patch the holes in the roof, but the conditions were constantly deteriorating. "Even after we fixed it, water would get in," Juan explained. They were also illegally required to pay for utilities, including electricity and water.

Conditions in the fields were not much better. Juan and his coworkers were exposed to pesticides but did not receive any training or protective equipment to help them reduce the risks to their health. Some workers became sick from pesticide exposure, and many suffered from nausea and dizziness. A few seasons ago, one worker was taken to the hospital for pesticide poisoning.

All the while, Juan wasn't paid adequately for his work. Though Juan and his coworkers had been promised $8.00 an hour, they were often paid only about $6.00. A recruitment fee of $800 was deducted from Juan's paycheck. Many weeks they only were needed for three days of work. During these idle times they were forced to seek work on neighboring farms to make money.

In August, 2010, Juan was fired. He says his employer was not satisfied by the workers' pace and demanded they work faster. But it is clear that the employer was not keeping up his side of the bargain – providing livable housing, honest wages, and decent working conditions. "[The H-2A contract] had no enforceability," said Juan.

or pest-ridden—and sometimes all of the above. Indeed, farmworker housing has not improved much since the images portrayed in Edward R. Murrow's documentary on the conditions of farmworkers, "Harvest of Shame," shown on Thanksgiving, 1960. H-2A employers have placed five men in a single motel room with one bathroom, and reports have described workers sleeping on the floor because of worn and moldy mattresses. Other problems have included crumbling buildings; rat infestations; moldy toilets, showers, and sinks; and in one case workers were even known to be living in a converted chicken coop.[31] Because a tangled mass of state and federal regulations and agencies holds authority over farmworker housing, deplorable conditions may go unnoticed.[32]

Employers have long tried to reduce or eliminate the housing requirement. For example, H-2A growers in border regions, particularly in the Yuma, AZ region, have recently claimed that their workers don't want housing, and would rather cross the border to return to their homes in Mexico each night.[33] Instead, they have advocated for a "border commuter" program that would exempt employers near the border from the H-2A housing requirement. Sen. Chambliss (R-GA), though not from a border state, introduced a bill including such a program in 2010. This idea is not new; similar claims were made in the 1970s by H-2 employers

[31] For reports of these conditions, see: Complaint in Asanok et al. v. Million Express Manpower, Inc., et al. 5:07-CV-00048-BO (E.D. NC 2007); Barry Yeoman, "Silence in the Fields," Mother Jones (January/February 2001), accessed 21 April 2011 at http://motherjones.com/politics/2001/01/silence-fields; U.S. Department of Labor, WHISARD Compliance Action Report, Demski Farms, Coloma, MI, (21 August 2007); Leah Beth Ward, "Desperate Harvest," Charlotte Observer (30 August 1999), accessed 21 April 2011 at http://are.berkeley.edu/APMP/pubs/agworkvisa/desperate103099.html.

[32] Depending on the kind of housing and date it was built, H-2A housing may be governed by OSHA, ETA, state or local housing standards, or a combination of these. See 20 C.F.R. 655.122(d).

[33] Griselda Nevarez, "Jones: Change farmworker housing rules," YumaSun.com (9 March 2011), accessed 21 April 2011 at http://www.yumasun.com/news/workers-68302-housing-farmers.html.

from the Presidio region of Texas when they refused to offer housing to their guest workers.

Of course, under the current regulations, workers are not required to accept housing if they would rather commute daily from Mexico. Furthermore, anecdotal evidence suggests that current H-2A workers in the border region come from a variety of places, including Guanajuato in central Mexico and Oaxaca in distant southern Mexico.[34] A "border commuter" housing exemption would leave Mexican border towns with the burden of providing sufficient housing for the influx of workers from other regions arriving for the opportunity to become H-2A workers. Many workers could end up in substandard housing or homeless, sleeping on the streets or in fields. Additionally, the existence of large numbers of workers crossing the border daily would increase the danger that Mexican drug cartels could take control of labor camps in Mexico and recruit workers for drug smuggling. A border commuter program would harm H-2A workers, U.S. workers, and the border communities.

RETALIATION AND LABOR ORGANIZING

H-2A workers who wish to stand up to unfair or illegal conduct have reason to fear retaliation

A FARMWORKER'S STORY

Diego (Harnett County, NC)

Diego, 48, has experienced first-hand the stark contrast between life before and after the signing of a union contract. A veteran of nine seasons in the North Carolina tobacco fields, Diego is a lifetime farmworker from San Luis Potosi, Mexico. He is proud of his strong work ethic and his participation in the protests that led to the collective bargaining agreement between the Farm Labor Organizing Committee, AFL-CIO (FLOC) and the North Carolina Growers Association (NCGA). "There have been many positive changes," since the adoption of the contract, Diego said.

Diego first came to North Carolina under a 6-month H-2A contract in 2003. He paid a recruiter $470 to obtain the job, and had to pay similar sums to return each year. The wages were low, and he was often paid on a piece rate. Workers were on call 24/7. "We were obligated to go to work at any time the boss wanted to take us to the field," explained Diego.

Diego described his housing conditions as especially bad in those first years; he recalled abandoned houses, insect-infested mattresses, and overflowing toilets that went unrepaired for days. "The boss didn't care," remembered Diego.

Remarkably, Diego and many of his fellow H-2A workers risked their jobs by protesting for better conditions. In 2004, FLOC, a farmworker union with roots in the Midwest, signed a collective bargaining agreement with NCGA, the umbrella company that organizes H-2A visas and paperwork for many North Carolina growers. The agreement covers thousands of H-2A workers and has set up a grievance procedure for workers and growers to address complaints.

Since the signing of the FLOC contract, Diego has seen marked improvements. Workers no longer pay recruitment fees to be hired back each year and are reimbursed for visa fees on arrival in North Carolina. Wages have increased. Workers can take water breaks to protect themselves from heat-related illness without fear of getting fired, and they even get paid leave in the event of a family death. Growers respond to union concerns - when FLOC representatives came to Diego's camp to document poor housing conditions, his boss immediately bought new mattresses and kitchenware for the workers.

Diego is overjoyed that the wages and working conditions as part of the FLOC contract have allowed him to support his family, including 11 children. "I've been able to provide for them, give them clothes…not the best clothes…I'm very happy now that they can be in school and college," exclaimed Diego.

"I encourage all workers to join a union," said Diego. "[Workers] should get involved in FLOC because of all the good they've been able to do. I invite all the friends to join us and work with us."

[34] Mara Knaub, "Farmworkers – 'Who Else Would Do All the Work?" YumaSun.com (6 December 2010), accessed 21 April 2010 at http://www.yumasun.com/articles/workers-65945-migrant-duron.html.

in the form of discharge and deportation as well as denial of a job and visa in a future season. Because foreign citizens have no ability to apply independently for an H-2A visa, they must hope that an employer will request a visa for them. Employers have been able to retaliate against H-2A workers who assert themselves simply by refusing to offer visas to the workers in a following season.

In other industries, workers may achieve bargaining power and protection from retaliation through unionization. Though California's Agricultural Labor Relations Act grants farmworkers the right to join a union and mechanisms to engage in collective bargaining, farmworkers in most other states do not have the right to unionize, and agricultural workers are excluded from the National Labor Relations Act, leaving them vulnerable to being fired for simply joining a union.

H-2A workers experience even greater barriers to unionization than do other farmworkers, as their livelihoods are precariously dependent on the goodwill of their employer. They work for short periods in seasonal work, so they often lack the trust established among co-workers over a longer period of time. Furthermore, an H-2A employer may recruit guest workers at the wages and working conditions approved by DOL and can reject U.S. workers and guest workers who ask for higher wages or benefits, making it difficult for unions to persuade workers that they can negotiate better job terms. As a result, few H-2A workers enjoy collective bargaining rights.

However, in recent years, as a result of intensive outreach and organizing efforts, farmworker unions have begun to win contracts with some H-2A growers. The Farm Labor Organizing Committee, AFL-CIO (FLOC) now represents several thousand guest workers employed at several hundred North Carolina H-2A growers through the North Carolina Growers' Association, an umbrella organization that is the largest H-2A importer in the country. In these unionized fields, workers have seen positive changes in their working conditions. For example, FLOC has been able to set up an office by the U.S. Consulate in Monterrey, Mexico to help secure visas and educate new workers about their rights under the contract. Through its grievance-arbitration procedure, FLOC has worked to ensure that H-2A workers gain employment in future seasons, free from retaliation.

In 2010, FLOC's President Baldemar Velasquez reported that several hundred disputes were resolved through grievance-arbitration. For example, 57 complaints regarding the proper reimbursement of workers' transportation costs were settled. The union helped workers in more than 50 cases address health and safety needs and handled 60 wage dispute cases. In some cases, the union's presence helped overcome problems that were primarily failures to communicate effectively. FLOC has said that it still faces challenges in representing workers under the H-2A program but expects to continue making progress, particularly if it succeeds in its campaign to organize additional H-2A employers in North Carolina.

The opportunity to bargain collectively allows farmworkers to assert their rights, improve their wages and working conditions, protect themselves from retaliation, and achieve a voice in the workplace and in the public sphere. The presence of a union that helps workers in both the U.S. and the workers' homelands can be especially helpful in reducing the extensive and serious abuses associated with recruitment. Unions can also help ensure that job applicants need not pay recruiters for access to jobs under the H-2A program. Expansion of union capacity to help H-2A workers would reduce exploitation and abuse in the H-2A program and enable workers to improve their wages and working conditions.

"It's really changed for the better…I encourage all workers to join a union."

—Diego (Harnett County, NC)

PART 03

A PROGRAM TO FILL SEASONAL JOBS

SHEEPHERDERS: A DANGEROUS EXCEPTION

The H-2A program is designed by law to satisfy temporary, seasonal jobs that would otherwise go unfilled. Yet the ranching lobby, politically powerful in western states like Colorado, Utah, and Wyoming, has effectively lobbied DOL for a special exemption for sheep- (and goat-)herders. Herding is extremely tough, year-round work, and herders often spend extensive time in complete isolation, following the herd as they move through grazing areas. >>

A FARMWORKER'S STORY

Pedro* (Delta County, CO)

Pedro arrived in the U.S. from Peru on an H-2A visa in spring 2009. In Peru, Pedro had worked for ten years in farming before becoming a philosophy and Spanish teacher. When he heard he could make significant money as a sheepherder in the U.S., he jumped at the chance to better provide for his wife and child. He paid approximately $5,500 in visa and recruiting fees.

But when he arrived in Colorado, Pedro's image of the U.S. as a land of opportunity quickly vanished. He learned that he would be working 11-14 hour days, seven days a week, for only $750 a month, minus a $27 deduction for health insurance. His employer, a rancher contracting with the Western Range Association, took his passport and other documents and refused to return them.

On the ranch, he was housed in a small sheepwagon with holes and a door that did not shut properly. There was no bathroom or refrigerator to store food. Though his employer was supposed to provide him with food every weekend, he would often not show up. When he protested, the ranch owner threatened to send him back to Peru.

"One thinks that life over here is easy, that everything is beautiful and that all the people are good people…but once one arrives here, well, I had the misfortune of bumping into very bad people," said Pedro.

Not real name

Soon, Pedro was sent to herd sheep in the mountains and subsequently became ill. Though money was being deducted from his pay each month for health insurance, the rancher refused to take him to the doctor. He had no easy access to a phone and was mostly cut off from communication with the outside world. He could not use ranch vehicles to go to town and buy food. When he asked if he could have a friend take him to town, the rancher replied that he could not have friends or talk to neighbors.

Finally, in August 2009, Pedro realized that the only way out was to escape. He called 911, but could not identify his exact location. He then walked to a neighbor's house and found someone to drive him to the police station. The local police led him to a legal services attorney, who was able to help him reclaim his documents and some of his stolen wages.

"I knew that slavery had once taken place," said Pedro. "But here in the United States, slavery is still being experienced…a form of modern-day slavery."

DOL directives allow ranchers to employ H-2A herders for year-long contracts with possibility of extension, and pay them only $750 a month (the current "prevailing wage" for sheepherding in many western states), though they are required to be on call nearly 24 hours a day, 7 days a week. Special regulations allow sheepherders to be housed in wagons or tents and permit employers to provide alternatives to toilets, showers, running water, and electricity if these amenities are not available.[35]

Sheepherders are particularly vulnerable to abuse. A survey of 93 herders by Colorado Legal Services found that more than 80% were not permitted to leave their ranch, to have visitors, or to engage in social activities at any time during their employment. Seventy percent reported that they never had access to a functioning toilet and less than one-third had refrigerators to store food in their mobile campers. Many herders reported that their employer confiscated their passports and other documents, and some had pay withheld until they returned home to Peru. Wage theft, dilapidated housing, and forced labor are commonplace in this industry.[36]

It is no wonder that with conditions like these, which often border on modern slavery, ranchers cannot find U.S. workers to fill sheepherding jobs. Indeed, the experience with H-2A in the herding industry highlights how easy it is for unscrupulous employers to use the H-2A program to find low-paid exploitable workers, rather than improving pay and conditions to attract workers in the normal job market. In fact, a recent lawsuit in Utah alleges

"I knew that slavery had once taken place. But here in the United States, slavery is still being experienced… a form of modern-day slavery."

—Pedro (Delta County, Colorado)

[35] U.S. Department of Labor, Employment and Training Administration, Field Memorandum No. 32-10, "Special Procedures: Labor Certification Process for Employers Engaged in Sheepherding and Goatherding Occupations Under the H-2A Program" (14 June 2011), online at: http://wdr.doleta.gov/directives/attach/TEGL/TEGL32-10ACC.pdf

[36] Colorado Legal Services Migrant Farm Worker Division, "Overworked and Underpaid: H-2A Herders in Colorado" (14 January 2010), online at http://users.frii.com/clsfcdsl/CLSoverworkedandunderpaid.pdf

"This guestworker program's the closest thing I've ever seen to slavery."

—Rep. Charles Rangel (D-NY), quoted in Southern Poverty Law Center, Close to Slavery (2007)

that in order to pay the low monthly prevailing wage, an employer categorized one worker as a sheepherder, though he was primarily engaged in non-range work, including mowing private lawns.[37] These stories should provide pause for those who would expand the H-2A program into other non-seasonal agricultural work.

DAIRY, MUSHROOMS, GREENHOUSES: AN UNCHECKED EXPANSION OF GUEST WORKER INDUSTRIES

In recent years, dairy farmers, recipients for many years of significant government subsidies and price regulations, have begun to turn their political power toward a new goal: gaining access to the H-2A program.

Though dairy barns clearly require year-round, permanent workers, the industry has argued that the lack of willing and available domestic workers has created a desperate need for foreign workers, and that those workers should come through the H-2A program. At the time of this report's preparation, companion bills called "The H-2A Improvement Act," introduced in the Senate (S. 852) and the House of Representatives (H.R. 1720), would codify the sheepherder exception and add dairy to the list of non-seasonal industries open for H-2A work.

But supporters of the dairy extension fail to mention the history of poor working conditions in the dairy industry, even without the H-2A program. For example, legal advocates in California, the largest dairy-producing state, have noted that many milkers work more than 12 hours a day, six days a week, with no overtime pay, rest breaks, or meal periods.[38]

[37] See complaint in: Saenz Mencia et. al. v. Allred et. al., No. 2:11-CV-00200 (C.D. Uta., filed Feb. 24, 2011).
[38] Julia Montgomery, "The Impact of Limiting Workforce-wide Lawsuits on Low-Wage Workers," *The California Labor & Employment Law Review*, Vol. 22, No. 3, May 2008, at 21.

Workers are also subject to the hazards of lax safety requirements; for example, a dairy worker in upstate New York was recently killed when trying to climb over a gate, a "common" practice, according to the newspaper report.[39] Rather than being allowed to bring in foreign workers, dairy owners should be required to attract U.S. workers by offering jobs with fair pay and workplace safety.

Rather than "improve" the H-2A program, the dairy extension would simply expand the guest worker scheme into an already abuse-ridden industry. If it passes, other year-round agricultural industries, including mushroom farms and greenhouses, seem ready to line up and demand access to H-2A guest workers.[40] There is no end to the list of industries that could lower wages, claim "labor shortages," and demand cheap foreign labor. Soon, all our low-wage industries could become populated by low-paid guest workers with few rights.

Instead, the H-2A program should be restricted to seasonal work, and both U.S. and foreign workers must be provided with stronger protections. The H-2A guest worker program should not be the model for American agriculture or other low-skilled jobs. America is a nation of immigrants and should remain so.

Proposals to slash wage rates and remove labor protections from the H-2A program are not only cold-hearted but bad public policy.

[39] David C. Shampine, "Death of migrant worker caused by fall, ruled accident," Watertown (NY) Daily Times (24 March 2011), at http://www.watertowndailytimes.com/article/20110324/NEWS03/303249965

[40] See, for example, the testimony of Pennsylvania state senator Arthur Hershey before the U.S. Senate Judiciary Committee (5 July 2006), where Mr. Hershey suggested that the mushroom industry should be allowed to use guest workers.

PART 04

RECOMMENDATIONS

H-2A PROGRAM RECOMMENDATIONS

The narrative and worker stories in this report show the mistreatment of both domestic and foreign workers under the H-2A temporary foreign agricultural worker program. The abuses are widespread because the guest worker program model is deeply flawed. The constraints on guest workers deprive them of the ability to protect themselves from illegal and unfair treatment and from retaliation for speaking out. The law gives employers incentives to discriminate against U.S. workers. >>

The inability of the government to monitor the job terms and practices of thousands of agricultural employers encourages employers to take advantage of the guest workers' vulnerability with little risk of getting caught violating the law. The H-2A guest worker program cannot and should not be the principal vehicle for filling the nation's agricultural job needs. Farmworkers should be given the opportunity to become immigrants and productive citizens of this country.

Though the Department of Labor under Hilda Solis restored most of the longstanding wage and other labor protections that Secretary Elaine Chao had removed, systematic problems persist. Farmworker Justice suggests a number of further steps that policymakers must take, in both the short- and long-term, to protect U.S. workers in agriculture, prevent exploitation of guest workers, and help ensure an adequate supply of citizens and authorized immigrants to keep America's agriculture sector productive.

At the time of writing, a new campaign is underway to eliminate or weaken job protections, government oversight, and enforcement mechanisms under the H-2A program, or to create a new guest worker program altogether. Some policymakers have argued that, in the face of a government crackdown on employers who hire unauthorized immigrants, these changes are necessary to facilitate the hiring of legal guest workers. This report demonstrates that instead of diminished protections, the H-2A program requirements should be strengthened and enforcement increased to end abuses in the program.

SHORT TERM

Congress should pass the Agricultural Jobs, Opportunities, Benefits, and Security Act (AgJOBS).

➜ AgJOBS is a bipartisan compromise between growers and farmworker groups that would allow currently unauthorized farmworkers to earn legal status by continuing to work in U.S. agriculture, make balanced changes to the H-2A program, and provide U.S. growers with a stable, productive, and decently-treated farm labor force.

DOL should increase oversight and enforcement of worker protections in the H-2A program.

➜ DOL should investigate more H-2A employers and do so more thoroughly to remedy violations and deter unlawful practices.

➜ DOL should undertake regular unannounced visits to all H-2A employers to gauge compliance with H-2A regulations and work orders.

➜ DOL should require State Workforce Agencies (SWAs) to be more vigilant in reviewing H-2A applications for illegal job terms.

➜ DOL should take steps to eradicate common employer violations, including misstating the number of hours worked by piece-rate workers to deny workers the minimum hourly wage rate, erecting artificial and illegal barriers against U.S. workers who apply for H-2A jobs, and falsely claiming that workers are not entitled to their outbound transportation expenses because they quit work before the end of the season.

"The reality is that the majority of farmworkers in our country are undocumented. We need a fair, orderly way for those who harvest our fruits and vegetables to come out of the shadows and for farmers to retain a skilled, stable, and productive workforce. The H-2A program needs reform to better protect workers from abuses, but even if reformed it is not a practical solution for filling the hundreds of thousands of jobs in agriculture. The AgJOBS compromise, supported by farmworker groups and growers, is the solution."

— Rep. Howard Berman (D-CA)

"I think the Department of Labor has to take responsibility for these workers. We are inviting them; they're called 'guest workers.' This isn't how you treat guests."

—Rep. George Miller (D-CA), quoted in "Corruption Leads to Deep Debt for Guest Workers," NPR (May 8, 2007)

➜ DOL should work closely with labor unions, community-based organizations, and legal advocates to communicate effectively with H-2A workers. To collect evidence of illegal conduct, DOL must recognize and overcome the guest workers' fear of retaliatory discharge, deportation and denial of jobs in future seasons, as well as educational, linguistic and cultural barriers.

➜ DOL should take better advantage of its power to bar employers from the program for violating workers' rights.

DOL should exercise jurisdiction over H-2A recruitment abroad.

➜ The Department of Labor, in cooperation with the Department of State and the Department of Homeland Security (DHS), should examine the international recruitment mechanisms that result in foreign workers' indebtedness. Workers' desperation to earn enough money to repay the employers' recruiters and bring home money to their families leaves them vulnerable to exploitation.

➜ Employers should be required to disclose any arrangements with and identities of labor contractors and recruiters and to determine and disclose all contracting and recruiting in foreign countries, including by sub-contractors and sub-agents.

➜ DOL should require H-2A employers to disclose in advance how foreign workers will be transported to the place of employment in the U.S. and by whom.

➜ All recruiters and employers' agents should be licensed and listed online in an easily accessible format.

➜ DOL should cooperate with labor unions to establish fair recruiting processes in the foreign country.

DOL should relieve workers' debt by mandating immediate reimbursement for work-related expenses.

➜ Workers should be reimbursed for transportation to the place of employment within the first week of arrival, rather than at the halfway mark of the contract.

➜ Employers should be required to reimburse visa and passport fees paid by workers.

DOL should ensure that both domestic and H-2A workers, especially those employed near the U.S.-Mexico border, are provided with housing as required by the H-2A program.

➜ Special attention must be paid to worker housing and conditions at the U.S.-Mexico border to ensure that employers do not deny housing to those workers who want it based on the claim that workers can commute to their homes in Mexico each night.

➜ Employers should be required to pay workers for time spent waiting to cross the border, reducing the incentive for employers to give preference to "border commuters" and deny them housing.

DOL, DHS, and the State Department should coordinate data and action on H-2A workers.

➜ DOL currently collects data on employer requests/certifications, DHS collects worker entry and exit data at the port of entry, and the Department of State collects data on visas issued. Collaboration between agency data collection activities would paint a fuller picture of the origin and destination of H-2A workers, allow for better assessment of regional labor needs, and facilitate

enforcement against unscrupulous employers and recruiters.

➜ The Department of State should ask workers to present an H-2A contract at their visa interview to ensure that workers have been given a contract in their language that complies with the law. H-2A employers should be penalized when workers have not been given their contracts.

Employers under the H-2A program should take responsibility for foreign recruitment.

➜ Employers must monitor the actions of recruiters in foreign countries that supply them with guest workers and act to end recruitment abuses.

➜ Employers should be held jointly liable when recruiters working for them break the law.

LONG TERM

H-2A workers should be allowed the freedom to change employers.

➜ Tying guest workers' visas to a single employer leaves them vulnerable to abuse and reluctant to challenge illegal or unfair employer practices. Congress should amend the law to extend the fundamental protections of a free labor market to H-2A workers.

H-2A workers should be able to earn permanent immigration status in order to enforce their rights and improve their conditions.

➜ No matter how much time they spend in the United States, H-2A guest workers can never earn permanent status or become citizens with the right to vote. Congress should end this anti-American system that treats guest workers as short-term commodities, and provide a process for H-2A workers to obtain permanent residency.

The H-2A program should remain available for temporary and seasonal workforce needs only.

➜ The H-2A program was designed for seasonal jobs where U.S. applicants are lacking. Proposals to extend the H-2A program to year-round jobs in dairies or other industries should be rejected.

➜ The exemption for sheepherding, a year-round industry with a history of worker abuse, should be ended.

H-2A workers should be covered by the labor laws applicable to farmworkers.

➜ H-2A workers are currently excluded from the most important labor law that protects farmworkers, the Migrant and Seasonal Agricultural Worker Protection Act (AWPA). Congress should end this unfair exclusion and extend AWPA rights to H-2A workers, including a federal private right of action to enforce their job terms, disclosure of job terms at the time of recruitment, and safe transportation vehicles.

➜ Congress should deter wage theft by ensuring that H-2A workers are entitled

"H-2A guestworkers may be less aware of U.S. laws and protections than domestic workers, and they are unlikely to complain about worker protection violations…fearing they will lose their jobs or will not be hired in the future."

—U. S. General Accounting Office (GAO), H-2A Agricultural Guestworker Program: Changes Could Improve Services to Employers and Better Protect Workers (1997).

"NCLR has serious concerns about the treatment of farmworkers in this country. Our broken immigration system, including the problematic H-2A guest worker program, contributes to the poor wages, working conditions and health of farmworkers. The ability to legalize immigration status is instrumental to enabling farmworkers to bargain for better working and living conditions. Congress should fix our broken immigration system to ensure our country has a productive, legal farm labor force that benefits from strong workplace protections for all workers."

—Janet Murguía, president, National Council of La Raza (NCLR)

to liquidated (double) damages when employers fail to pay the AEWR.

➜ To encourage attorneys to accept farmworkers' cases, workers who win litigation for violations of the H-2A program protections should be entitled to an award of attorneys' fees and court costs.

H-2A program wage rates should reflect the wage necessary to attract U.S. workers in the labor market:

➜ The H-2A hourly wage rates set under the Adverse Effect Wage Rate methodology are too low, as they fail to account for wage depression caused by the presence of guest workers and undocumented workers in the farm labor force. Wage rates are outdated, as they are based on the previous year's surveys, and they allow growers who have trouble finding workers to avoid offering *higher than average* wages, as the market would demand. Instead, the AEWR is a regional average. DOL should revise the method for determining the AEWR to prevent downward pressure on the wages of domestic farmworkers.

➜ The rules regarding piece rates should be changed to end abuses. Piece rates delineated in the H-2A contract should rise annually with changes in the Adverse Effect Wage Rate.

Employers should be required to pay Social Security and unemployment taxes on guest worker wages.

➜ The exemption from Social Security (FICA) and federal unemployment (FUTA) taxes on wages paid to H-2A workers is currently a huge monetary incentive for H-2A employers to choose guest workers over domestic workers. Congress should end this incentive for H-2A employers by requiring them to pay an amount equivalent to FICA and FUTA taxes for their H-2A workers. Payment of these taxes would also strengthen the social safety net.

Anti-discrimination laws should apply to recruitment of H-2A workers abroad.

➜ Workers recruited abroad for employment in the United States, including for H-2A program jobs, should not be subjected to hiring practices that would be illegal if they occurred in the U.S. Employers should be held "strictly liable" for recruitment practices by recruiters or sub-contractors on their behalf.

Workers who have already worked in the H-2A program should have a guaranteed "right of recall."

➜ Workers who perform well and complete their contracts for an H-2A employer should be entitled to be hired the following season, assuming there remains a labor shortage. This requirement would reduce workers' fear of retaliation for joining a labor union or raising a concern.

➜ Employers should be obligated to arrange a visa for returning workers, rather than subjecting workers to the process of paying recruiters in the foreign country every year for access to a visa and a job.

Increased union representation would help H-2A workers protect themselves from abuse and exploitation.

➜ DOL should recognize and support the important role of union organizing and collective bargaining for workers on both sides of the border. DOL should work with the State Department and other agencies to support the efforts of unions to open foreign offices to prevent recruitment abuses.

➜ DOL should facilitate the efforts of unions to provide workers with bona fide grievance-arbitration processes, which can be efficient mechanisms to resolve disputes.

APPENDIX:

RESOURCES ON H-2A PROGRAM ABUSE

Recent Media Coverage:

Courthouse News Service: Dan McCue, "Blacks Say Mexicans Favored on Farm," (June 23, 2011)

Honolulu Star Advertiser: Nelson Deranciang, "Aloun Farms owners hit with more accusations," (June 20, 2011)

Yakima (WA) Herald: "Farm workers laid off in 2008 win settlement against grower," (May 21, 2011)

The Denver (CO) Post: Felisa Cardona, "Third Peruvian shepherd claims abuse in Craig ranch lawsuit," (April 29, 2011)

The Wenatchee (WA) World: Amy Taxin, "Yakima farms named in human trafficking case," (April 21, 2011)

Courthouse News Service: Dan McCue, "Labor Abuse Reported in Tennessee," (April 14, 2011)

The Gainesville (FL) Sun: Kimberley Moore Wilmoth and Karen Voyles, "Federal officials: Human trafficking a pervasive problem," (March 29, 2011)

Moultrie (GA) Observer: Kevin Hall, "Labor Dept. hits J&R Farms," (November 18, 2010)

Deseret (UT) News: Lee Davidson, "A Story of Modern Slavery in Utah," (April 15, 2010)

Yuma (AZ) Sun: James Gilbert, "In the Fields, Farmworkers see abuse, fraud," (January 24, 2010)

The Honolulu Advertiser: Jim Dooley and Christie Wilson, "Aloun Farms owners indicted in forced labor of Thai workers," (August 29, 2009)

New York Times: Dan Frosch, "In Loneliness, Immigrants Tend the Flock," (February 21, 2009)

FoxNews.com: Jennifer Lawinsky, "Tennessee Woman Accuses Farm of Favoring Foreigners," (January 6, 2009)

High Country (CO) News: Rebecca Claren, "Guest workers: Laborers or commodity?" (June 13, 2008)

Yakima (WA) Herald: Leah Beth Ward, "Farm workers' lawsuit names Zirkle fruit," (March 3, 2008)

WTVD-TV (NC): Steve Daniels, "Guest worker program: Are we treating them like guests?" (November 15, 2007)

The Washington Post: Laura Wides-Munoz, "Migrants See Abuse in Guest Worker Jobs," (June 2, 2007)

NPR: Jennifer Ludden, "Corruption Leads to Deep Debt for Guest Workers," (May 8, 2007)

Raleigh (NC) News-Observer: Kristin Collins, "Workers: Promise became a prison," (March 10, 2007)

New York Times: Eduardo Porter, "Who Will Work the Farms?" (March 23, 2006)

Magazine/ TV:

Dan Rather Reports (HDNet TV), "All I Want is Work," (October 12, 2010) - transcript

Mother Jones: John Bowe, "Bound for America," (May/June 2010)

The Nation: Felicia Mellow, "Coming to America," (June 25, 2007)

The Nation: David Bacon, "Be Our Guests," (September 27, 2004)

>>

APPENDIX:
(CONT).

Boston Magazine: Michael Blanding, "The Invisible Harvest," (October 2002)

Equal Justice Magazine: Daniel Cox, "Discrimination on the Farm," (Fall 2002), reprinted in Reed Magazine (February 2005)

Vanity Fair: Marie Brenner, "In the Kingdom of Big Sugar," (February 2001)

Mother Jones: Barry Yeoman, "Silence in the Fields," (January/February 2001)

Charlotte (NC) Observer: Leah Beth Ward, "Desperate Harvest," (October 1999) – three-part series

Reports:

Colorado Legal Services Migrant Farm Worker Division, Overworked and Underpaid: H-2A Herders in Coloradio (January 2010)

Farmworker Justice, Litany of Abuses: More – Not Fewer – Labor Protections Needed in the H-2A Guestworker Program (December 2008)

Southern Poverty Law Center, Close to Slavery: Guestworker Programs in the United States (March 2007)

Photo Credits:

Cover (clockwise from left): Student Action with Farmworkers; Shutterstock; David Bacon; p.6 David Bacon; p. 10 David Bacon; p. 11 Rebecca Young; p. 13 Tim Freilich, Legal Aid Justice Center (VA); p. 14 Rosa Varela, Community Legal Services (AZ); p. 15 From the film, *After I Pick the Fruit*, by Nancy Ghertner, to be released in October 2011; p. 16 Rebecca Young; p. 17 From the film, *After I Pick the Fruit*, by Nancy Ghertner, to be released in October 2011; p. 20 From the film, *After I Pick the Fruit*, by Nancy Ghertner, to be released in October 2011; p. 21 (top to bottom): *Dan Rather Reports*; Georgia Legal Services; p. 22 Farmworker Justice; p. 23 Miriam Strauss; p. 24 David Bacon; p. 25 From the film, *After I Pick the Fruit*, by Nancy Ghertner, to be released in October 2011; p. 26 Student Action with Farmworkers; p. 27 Farmworker Justice; p. 30 Courtesy of Diego; p. 31 Student Action with Farmworkers; p. 33 Kimi Jackson, Colorado Legal Services, from "Overworked and Underpaid: H-2A Herders in Colorado" (2010); p. 34 Farmworker Justice; p. 39 Rebecca Young; p. 40 Student Action with Farmworkers; p. 43 Tim Freilich, Legal Aid Justice Center (VA)

Design by: www.katetallentdesign.com

FARMWORKER JUSTICE

1126 16th Street NW, Suite 270
Washington, DC 20036
202.293.5420
www.farmworkerjustice.org

FARMWORKERS HOUSING AND HEALTH
IN THE UNITED STATES

A General Introduction and Overview[I]

[I] Much of the information in this paper was excerpted from *Taking Stock: Rural People, Poverty, and Housing in the 21st Century.* Housing Assistance Council (Washington DC: 2012).

Introduction

Agriculture is a multibillion dollar industry in the United States and is integral to the health and well-being of the nation. Most Americans enjoy an abundance of high quality food at some of the most affordable prices in the world. The affordability of fresh and unblemished fruits and vegetables comes, in part, through cheap labor undertaken by farmworkers. While no definitive figures are available, approximately 2-to-2.5 million people work harvesting fields, farms, and orchards in the United States.[1] Among the poorest groups in the nation, farmworkers are challenged by low wages, exploitation and discrimination that hinder their ability to access affordable quality housing. The adverse conditions faced by farmworkers are further exacerbated by a plethora of legal, cultural, and geographic circumstances that often keep this population in the shadows of American society and contribute to their economic marginalization.

In large-scale surveys and standard data sources such as the Current Population Survey or the American Community Survey, data on farmworkers are generally nonexistent or unreliable. The National Agricultural Workers Study (NAWS) provides valuable insights into the characteristics of farmworkers in the United States and serves as the basis of much of the information presented in this report.[II] Administered by the U.S. Department of Labor, NAWS is an employment-based, random survey of the demographic and employment characteristics of the U.S. crop labor force. Since 1988, NAWS has been surveying crop workers annually and publishing periodic research reports and a public-use dataset.

Specialized reports and ethnographic studies periodically provide additional insights into different aspects of farmworkers' lives. These are often valuable, but sound policy analysis and program planning requires careful attention to the limitations of each study, i.e., methodology, sub-population studied, and distinctive community context.

Farmworkers in the United States often have been racial and ethnic minorities or immigrants. Farm work, which involves physically demanding labor, often serves as entry-level employment for newly-arriving immigrant workers, some of whom eventually move out of farm labor and into other forms of employment. They are replaced by others, who go through the same cycle.

However, this pattern is changing. Economic, political, technological, and national security transitions are changing the landscape of migrant and seasonal labor. Most farmworkers are still Mexican immigrants who come to work in the U.S. as young adults, but

[II] Unless otherwise noted, the figures and statistics in the farmworker analysis come from Housing Assistance Council (HAC) tabulations of the 2005 to 2009 NAWS data. The public-use NAWS data set includes interviews for FY2010-2012 and selected analyses have been updated to reflect recent changes. NAWS provides vital information on the conditions of farmworkers. However, these surveys have distinct limits. The NAWS provides data for active farmworkers only, includes limited information on the families of farmworkers, and contains virtually no data on the conditions of persons who were farmworkers in the past but have made the transition to other employment or on currently inactive, unemployed, or retired farmworkers. The NAWS sample also includes only crop workers, not livestock workers. Description of the NAWS methodology, the survey instrument, codebook, and public-use dataset are available on the ETA/DOL website http://www.doleta.gov/agworker/naws.cfm

farm work is less often a gateway to other occupations. Over the past decade, an increasing number of farmworkers remain in agriculture throughout their working lives. The mean age of U.S. farmworkers in 2012 is now 38. Farmworkers are remaining in agriculture in part because the educational and skills requirements for non-agricultural jobs are increasing. Today, the farm labor population is more stable, experienced, and less mobile than 10 years ago. Fewer farmworkers are following crops along the migrant streams, instead staying in place all year.

The U.S. farm labor force, whether unaccompanied workers or farmworker families, almost always has been poorly housed, and these developments are creating new and different demands for housing. While the residency patterns of farmworkers is changing, the conditions of substandard, unaffordable, and crowded housing remain unchanged for most farmworkers in America today. This presents a new challenge and opportunity for the communities in which they live, as housing has a direct link to health.

The composition, working, and housing conditions of the U.S. farm labor force vary substantially from region to region and, within regions, from one labor market and crop to another. This can lead local employers and service providers to question the accuracy of national-level estimates. The proportion of indigenous farmworkers in the labor force, for example, is higher along the Pacific Seaboard than in the Midwest while, conversely, the proportion of farmworkers who are U.S. citizens is much higher in the Midwest. The socioeconomic context in which farmworkers live and work also varies greatly from one area to another; for example, California agribusiness relies much more heavily on farm labor contractors than most other states, North Carolina relies more heavily on guest workers than other states, and the proportions of farmworkers living in mobile homes or labor camps varies greatly from one community to another.

Social Characteristics

Many factors contribute to the evolving context of farmworkers' lives in the U.S., but two events of the last decade in particular have had significant impacts. The recent economic recession and the near collapse of some industries, especially the construction sector, interrupted traditional labor transition patterns long associated with farm work. Fewer non-farm jobs are available for farmworkers to move into and an increasing proportion of even "low skill" jobs require fluency in English, basic writing skills, or computer literacy. The burgeoning demand for fresh produce also has increased the availability of farm labor jobs and the duration of the work season, which also affects the need for housing.

Homeland security concerns in the wake of the September 11, 2001 terrorist attacks have also shaped farmworker demographics. While many farmworkers and family members are citizens and documented and live in the U.S. year round, before September 11 it was possible for farmworkers who lacked permanent status to work in the United States and visit their families in Mexico or Central America each year. Now, it is easy enough to exit the United States, but getting back into the country has become much more difficult.[2] Increasingly, foreign-born farmworkers are remaining in the United States for longer periods or bringing their spouses and children to live with them in the U.S. The lack of immigration reform has made farmworkers' employment and concomitant housing circumstances even more complicated. The circumstances are altering the demographic composition of farmworker

populations such that families are now more prevalent than single men[III].

Farmworkers in the United States are largely ethnic minorities or immigrants. More than nine of ten farmworkers are of Hispanic heritage. Much has been reported about how the rapidly growing Hispanic population has had an impact on the face as well as the economies of many areas of the United States. Nationally, the Hispanic population increased by 15 million between 2000 and 2010 and now comprises 16% of U.S. residents. This growth is four times the rate of the overall population growth rate in the United States throughout the decade.[3] Over the past half century, the impact of Mexican and Central American immigrant farmworkers settling in rural communities has been dramatic, as once-homogeneous communities throughout the U.S. have become ethnically diverse.

Contrary to expectations, however, the increases between 2000 and 2010 in the total Hispanic population and in the numbers of individuals who are undocumented may not be intimately connected to the farm labor population. A recent report by the Pew Hispanic Center challenges the perception that the growing undocumented Hispanic population has found employment primarily in farm labor, estimating that only 3% of the unauthorized labor in the U.S. is employed in agriculture.[4]

About half (52%) of the persons engaged in U.S. farm work are legal residents of the United States (33% are citizens and 19% are legal permanent residents or work-authorized), while the other half are undocumented workers. While the proportion of unauthorized farm labor force has remained consistent over the past decade, a growing share has gained U.S. citizenship.[5] The proportion of farmworkers who are citizens increased from 22% in 1998 to 33% in 2012. Most foreign-born farmworkers come to the U.S. at an early age, so most (about three-quarters) of their children are U.S.-born citizens. The share of "mixed status" families among farmworkers increased from 10% in 1998[6] to 24% in 2009.

More than two-thirds of farmworkers were born outside the United States, while the rest were born in the United States or Puerto Rico. There is a great deal of variation from state to state in the proportion of foreign-born farmworkers in the farm labor force. In California, for example, 96% of all farmworkers were born in Mexico or Central America, while in the Midwestern states many more of the workers are native-born. The overwhelming majority of foreign-born farmworkers are of Mexican origin, but Central Americans continue to make up 2-4% of the farm labor force. While most of the U.S.-born children of Mexican immigrant farmworkers follow different career pathways than their parents, the Mexican-American youth and young adults continue to be a significant sub-population in the farm labor force.

Immigrant farmworkers on average have resided in the United States for 15 years. Residency figures signal a shift in the demographics of farmworkers, with foreign-born farmworkers still entering the United States as teenagers or young adults but staying in this country longer than previously. More than 80% of farmworkers entered the United States before 2005.

Consistent with the nature and physical demands of their occupation, farmworkers largely are adults who tend to be slightly younger than the general population. The median age of farmworkers in 1998 was 31 years, but by 2009 the farmworker median age had increased to

[III] Id.

34 years. The increasing average age of agricultural workers may be influenced by immigration policies and issues that have reduced the number of new nonresident farmworkers entering the United States.

The nature of farm work creates unique household and family dynamics. Most farmworkers live in a family unit, some in complex households that include extended family members, and others (particularly those who are newly-arrived) travel, work, and live in groups of single men.[7] The vast majority of farmworkers (more than three-quarters) are men; but women play an important role in filling some types of agricultural jobs. Over the past several years, the proportion of women in the farm labor force has been slowly increasing. As in other low-income immigrant households, husbands and wives usually both work to make ends meet.

Almost two-thirds of all farmworkers are married, but about one-quarter of these married workers are "unaccompanied"; their spouses and children did not come to the U.S. with them. While about half of the farmworkers in the U.S. are living in households with their children, the vast majority of farmworkers are supporting families with children. More than half of the families with children are very low-income (living below 125% of the LLSIL, or Lower Living Standard Income Level). As might be expected, the families with more children are the poorest.

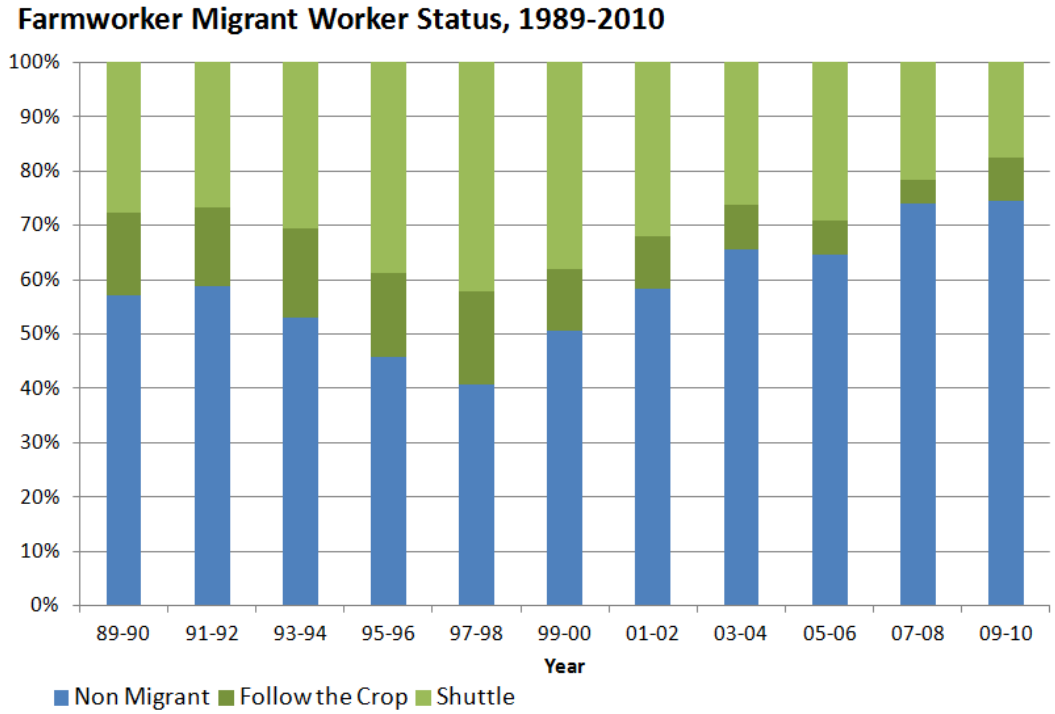
The typical farmworker household consists of a nuclear family of parents and children, but economic necessity often makes it necessary for farmworker families to share housing. While housing arrangements vary greatly from community to community, about one-third of farmworkers live in "complex" households where a single-family house or apartment is shared by multiple families and, sometimes, unrelated co-workers. Although the proportion of unaccompanied male migrants in the labor force is decreasing, there continues to be a substantial population of farmworkers living in crowded all-male households—sometimes labor camp barracks, but, also old motels, mobile homes, apartments, or single-family houses or less formal shelter arrangements.

Economic Characteristics

Harvesting crops is largely low-wage employment but, for many, it also serves as a stepping-stone into more stable employment. Non-English speaking and undocumented workers are at increased risk of being victims of labor and housing rights violations and they often are the target of anti-immigrant sentiment, but these issues are confronted by virtually all farmworkers. The economy and mechanization have reduced the overall need for farm labor, but crops largely are harvested by hand and a substantial number of agricultural jobs still exist in the United States. Changes in production practices appear to be increasing the amount of farm labor devoted to pre-production tasks (such as soil fumigation or transplanting) as well as post-production. From 2007 to 2012, the number of U.S. farms reporting hired labor expenditures increased by 17%, producers' labor expenditures for directly-hired labor increased 23% and contract labor by 44%, greatly outpacing inflation for the period.

One sign of greater stability in the farmworker population is increased work experience. In 2009, the average farmworker had 13 years of experience in farm labor, up substantially from an average of eight years of farm work reported in 1998; about one-quarter of the farm labor force consists of middle-aged workers who have worked 20 years or more in agriculture.

Figure 1: Farmworkers are Becoming Less Mobile



Source: HAC Tabulations of 1989-2010 National Agricultural Workers Survey

Historically, migration has been an element of farmworker life. A pattern of traveling to a particular geographic area to harvest crops for a temporary period was common. Under this framework, migrant farmworkers were categorized according to one of three migration streams: East, Midwest, and West. During the winter months, migrant farmworkers typically resided in their home-base communities in California, Florida, and Texas, or in Mexico or other Central American and Caribbean nations. They traveled along the respective streams to perform farm work.[8]

In recent years, migration patterns have changed. In the past decade, the proportion of migratory farmworkers declined substantially. Currently, the largest ongoing migration stream is along the Eastern Seaboard, as a result of high levels of winter labor demand and scarcity of summer work in Florida. This makes migration "up the stream" an important part of the East Coast farm labor scene.

Increasingly, farmworkers are settling into local communities and traveling shorter distances to work while generally remaining in a specific geographic area. By 2012, an estimated 86% of farmworkers lived in the same place throughout the year. The number of farmworkers reporting only one farm employer in the past year has increased in the past decade. In 2009, as many as 81% of farmworkers worked for only one farm employer for the year, up from 65% in 1998.

While work patterns are changing, a good number of farmworkers still travel to different regions of a state or to different states following crop seasons and labor demand. Although there are complex definitional issues regarding ways to define migrancy, it appears that only about one out of five farmworkers, most of them relative newcomers to U.S.

agriculture, are migrants.

Farmworkers are among the poorest populations in the country. In 2009, approximately half of all individual farmworkers earned $16,250 or less annually. To put these income levels into perspective, only 18% of all households nationally earn under $20,000 per year.[9] While farmworkers' average hourly earnings have increased nominally and in real terms over the past decades, these gains do not compare with those gained by non-farm workers. In addition, the rate of gain has slowed substantially during the past five years, and increased at about half the rate of inflation from 2007-2012.

Approximately one-quarter of farmworkers have below-poverty family incomes; this is roughly twice the national rate of poverty. Poverty rates are decreasing for farm workers, however; in 1998, approximately 46% of farmworkers had incomes below poverty level compared to 25% today. The reduction is likely related to the greater stability of the labor force. Families with children are much poorer than the overall farmworker population; close to half of these farmworker family households continue to live below the poverty level.

By 2009, farmworkers were working more days of the year, earning higher wages, and living more often in two-income households than in 1998.[IV] Farmworkers' economic progress is uneven; the recent recession seems to have slowed their wage gains and resulted in less work. This is a valuable reminder of the constant uncertainties faced by farmworkers as market conditions or weather impact production. Many farmworkers in California's San Joaquin Valley, the region of the state most seriously affected by the 2012 drought, for example, are finding less work than those who have settled in a local community.

Despite low incomes, persistent under-employment, and periodic seasonal unemployment, most farmworkers do not use public assistance programs. An estimated 43% of farmworker families utilized public assistance programs between 2007 and 2009, an increase from the 35% who used these services between 1998 and 2000. While contribution-based assistance such as unemployment insurance has remained constant, there has been a more marked increase in need-based assistance, such as Medicaid the Special Supplemental Nutrition Program for Women, Infants, and Children program (WIC); and food assistance.[10]

Farmworker Housing Conditions

Farmworker housing conditions and needs vary by type, location, tenure and condition. Migrant farmworkers often reside in formal or informal labor camps, RV and mobile home parks, old motels, vehicles, campgrounds, in fields, under tarps or in barns and tool sheds. Seasonal and year round farmworkers, and farmworkers and their families, often reside in dilapidated rental housing and substandard mobile home parks. Farmworkers who are fortunate enough can benefit from the federally and state subsidized housing programs that provide decent, affordable homeownership and rental housing.

[IV] Farmworkers who did not have prior calendar year income are not included in the poverty estimates produced by the NAWS. This stipulation eliminates about 15% of all crop workers from NAWS data. If the earnings of these omitted workers were calculated, the share of farmworkers with level incomes below poverty would likely be higher.

Housing conditions for farmworkers and their families historically have been substandard, whether in typical rental housing or in formal and informal labor camps, mobile home parks, camp grounds, open fields, parked cars, tool sheds, barns, and other makeshift shelter arrangements. During the past decade, the shift away from migrant labor toward a more year-round workforce added pressure on housing. The decrease in farmworker mobility has contributed to the cultural diversity and economic development of the communities in which they live, while also adding to the strain on housing. Whether the shift in farm labor has been the result of the economic downturn, an increase in the temporary visa workforce or changing production practices, the stress on rural communities and an inadequate farmworker housing stock has continued to increase. The communities in which farmworkers and their families live often must contend with other deprivations such as the lack of a decent or sufficient water supply, inadequate septic systems, no streetlights or sidewalks, and fundamentally inadequate municipal services that other communities take for granted as basic necessities.

The nature of their employment and working conditions means that farmworkers' housing options – in terms of arrangement, costs, and quality – often are substantially different from others' options. Farmworker housing may be provided by the private market or by the employer. Most farmworkers (85%) access their housing through the private market. More than 60% of farmworker-occupied housing units are rented and approximately 35% are owner-occupied. The private housing market often fails to meet the needs of farmworkers. Rental housing is not as plentiful in rural communities as it is in urban areas. Rental properties frequently can be acquired only with a security deposit, a credit check, a utility deposit and sometimes a long-term commitment – requirements that often conflict with the unique conditions of the farm labor industry.[11]

Income from farm work has seasonal fluctuations that can make rental or homeownership in the private market more difficult. Where private rental housing is available, health and safety standards in private rental housing are often subject to lax enforcement, so units available to farmworkers may be substandard and too expensive. Formal and informal labor camps or other shelter arrangements are often unregulated or poorly regulated. Although such housing might be provided in exchange for work rather than rent, it may be inconvenient or of poor quality. Farmworkers fear retaliation, in employment and/or housing, should they complain or seek help from authorities to remedy substandard conditions.

Only about 13% of farmworker housing units are employer owned. Among these, 83% are provided free of charge to the workers; however families are often charged for utilities. The prevalence of employer-owned housing has declined markedly since 1995, when nearly 30% of farmworker units were owned by the employer. In many states, employer-provided housing is regulated to some degree for health and safety reasons, thus possibly benefiting workers whose other housing options are not subjected to scrutiny. Employer-owned housing is not without problems, however. A situation with an employer as a landlord may compound an already asymmetric relationship. Some farmworkers may be uncomfortable complaining or making suggestions regarding housing to their employer.[12] Increasingly, regulation, combined with the costs of administration and maintenance of housing, has dissuaded many growers from providing housing to workers.[13]

In situations where migrant workers' employers are farm labor contractors, employer-

provided housing is very often problematic. In the Eastern Migrant Stream, in large measure because farmworkers must rely on farm labor contractors for transportation and housing as well as for employment, there have been a number of cases where farm labor contractors were holding workers in conditions of indentured servitude in isolated labor camps. Although less common, similar problems have also been documented in some areas of California (e.g. the Sacramento River Delta). Problems stemming from farm labor contractors' role in housing workers in isolated areas have also been a particular problem for farmworkers working in reforestation.

Guestworkers: How does the growth of the H-2A program affect farmworker housing?

Agricultural guest worker or "H2A" visas have generated increased controversy in the farm labor community over the past decade. The H2A temporary foreign agricultural worker program allows agricultural employers to hire workers from other countries with temporary work permits to fill agricultural jobs for less than one year.[14] The temporary work visas can only be issued once an employer documents a labor shortage of U.S. citizens who are unwilling or unable to perform the task.[15] Under the program, employers must compensate workers with prevailing wages and guarantee minimum work hours. The guest worker program has grown substantially over the past few decades and approximately 70,000 H2A visas are issued for agricultural work annually in the United States.[16]

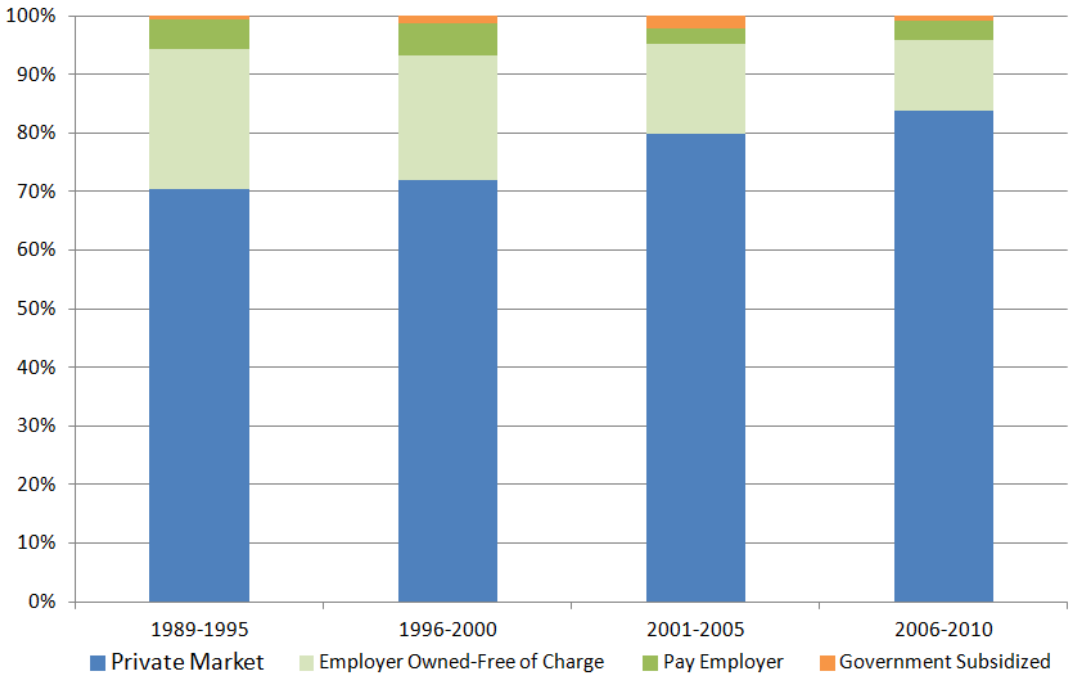
The H2A program requires employers to provide free housing or pay for workers' housing. The housing must be inspected and certified in advance to ensure that it complies with applicable health and safety standards. While these obligations are intended to promote the safety and well-being of guest workers, documented abuses of the program and employees have been reported over the past few years.[17] Again, the remote and rural nature of many facilities housing H2A workers contributes to the potential for abuses by employers. Additionally, with the considerable growth in workforce visas, competition for housing options, which are scarce in many communities, has grown between guest visa holders and non-H2A farmworkers. Furthermore, since employers who wish to hire H2A workers cannot be certified unless their housing is inspected and certified, the agencies inspecting housing face pressure from H-2A employers to prioritize their inspections, sometimes at the expense of timely inspections of other farmworker housing.

Farmworker housing may also be categorized as *on-farm* or *off-farm* housing. During the Depression era and after, farmworkers in the many parts of the country were housed predominately by growers in large on-farm tent camps. After public outcry about deplorable living conditions in the 1960s and 1970s, however, laws and regulations were enacted to ban these makeshift camps. Since then, growers generally have been less involved in the housing of farmworkers.[18] Today, on-farm housing, while much improved from past decades, often only affords the most basic arrangements (such as simple concrete barracks or older manufactured homes), typically of lower quality than off-farm housing.

Figure 2

Employer Provided Housing is on the Decline

Farmworker Housing Arrangement, 1989-2010



Source: HAC Tabulations of 1989-2010 National Agricultural Workers Survey

The vast majority of farmworker housing units (85%) are located in off-farm settings, with the remaining 15% of farmworker housing units located on a farm. The number of on-farm housing units has been in decline over the past few decades. Prior to 1995, estimates indicated that 75% of farmworker housing was off the farm. It is important to recognize the diversity and huge disparities in quality of off-farm housing. In some agricultural communities, farmworker housing is dispersed throughout a town and is quite similar to the accommodations of other low-income community residents (although typically more crowded); in others, farmworker housing has been concentrated in the neighborhoods with the most decayed infrastructure, giving rise to rural ghettoes.

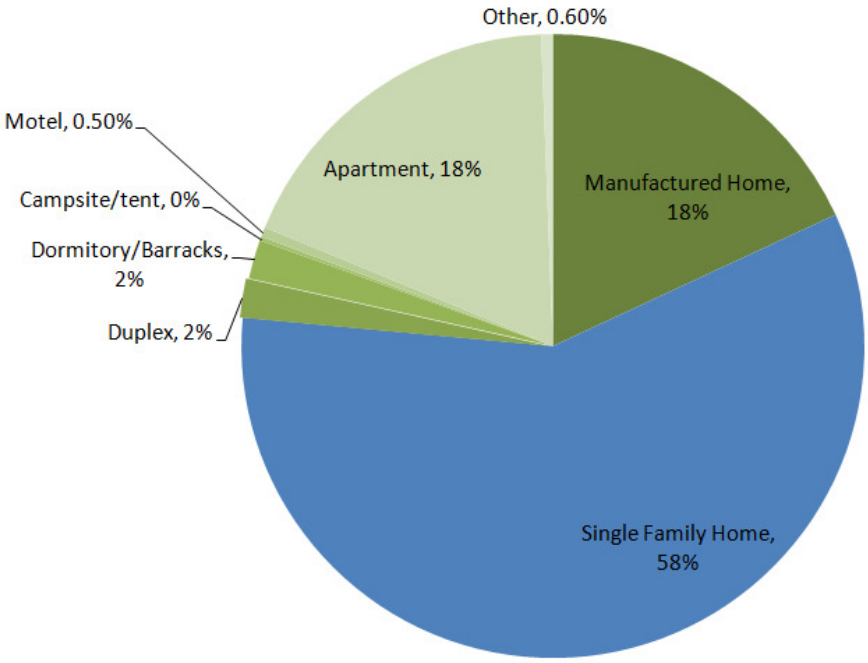
Farmworkers are much more likely to be renters than are U.S. residents as a whole. Only one-quarter of farmworkers own a home in the United States, compared to nearly two-thirds of all households in the United States. Forty percent of farmworkers are estimated to own a home in another country, however.

Single-family homes, prevalent throughout the rural U.S., are home to the majority (58%) of farmworkers in the U.S. Fewer live in apartments (18%) and manufactured homes (18%). A more telling indicator of the precarious nature of farmworker housing arrangements is the number of farmworkers who live in dormitory or barracks settings (2%) and tents, motels, or other housing structures (1%).

Figure 3

Most Farmworkers Live in Single-Family Homes

Farmworker Housing Type, 2005-2009



Source: HAC Tabulations of 2005-2009 National Agricultural Workers Survey

Farmworkers cope with a spectrum of housing problems, including costs that do not fit their incomes, substandard quality, and the need for short-term housing during temporary work. Farmworkers often face crowded housing conditions as a result of their low incomes and high housing costs. One definition of crowding is more than one person per room (excluding bathrooms). Excluding dormitories and barracks (structures designed for high occupancy), almost 31% of farmworkers live in crowded conditions. This figure is more than six times higher than the national average. While a substantial portion of farmworker housing units are crowded, the incidence of crowding is even greater in some types of housing. More than 40% of apartments housing farmworkers and one-half of duplexes contain more than one person per room.

A survey of farmworker housing conditions conducted by HAC[V] in the early 2000s estimated that 17% of farmworker housing units were severely substandard and an additional 16% were moderately substandard. Farmworkers in manufactured homes were more likely to experience substandard living conditions, with 44% of manufactured homes being classified as moderately or severely inadequate.[19]

[V] NAWS does not provide detailed information about housing quality or conditions.

Substandard and structurally deficient conditions are endemic to farmworker housing; however, they are often exacerbated by crowding or and lack of affordability. Approximately 20% of farmworker housing units surveyed by HAC were both substandard and crowded. In 11% of all units surveyed, both substandard conditions and cost burden existed, and 6% suffered three housing deficiencies; they were substandard, crowded, and unaffordable.[20] Though containing numerous serious problems, these units often were home to children. In addition to high housing costs, crowding, and substandard housing, farmworkers also encounter unique environmental hazards related to housing, particularly exposure to pesticides in homes near fields.

How Many More "Durovilles" Are There in the U.S.?

Typical Duroville home

The Desert Mobile Home Park (commonly referred to as "Duroville," named for its owner) is an infamous manufactured home community located in California's Coachella Valley on the Torres Martinez Indian Reservation. This community was largely inhabited by farmworkers, with an estimated 2,000 to 6,000 migrant workers living in the park's several hundred manufactured homes.[21]

Duroville gained national attention because of its deplorable housing conditions and the legal battles surrounding its continued operation. Duroville residents resided in very old mobile homes amidst unsafe and unsanitary conditions, including open sewage, hazardous electrical wiring and packs of wild dogs.[22] *In response to numerous health and housing violations, the U.S Attorney's Office on behalf of the Bureau of the Indian Affairs sought to have the park closed in 2009. A contentious and complicated legal battle ensued, and after many years Duroville was finally closed in 2013. Most of Duroville's residents have been relocated to Mountain View estates, a newly developed community of modern manufactured homes funded with public and private resources.*[23]

Mountain View Estates

While Duroville has been closed, hundreds of other substandard manufactured home parks across the nation continue to serve as a primary source of housing for farmworkers. These old manufactured home parks are emblematic of the challenge many farmworkers face in finding decent housing in the private market.

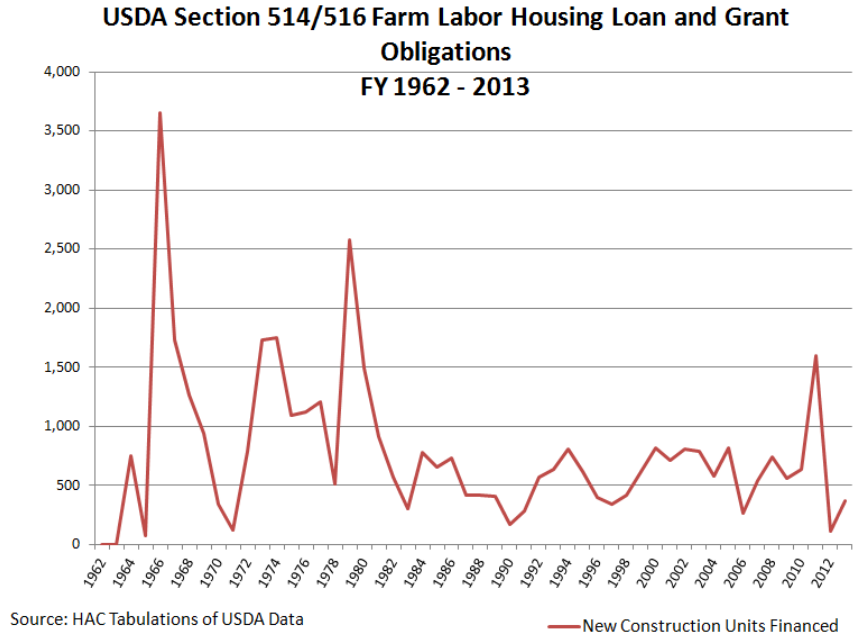
Federal Investment in Farm Labor Housing

Less than 1% of farmworkers are estimated to receive any form of affordable housing assistance from a state, local, or federal government entity. For more than 40 years, the federal government has been working to combat farmworker housing problems through grant and loan programs. One important farmworker housing resource is the USDA Section 514/516 Farm Labor Housing program, which provides funding to buy, build, improve, or repair housing for farm laborers.[VI] This program addresses some of the barriers farmworkers face in finding safe, decent housing, such as high levels of poverty, the lack of affordable rental housing and the inability to sign a full-year lease.

Slightly fewer than 800 USDA Farm Labor Housing properties encompass more than 14,000 units located across the nation. While many USDA projects are employer-managed and located on-farm, the majority of the 514/516 units are located off-farm because off-farm properties can support many more units than on-farm projects. Off-farm housing is located primarily in the West and in the states of California, Florida, and Texas.

Figure 4

Production of Federally-Funded Farmworker Housing Has Declined



Source: HAC Tabulations of USDA Data

[VI] A number of other federal programs address farmworker housing problems, such as the Department of Labor's Migrant and Seasonal Housing program, HUD's Rural Housing and Economic Development Program/Rural Innovation Fund, and HUD's HOME Investment Partnerships program, as well as the Low Income Housing Tax Credit.

Despite moderate increases in overall funding, the development of new units of Section 514/516 Farm Labor Housing has been steadily dropping over the past 25 years. This decrease in housing unit development may be due partially to the fact that development funding has not kept pace with rising development and construction costs. This decline culminates in an aging housing stock, with the majority of units over 25 years old.[1]

Recent economic, social, and political developments in the United States continue to change the landscape for farmworkers. Today, farmworkers live in poverty at more than twice the national rate and are six times more likely to live in crowded homes than are others across the nation. While reliable data are limited, available information indicates that the nation's farm laborers are less mobile, and are more often settled in local communities than 10 years ago. While most of these developments are generally positive, the social, economic, and housing conditions that many farmworkers experience are still precarious.

As discussed in subsequent papers here, farmworker housing conditions are linked in many diverse ways to the overall health of farmworkers and their families. With the prevalence of crowded, substandard, and unaffordable farmworker housing conditions, an increased investment in housing for farmworkers is a critical component in a public health response to farmworker well-being.

This investment should be multifaceted and come from private as well as public sources. Farmworker housing needs have long outpaced the federal funding offered to improve the housing conditions. The agricultural industry, from local growers to multinational corporations, has a responsibility to ensure that an integral element of its workforce is appropriately compensated, housed, and protected.

An important consequence of farmworkers' decreasing migrancy, coupled with their continuing poverty and economic instability as seasonal work ebbs and flows, is that the stakes are higher every year, not just for farmworkers, but for the local communities in which they live. Overall community well-being will be determined by the types of neighborhoods which evolve. Sound farmworker housing policy will be a crucial component of sound community health policy.

Notes

[1] David A. Strauss. "Farm Labor Housing: An Overview." *Rural Voices*. 10, No. 2. 2006. 2-6.
[2] Housing Assistance Council. *USDA Section 514/516 Farmworker Housing: Existing Stock and Changing Needs*. Washington, DC: Housing Assistance Council. 2006.
[3] Housing Assistance Council tabulations of the 2010 Census of Population and Housing.
[4] Pew Hispanic Center. *Unauthorized Migrants: Number and Characteristics*. Washington, DC. 2005, http://pewhispanic.org/files/reports/46.pdf.
[5] Daniel Carroll, Anne Georges, and Russell Saltz. "Changing Characteristics of U.S. Farmworkers: 21 Years of Findings from the National Agricultural Workers Survey." Paper presented at the Immigration Reform an Agriculture Conference, "Implications for Farmers, Farmworkers and Communities." University of California, May 2011.
[6] Ibid.
[7] National Center for Farmworker Health, Inc. (NCFH). *Overview of America's Farmworkers*. 2002.
[8] Ibid.
[9] Housing Assistance Council tabulations of the U.S. Census Bureau's 2005-2009 American Community Survey.
[10] Carroll et. al. "Changing Characteristics of U.S. Farmworkers."
[11] Housing Assistance Council. *USDA Section 514/516*.
[12] Julian Samora Research Institute (JSRI). *JSRI Research Analyzes Farmworker Housing*. NEXO VIII, No. 1. 1999. East Lansing, Michigan.
[13] NCFH. *Overview of America's Farmworkers*; JSRI, *Farmworker Housing*. East Lansing, Michigan; HAC. *USDA Section 514/516*.
[14] "Farmworker Justice. H-2A. *Guestworker Program: Introduction to the H-2A Program.* January 2010.
[15] Immigration and Nationality Act of 1952 (INA), as amended (8 USC §§1101, 1184, and 1188); 20 CFR 655 Subpart Band 29 CFR Part 501.
[16] Ibid.
[17] "Close to Slavery: Guestworker Programs in the United States." Southern Poverty Law Center. 2007.
[18] Housing Assistance Council. *USDA Section 514/516*.
[19] Housing Assistance Council. *No Refuge from the Fields: Findings from a Survey of Farmworker Housing Condition's in the United States.* Washington, DC: Housing Assistance Council. 2000.
[20] Housing Assistance Council. *No Refuge from the Fields: Findings from a Survey of Farmworker Housing Condition's in the United States.* 2000.
[21] Dan Barry. "Beside a Smoldering Dump, A Refuge of Sorts." *The New York Times*. October 21, 2007.
[22] David Kelly. "The Southland's Hidden Third World Slums." *The Los Angeles Times*. March 26, 2007.
[23] Phil Wilson. "Farmworkers' new home is near Duroville, yet a world away." *The Los Angeles Times*. March 25, 2014.
[1] Housing Assistance Council. *USDA Section 514/516*.

BMC Public Health

REVIEW Open Access

Pesticides and environmental injustice in the USA: root causes, current regulatory reinforcement and a path forward

Nathan Donley[1*], Robert D. Bullard[2], Jeannie Economos[3], Iris Figueroa[4], Jovita Lee[5], Amy K. Liebman[6], Dominica Navarro Martinez[7] and Fatemeh Shafiei[8]

Abstract

Many environmental pollutants are known to have disproportionate effects on Black, Indigenous and People of Color (BIPOC) as well as communities of low-income and wealth. The reasons for these disproportionate effects are complex and involve hundreds of years of systematic oppression kept in place through structural racism and classism in the USA. Here we analyze the available literature and existing datasets to determine the extent to which disparities in exposure and harm exist for one of the most widespread pollutants in the world – pesticides. Our objective was to identify and discuss not only the historical injustices that have led to these disparities, but also the current laws, policies and regulatory practices that perpetuate them to this day with the ultimate goal of proposing achievable solutions. Disparities in exposures and harms from pesticides are widespread, impacting BIPOC and low-income communities in both rural and urban settings and occurring throughout the entire lifecycle of the pesticide from production to end-use. These disparities are being perpetuated by current laws and regulations through 1) a pesticide safety double standard, 2) inadequate worker protections, and 3) export of dangerous pesticides to developing countries. Racial, ethnic and income disparities are also maintained through policies and regulatory practices that 4) fail to implement environmental justice Executive Orders, 5) fail to account for unintended pesticide use or provide adequate training and support, 6) fail to effectively monitor and follow-up with vulnerable communities post-approval, and 7) fail to implement essential protections for children. Here we've identified federal laws, regulations, policies, and practices that allow for disparities in pesticide exposure and harm to remain entrenched in everyday life for environmental justice communities. This is not simply a pesticides issue, but a broader public health and civil rights issue. The true fix is to shift the USA to a more just system based on the Precautionary Principle to prevent harmful pollution exposure to everyone, regardless of skin tone or income. However, there are actions that can be taken within our existing framework in the short term to make our unjust regulatory system work better for everyone.

Keywords: Pesticides, Agrochemicals, Racism, Classism, Environmental justice, Regulation, Farmworkers, Worker safety, Children's health

Introduction

Pesticides have been used for thousands of years – with the first recorded pesticide ingredient, elemental sulfur, used over 4000 years ago in Mesopotamia [1]. As civilizations grew, so did the desire for easy ways to facilitate food production, prevent disease and manage nuisances. From ancient Egypt's divination of cats as representations

*Correspondence: ndonley@biologicaldiversity.org
[1] Center for Biological Diversity, Portland, OR, USA
Full list of author information is available at the end of the article

of gods and protectors of the home (quite adept at rodent control), to the "aim and spray" bottles that are found on store shelves today, modern society's comfort with, and use of pesticides, has rapidly evolved.

A pesticide is anything that is intended to prevent, destroy, repel, or mitigate any pest [2]. This catchall term includes insecticides, herbicides, fungicides, bactericides, and rodenticides, among others. While typically thought of as a chemical component that is manufactured in a facility, the term "pesticide" can also encompass living organisms and management practices that seek to restore balance to an unhealthy system.

Commonly overlooked, the largest and most effective pest controller is nature itself. Traditional Ecological Knowledge (TEK) is an ever-evolving knowledge acquired by Indigenous and local peoples over thousands of years through direct relationship and connection with the land and surrounding environments [3]. The colonization of North America, known by some Indigenous people as Turtle Island, saw the brutal extermination of Native Americans and violently stolen land. Along with the loss of life, culture and TEK came a shift in ideologies that valued capital wealth, control, and expansion over balance and co-existence with land and people.

Hundreds of years would pass before the infamous pesticide, DDT, became a household name and ushered in an era of massive use of chemical pesticides in our daily lives [4]. During this ensuing time-period, structures of racism and class discrimination were erected in the USA through the systematic oppression and exclusion of BIPOC communities and people with lower socioeconomic status. This structural racism and classism, defined here as a system brought about by historical, institutional, cultural, or behavioral societal actions that routinely disadvantage, harm and cumulatively oppress BIPOC and/or people of low-income or wealth, has led to significant disparities in exposure to many pollutants that can lead to premature death or chronic disease [5–7].

Nearly 90% of pesticide use in the USA is in the agricultural sector, making agricultural laborers or farmworkers and their families particularly vulnerable to the effects of these dangerous chemicals [8]. Agricultural work in the USA was founded upon exploitative, dehumanizing mechanisms meant to reinforce white supremacy and prevent upward mobility of people of color. From the abhorrent use of African slave labor on Southern plantations and the subsequent practice of sharecropping and indentured servitude to the exploitation of Asian immigrants to do low-wage farm work along the West coast, racist agrarian structures are as old as modern agriculture itself [9, 10].

Just as chemical-intensive agriculture was becoming commonplace in the mid-twentieth century, the Bracero Program was implemented in the USA to facilitate the use of low-paying Mexican immigrant labor to fill agricultural positions left vacant during World War II [9, 11]. This further perpetuated a racial caste system in which wealthy, mostly white landowners profited from physically demanding, dangerous work done by people of color. Since the end of the Bracero Program, most labor and occupational safety laws have specifically excluded agricultural workers and, to this day, agricultural workers still have fewer protections than most other occupations in the USA [12].

Today 83% of farmworkers identify as Hispanic or Latinx [13]. The average annual income for a farmworker is less than $20,000 a year and one third of farmworkers had family incomes below the federal poverty line [13]. Upward mobility in agriculture is essentially nonexistent, as federal policies and racist lending practices have largely been responsible for 98 and 94% of all U.S. farmland being owned or operated by whites, respectively [9]. All these policies combined have all but ensured that BIPOC and people of low-income or wealth working in agriculture will consistently be the ones that bear the brunt of pesticide exposure in the fields.

In addition to disparate exposures at the workplace, racist and classist structures have led to disparate potential for exposure to harmful pesticides in or near people's homes as well. This has ultimately led to many BIPOC and people of lower socioeconomic status being cordoned off into undesirable places within cities or rural areas that have poorer living conditions and very little political clout.

The 1800s saw overtly racist laws like the Indian Removal Act and Dawes Act that sought to erase Indigenous sovereignty and partition Indigenous people into small tracts of undesirable land. This was followed by the widespread use of eminent domain for "economic development," racially-motivated zoning ordinances, and the practice of "redlining" in the early 1900's that further partitioned and isolated BIPOC and communities of low income and wealth to areas that would receive less economic and social investment and ultimately deteriorate while other areas thrived [14]. More recent calls for "urban renewal" and subsequent gentrification has often further solidified these trends [15].

With regards to pesticide exposure, the consequences are two-fold. One is that these communities can often end up being located near toxic waste sites, including Superfund sites that contain legacy pesticide contamination, and are also directly targeted for new large-scale industrial chemical manufacturing and waste sites [16]. Most pesticides are synthetic chemicals that must be manufactured or synthesized in a facility. Polluting manufacturing facilities tend to be built in lower income

communities with a higher proportion of people of color or in neighborhoods that were already in the process of transitioning to that end [17, 18]. Furthermore, hazardous facilities in lower income areas tend to invest less in pollution reduction than those in higher income areas [19].

Another consequence is that as housing structures in these communities deteriorate due to lack of resources and investment – coupled with often crowded living conditions in public or low-income housing – the heavy use of pesticides is often employed as a short-term fix for chronic pest problems. For example, in subsidized, public housing developments in New York state, 33% of residents reported applying pesticides indoors at least once per week [20]. This varied dramatically by housing density, with nearly *half* of residents in higher density public housing applying pesticides indoors at least *once per week* [20].

In this paper we review the scientific literature and publicly available datasets to determine the extent to which these historical injustices have led to disproportionate exposures and harms to low-income communities and people of color from pesticides. This analysis demonstrates that pesticide exposure and harm often fall upon racial, ethnic, and socioeconomic lines in the USA. While structural racism and classism have likely played an enormous role in shaping this trend, the objective of our study was to explore the current laws, policies and practices in the US government that are facilitating this disturbing trend and propose ways in which these institutional failings can begin to be rectified.

How disproportionate pesticide impacts are realized

Pesticide production

It is well-established that chemical manufacturing, storage, and waste affect BIPOC and impoverished communities more than the general population [21, 22].

An analysis of nine U.S. cities and counties that had high numbers of hazardous chemical facilities found that people who lived within three miles of those facilities were disproportionately African American or Latinx and living in poverty compared to the city or county as a whole [23]. Similar findings have been found on a national level, where African Americans and Latinxs living below the poverty line were more than twice as likely to live within a mile of a hazardous chemical facility [24]. The disproportionate exposure of low income and BIPOC communities to polluting industrial facilities is even more pronounced when analyzing those facilities that release the most harmful pollutants [25]. These polluting facilities also fail to create meaningful job opportunities for the members of the community that they are harming, further perpetuating the detriment to those who live nearby [26].

One of the most infamous industrial facility disasters in the world happened in 1984 in Bhopal, India, where a pesticide manufacturing facility exploded and covered the nearby poverty-stricken community in a toxic gas that ultimately killed thousands of people and injured over half a million [27]. In 2008, Bhopal's sister facility in Institute, West Virginia – which used many of the same dangerous ingredients to manufacture pesticides – exploded, killing two people and blanketing the nearby community in dense smoke [28]. This was in an area of the state that had a 54% Black population compared to the state average of 3.6% and an average per-capita income that was two-thirds of the average in the surrounding counties [29, 30]. A Superfund site in Louisville KY, formally the Black Leaf chemical facility, which manufactured DDT and other pesticides, left widespread contamination in the surrounding area where 44% of people live below the poverty line and 84% of residents identify as Black compared with 16 and 8% in the state as a whole, respectively [31–34]. Another Superfund site, the former pesticide manufacturing facility United Heckathorn, heavily contaminated the harbor in the nearby city of Richmond, CA – where 84% of residents are people of color [35, 36].

As of November 2021, there were 31 pesticide manufacturing facilities in the USA that the United States Environmental Protection Agency (EPA) had deemed in "Significant Violation" of bedrock environmental laws, including the Clean Air Act (CAA), Clean Water Act (CWA), and the Resource Conservation and Recovery Act (RCRA) (Additional file 1). An analysis of the demographics around these polluting facilities identified stark differences with state and national averages. An average of 44% of residents within one mile of these 31 pesticide manufacturing facilities had incomes less than two times the federal poverty level, compared to the national average of 28% and the relevant state average of 29% (Fig. 1).

The racial and ethnic demographics around these manufacturing facilities are more variable. Overall, there is little difference between the average percent BIPOC population within one mile of these facilities and the national average (Fig. 1). However, this gap widens when comparing to the relevant state average (37% BIPOC near facility compared to a 31% state average). Further examination of the data revealed significant variability from site to site, with about half of facilities having a higher BIPOC population within one mile of the facility and the other half having a lower BIPOC population nearby. The racial and ethnic variation appears to be largely regional, as

				1 Mi. From Facility		National Average		State Average	
Facility ID	City	State	Violation	% BIPOC	% low income	% BIPOC	% low income	% BIPOC	% low income
110000450020	BATON ROUGE	LA	CWA	97	60	40	28	42	36
110000503722	ALVIN	TX	CAA	37	20	40	28	59	31
110000597364	GEISMAR	LA	RCRA	44	9	40	28	42	36
110043803676	INSTITUTE	WV	CWA	38	56	40	28	8	33
110000344182	BELLE	WV	RCRA	7	40	40	28	8	33
110000602544	PITTSBURG	CA	RCRA	85	45	40	28	63	27
110008170237	FREEPORT	TX	CAA, CWA	85	75	40	28	59	31
110000463542	LA PORTE	TX	RCRA	36	33	40	28	59	31
110004940869	SUMTER	SC	CWA	68	67	40	28	36	29
110000452359	WEST HELENA	AR	CWA	87	71	40	28	28	33
110013104684	WILLIAMSBURG	IA	CWA	2	26	40	28	15	25
110063187411	SAINT JOSEPH	MO	RCRA	33	56	40	28	21	28
110017770624	SAINT JOSEPH	MO	RCRA	33	58	40	28	21	28
110022523982	ORANGE	TX	CAA	29	36	40	28	59	31
110000468351	SODA SPRINGS	ID	RCRA	9	27	40	28	18	27
110000485109	LATHROP	CA	CAA	67	31	40	28	63	27
110044280863	ELLENWOOD	GA	RCRA	93	31	40	28	48	32
110000491076	WASHOUGAL	WA	CWA	13	28	40	28	32	20
110000868035	NITRO	WV	CWA	4	32	40	28	8	33
110000449765	GEISMAR	LA	CAA	40	9	40	28	42	36
110027360629	MIDLAND	MI	RCRA	12	47	40	28	25	25
110009446643	MEMPHIS	TN	CWA	81	72	40	28	26	33
110000527706	GAINESVILLE	GA	RCRA	74	56	40	28	48	32
110000379563	CARROLLTON	KY	CWA	16	41	40	28	16	35
110035828129	NEWPORT	TN	RCRA	18	63	40	28	26	33
110000597426	SAINT GABRIEL	LA	RCRA	79	57	40	28	42	36
110043787408	MIDLAND	MI	CAA	12	52	40	28	25	25
110000443618	SAINT JOSEPH	MO	RCRA	28	52	40	28	21	28
110045745431	MC COOK	NE	RCRA	7	42	40	28	22	27
110000351930	ELGIN	SC	CAA	28	30	40	28	36	29
110000585974	KENOVA	WV	CWA	8	39	40	28	8	33
Average for All 31 Facilities				37	44	40	28	31	29
Average for Facilities in CA, LA, SC, AR, MO, GA, TN				63	51	40	28	38	31

Red	% BIPOC or people with low income is more than 5 points higher near the facility than the state or national avg
Green	% BIPOC or people with low income is more than 5 points lower near the facility than the state or national avg
Yellow	% BIPOC or people with low income near the facility is similar to the state or national avg (≤5 points)
Gray	Facilities located in CA, LA, SC, AR, MO, GA, TN

Fig. 1 The % BIPOC and % Low-income Population that Reside Near Pesticide Manufacturing Facilities that Have Violated Environmental Laws Compared to National and State Averages. The first column gives the Facility ID as found in EPA's Enforcement and Compliance History Online (ECHO) database. The second and third columns provide the city and state the facility is located in. The fourth column indicates the environmental law(s) that the facility has violated: Clean Water Act (CWA), Clean Air Act (CAA), or Resource Conservation and Recovery Act (RCRA). The fifth column provides the percent of people within one mile of the facility who do not identify as non-Hispanic, white (for the purposes of this Figure we have designated this population as Black, Indigenous and People of Color (BIPOC)). The sixth column provides the percent of people within one mile of the facility that have incomes below 200% of the federal poverty level. Columns 7–8 and columns 9–10 provide the national and relevant state averages of the percent of people who do not identify as non-Hispanic, white or have incomes below 200% of the federal poverty level. The bottom two rows compile the averages for each column for all facilities and facilities in California, Louisiana, South Carolina, Arkansas, Missouri, Georgia, and Tennessee

California and many Southern states harbor the highest number of facilities in predominantly BIPOC neighborhoods, averaging a 63% BIPOC population within one mile of a facility compared to a 40 and 38% national and relevant state average, respectively (Fig. 1).

Three of the 31 pesticide manufacturing facilities are located in St. Joseph, MO and were recently ordered by a federal judge to be transferred to a third party to oversee their operations after thousands of containers of hazardous waste, stored in rusted or leaking containers,

were found in dilapidated buildings that were in danger of collapse [37]. Lawsuits from federal and state governments allege that rainwater had been mixing with pesticide waste in the containers – ultimately leaking into the sewer system and nearby Missouri river [38]. The average "% BIPOC" and "% low-income" populations within one mile of these three facilities is 31 and 55% compared to the state average of 21 and 28%, respectively.

This indicates that pesticide manufacturing facilities in the USA that are in significant violation of bedrock environmental laws are disproportionately located in areas where a higher proportion of residents have low incomes. There is regional variation in whether these facilities are in areas with a higher BIPOC population – with this overwhelmingly being the case in California and many Southern states, but not elsewhere in the country.

Pesticide use

Exposure

Worldwide, the burden of higher pesticide exposure is typically carried by the poorest and most vulnerable to exploitation [39, 40]. This is also the case in the USA, where exposure to pesticides correlates strongly with race, ethnicity, and socioeconomic status. Here we focus on the general trends in exposure to different subpopulations in the USA and further discuss specific demographic groups that are disproportionately bearing the societal burdens of pesticide use.

General trends Researchers at the California EPA found that pesticide use was the pollution burden that showed the greatest racial, ethnic and income disparities in the state – disproportionately imposing more of a hazard than multiple air pollutants and other toxic releases [41]. The authors found that almost all pesticide use in the state occurs in the 60% of California zip codes that have the highest percentage of people of color. Others have found that over half of the glyphosate used in California was applied in the state's eight most impoverished counties, where 53% of residents identified as Hispanic or Latinx compared to the state average of 38% [42]. In 2019, more than eight million pounds of pesticides linked to childhood cancers were used in the 11 California counties that had a majority Latinx population (>50%), resulting in 4.2 pounds of these pesticides used per person [43]. This contrasts sharply with the 770,000 pounds of these same pesticides used in the 25 California counties with the fewest Latinx residents (<24%), resulting in 0.35 pounds of these pesticides used per person [43]. Both groups of counties have comparable land area and population.

This is the case nationally as well, as African Americans and Mexican Americans had higher concentrations of pesticide biomarkers in their blood or urine than non-Hispanic whites who don't live in poverty [44]. Similarly, biomarkers of pesticide exposure showed the greatest disparity between white women and women of color than 16 other chemical groups tested [45]. A U.S. Centers for Disease Control and Prevention (CDC) study found that metabolites of certain legacy pesticides were higher in Mexican Americans and African American women above the age of 40 than in whites [46]. The costs and disease burden associated with exposure to organophosphate pesticides were shown to be disproportionately borne by those who identify as non-Hispanic Black or Mexican American than non-Hispanic white [47].

To analyze a wider variety of pesticides across a national scale, we reviewed data collected by the CDC for the Fourth National Report on Human Exposure to Environmental Chemicals (Additional file 1). This report has information on a wide range of pesticides and pesticide metabolites that have been monitored in the blood and urine of a nationally representative sample of the U.S. population between the years of 1999–2016. Of 14 pesticides/metabolites that were found in high enough concentrations to identify a geometric mean for the three analyzed demographic subgroups (non-Hispanic white, non-Hispanic Black and Mexican American), only 3 (21%) were found in non-Hispanic whites at levels higher than the average for the total population (Fig. 2). In contrast, mean urinary and serum concentrations were higher for 8 of 14 (57%) and 10 of 14 (71%) pesticides/metabolites in Mexican Americans and non-Hispanic Blacks compared to the national average, respectively (Fig. 2). Non-Hispanic Blacks or Mexican Americans had higher average concentrations than non-Hispanic whites for 12 of the 14 pesticides/metabolites analyzed.

A similar trend was apparent with the highest exposed individuals from each demographic subgroup. Of 35 pesticides/metabolites where concentrations at the 95th percentile were reliably identified, the highest exposed non-Hispanic whites, Mexican Americans, and non-Hispanic Blacks exceeded the 95th percentile for the total population 40, 51 and 57% of the time, respectively (Fig. 3). Non-Hispanic Blacks or Mexican Americans had higher concentrations at the 95th percentile than non-Hispanic whites for 26 of the 35 pesticides/metabolites studied.

This indicates that not only do non-Hispanic Blacks and Mexican Americans tend to have higher average urinary and blood levels of many pesticides, but that the highest exposed individuals within these demographic groups are

Class	Pesticide or Metabolite	Geometric Mean of Urinary and Blood Concentrations				
		Total Pop	White	Black	Mexican Am	Difference
Organophosphates	Diethylphosphate (DEP)	1.03	0.98	1.56	1.22	↑1.6x
	Diethylthiophosphate (DETP)	0.48	0.46	0.76	0.55	↑1.7x
	Dimethylthiophosphate (DMTP)	2.08	2.06	2.08	2.17	↑1.1x
	3,5,6-Trichloro-2-pyridinol (chlorpyrifos)	1.39	1.36	1.72	1.37	↑1.3x
	para-Nitrophenol (parathion)	0.56	0.53	0.67	0.55	↑1.3x
Antimicrobials	Triclosan	13.81	13.52	12.84	15.76	↑1.2x
Fumigants	2,5-Dichlorophenol (1,4-Dichlorobenzene)	7.43	5.03	29.08	18.00	↑5.8x
Herbicides	2,4-Dichlorophenoxyacetic acid (2,4-D)	0.31	0.33	0.28	0.28	↓1.2x
	2,4-Dichlorophenol (2,4-D)	0.85	0.70	1.75	1.41	↑2.5x
Insect Repellents	3-(Diethylcarbamoyl) benzoic acid (DEET)	3.25	3.48	3.54	2.81	↑1.0x
Pyrethroids	3-Phenoxybenzoic acid	0.36	0.35	0.46	0.32	↑1.3x
OC/legacy	Hexachlorobenzene	15.20	15.10	14.50	16.20	↑1.1x
	trans-Nonachlor (chlordane)	15.85	16.65	16.60	11.05	↓1.0x
	p,p'-Dichlorodiphenyldichloroethene (DDT)	264.33	226.00	293.67	590.00	↑2.6x
# of exceedances of the total population average (% of total)			3 (21%)	10 (71%)	8 (57%)	

Red	Pesticide/metabolite concentration at the geometric mean is above that of the total population
Green	Pesticide/metabolite concentration at the geometric mean is below that of the total population
Yellow	Pesticide/metabolite concentration at the geometric mean is identical to that of the total population
Gray	Pesticide/metabolite concentration at the geometric mean is greater in Blacks and/or Mexican Americans than in whites

Fig. 2 Average Urinary or Blood Pesticide/metabolite Concentrations in People of Various Demographic Groups in the USA. The first column identifies the class of the pesticide/metabolite. The second column identifies the specific pesticide/metabolite that was analyzed. The third, fourth, fifth, and sixth columns contain the geometric mean of the urinary or serum concentrations of each pesticide/metabolite for the total population (Total Pop), whites, Blacks and Mexican Americans (Mexican Am), respectively. All values are urinary concentrations (non-creatinine adjusted) in µg/L for all pesticide/metabolite classes except "OC/legacy." For the "OC/legacy" pesticide/metabolite class, values are serum concentrations in ng/g of lipid. The last column is the fold change between the pesticide/metabolite concentration in whites and the demographic group with the highest pesticide/metabolite concentration. The last row indicates the total number (and % of total) of pesticides/metabolites for which the concentration in the demographic group exceeded that of the total population

more likely to be exposed to higher quantities than the highest exposed non-Hispanic whites.

Altogether, the available literature and data suggest that BIPOC and people living in poverty are generally exposed to higher levels of pesticides than the total population at large. This presents a serious environmental justice issue that must be addressed.

Children In California, almost three out of every four children with the highest potential for exposure to pesticides at school were non-Anglo [48]. An analysis of 15 agricultural counties in California found that children identifying as Hispanic were 46% more likely than white children to go to school within a quarter mile of where pesticides of human health concern were used [49]. Hispanic children were also 91% more likely than white children to attend school where the highest amount of pesticides of human health concern were used nearby [49]. In Washington state, more than half of students who attended school in counties with the most agriculture did not identify as white compared to a 31% student average in the state [50]. Eight-year-old Latinx children in low-income households in North Carolina were exposed to an average of 5.7 different pesticides in a three-month timeframe, with the specific pesticide exposures differing whether they lived in a rural or urban area [51].

Children are more susceptible to the effects of environmental toxins like pesticides because they are still in a developmental stage of life. With children of color more likely to be exposed to pesticides, they are not only more susceptible, but more vulnerable to pesticidal harm. Children of color are therefore the most vulnerable of any vulnerable population subgroup and will often be the most at-risk population.

Urban and low-income housing Pesticide use is often heavy in inner-city housing due to the age of the structures, inadequate maintenance and often crowded living conditions [52]. Residential pesticide use tends to increase with higher housing density and pesticides were found to be widely used in low-income public housing in New York state – where 80% of facilities applied pesticides inside apartments and in common areas on a regular basis [20]. A study of public housing facilities in Boston, MA, where 98% of residents identified as Hispanic or Black, detected at least two pesticides in all

Class	Pesticide or Metabolite	95th Percentile of Urinary and Blood Concentrations				
		Total Pop	White	Black	Mexican Am	Difference
Organophosphates	Diethylphosphate	13.54	13.22	16.62	15.16	↑1.3x
	Dimethylphosphate	21.54	20.34	27.34	25.46	↑1.3x
	Diethylthiophosphate	3.21	2.88	4.00	3.31	↑1.4x
	Dimethylthiophosphate	36.24	36.80	34.62	52.76	↑1.4x
	Diethyldithiophosphate	0.68	0.67	0.64	0.97	↑1.4x
	Dimethyldithiophosphate	8.03	8.36	7.58	6.24	↓1.1x
	3,5,6-Trichloro-2-pyridinol (chlorpyrifos)	8.25	8.26	9.72	7.33	↑1.2x
	2-Isopropyl-4-methyl-6-hydroxypyrimidine (diazinon)	0.58	0.53	1.01	0.45	↑1.9x
	Malathion dicarboxylic acid (malathion)	1.85	2.10	1.20	1.21	↓1.7x
	para-Nitrophenol (parathion)	4.09	3.67	4.48	8.29	↑2.3x
Carbamates	Carbofuranphenol (carbofuran)	0.77	0.74	0.55	1.90	↑2.6x
Antimicrobials	Triclocarban	13.40	14.80	27.00	3.30	↑1.8x
	Triclosan	504.17	461.83	450.17	637.67	↑1.4x
Fumigants	2,5-Dichlorophenol (1,4-Dichlorobenzene)	362.00	131.95	1393.67	1310.67	↑10.6x
Organochlorines	2,4,5-Trichlorophenol	0.35	0.35	0.38	0.28	↑1.1x
	2,4,6-Trichlorophenol	1.28	1.18	1.75	1.30	↑1.5x
Herbicides	2,4-Dichlorophenoxyacetic acid (2,4-D)	1.50	1.62	1.24	1.43	↓1.1x
	2,4-Dichlorophenol (2,4-D)	11.67	6.70	35.53	34.78	↑5.3x
Fungicides	Ethylene thiourea (dithiocarbamate fungicides)	0.89	0.74	1.43	0.73	↑1.9x
	ortho-Phenylphenol	0.53	0.53	0.65	0.68	↑1.3x
	Pentachlorophenol	3.63	3.69	4.06	2.44	↑1.1x
Insect Repellents	3-(Diethylcarbamoyl) benzoic acid (DEET)	95.30	113.05	47.50	57.35	↓2.0x
	N,N-Diethyl-3-(hydroxymethyl) benzamide (DEET)	0.85	1.08	0.50	0.49	↓2.2x
Pyrethroids	trans-DCCA	4.17	4.47	4.08	2.16	↓1.1x
	4-Fluoro-3-phenoxybenzoic acid	0.14	0.14	0.14	0.16	↑1.1x
	3-Phenoxybenzoic acid	5.25	5.91	5.30	3.04	↓1.1x
OC/legacy	Hexachlorobenzene	28.90	28.20	26.60	33.70	↑1.2x
	Dieldrin (aldrin/dieldrin)	19.65	20.40	18.25	14.70	↓1.1x
	Oxychlordane (chlordane)	44.07	44.63	49.77	36.40	↑1.1x
	trans-Nonachlor (chlordane)	75.30	73.43	101.87	59.43	↑1.4x
	Heptachlor epoxide (heptachlor)	21.57	23.20	19.87	17.57	↓1.2x
	p,p'-Dichlorodiphenyltrichloroethane (DDT)	23.05	15.40	35.80	170.80	↑11.1x
	p,p'-Dichlorodiphenyldichloroethene (DDT)	2003.33	1430.00	2806.67	5106.67	↑3.6x
	beta-Hexachlorocyclohexane (hexachlorocyclohexane)	64.20	48.13	56.43	115.43	↑2.4x
	Endrin	5.10	5.10	5.40	5.30	↑1.1x
Number of exceedances of the total population average (% of total)			14 (40%)	20 (57%)	18 (51%)	

Red	Pesticide/metabolite concentration at the 95th percentile is above that of the total population
Green	Pesticide/metabolite concentration at the 95th percentile is below that of the total population
Yellow	Pesticide/metabolite concentration at the 95th percentile is identical to that of the total population
Gray	Pesticide/metabolite concentration at the 95th percentile is greater in Blacks and/or Mexican Americans than in whites

Fig. 3 High-end Urinary or Blood Pesticide/metabolite Concentrations in People of Various Demographic Groups in the USA. The first column identifies the class of the pesticide/metabolite. The second column identifies the specific pesticide/metabolite that was analyzed. The third, fourth, fifth, and sixth columns contain the 95th percentile of the urinary or serum concentrations of each pesticide/metabolite for the total population (Total Pop), whites, Blacks and Mexican Americans (Mexican Am), respectively. All values are urinary concentrations (non-creatinine adjusted) in µg/L for all pesticide/metabolite classes except "OC/legacy." For the "OC/legacy" pesticide/metabolite class, values are serum concentrations in ng/g of lipid. The last column is the fold change between the pesticide/metabolite concentration in whites and the demographic group with the highest pesticide/metabolite concentration. The last row indicates the total number (and % of total) of pesticides/metabolites for which the concentration in the demographic group exceeded that of the total population

42 units analyzed and at least six in the majority of units [53]. Eighty five percent of pregnant African American and Dominican women in New York City reported using pesticides in their residence and 83% had at least one pesticide in umbilical cord samples at birth [54]. Thirty percent of African American and Dominican mothers had at least eight pesticides detected in a home air monitoring study [55]. An analysis of seven pesticide

biomarkers in women from Long Island, New York found that the average total pesticide concentration in breast adipose tissue was about 10% higher in Black women than white women [56].

The majority of a person's life is often spent inside their home. Housing, therefore, represents a serious potential exposure pathway to many environmental justice communities in the USA. While some people are able to control environmental contaminants that enter their home to a certain degree, many do not have that luxury and are subject to the whims of what a landlord or management company decides to do (often without prior consent).

Farmworkers Due to the nature of their work and where they live, farmworkers – and by extension their families – are thought to be the group of people most highly exposed to agricultural pesticides. Urinary analysis of nearly 200 farmworkers in North Carolina found that not only were they exposed to a wide array of chemical pesticides, but that re-exposure was constant throughout the year [57]. Similar findings in Idaho found insecticide and herbicide metabolites in the urine of Latinx farmworkers in every sample tested, even after pesticide spraying season was done [58]. Hispanic and Haitian female farmworkers in Florida were found to have much higher levels of urinary pesticide metabolites than a nationally-representative survey [59]. Farmworkers in Monterey County, CA had median urinary pesticide metabolite levels that were up to 395 times higher than a nationally-representative survey [60]. Pesticides and pesticide metabolites were found in dust samples in 85% of Washington farmworker homes and in the urine of 88% of young children with whom they lived, indicating that work exposure can often transfer to the home [61].

The vast majority of pesticide use in the USA is in agriculture and farmworkers have always been the most highly exposed group of people to agricultural pesticides. Many also reside in housing where residential pesticide use is high. While the nature of their work means that farmworkers will likely always have somewhat of a higher exposure to pesticides than the general population, the current disparities in the USA are far beyond what should ever be considered acceptable.

Effects

In the USA Higher exposures of many pesticides at concentrations of human relevance are often associated with increased disease incidence [62, 63], and there is increasing evidence that the specific exposures that disproportionately burden BIPOC and communities of low income and wealth can lead to disproportionate levels of acute harm or disease.

There are major barriers in place that make it difficult to tie specific exposures of pesticides to specific harms, particularly to BIPOC communities and those living in poverty. Poison Control Center utilization is known to be much lower in BIPOC and low-income populations, making comparisons between different racial, ethnic and income demographics very difficult [64–66]. Correctly diagnosing illness from acute pesticide harm requires the harmed individual to have access to, and seek, medical treatment, which often doesn't happen [67]. Furthermore, the physician (often un- or under-trained in this area) must also be able to correctly identify and diagnose the problem and report it [68]. Other significant barriers can lead to even greater underestimates of harm to seasonal and migrant laborers [69]. All these difficulties are compounded when it comes to chronic effects from long-term pesticide exposure that don't have the same immediate temporal association with exposure that acute effects have.

Despite the enormous difficulties in tying pesticide exposure to harm in certain populations, pesticide exposure among low-income and BIPOC populations has routinely been associated with adverse health outcomes.

By extrapolating from hospital visits in California, the US EPA estimated that 10,000–20,000 agricultural workers (predominately Latinx) experience physician-diagnosed, acute illness each year in the USA due to pesticide exposure, and that number could be as high as 300,000 acute illnesses per year when accounting for workers who don't seek care from a medical facility [70, 71]. Surveillance of occupational injuries in the state of Michigan found that people who identify as Hispanic are more likely to become ill due to pesticide exposure on the job than non-Hispanics [72]. Between 2007–2011, the rate of acute occupational pesticide-related illness and injury was 37 times higher for agricultural workers than for non-agricultural workers [73]. Occupational exposure to some agricultural pesticides is associated with an increased risk of breast cancer in California Latinx women [74]. Studies on Mexican American children in a farmworker community in California found that exposure to certain pesticides *in utero* or after birth was associated with negative effects on attention and neurological impacts that can affect cognitive and behavioral function [75, 76].

It's not just on-the-job exposures that can result in harm. Multiple pesticides and pesticide metabolites were found at higher levels in non-Hispanic Black women than non-Hispanic white women, and those higher blood and urine concentrations in non-Hispanic Black women were found to have breast cancer associated biological activity [77]. Serum levels of two pesticide metabolites were associated with an increased risk of diabetes in an adult Native-American (Mohawk) population, while serum levels of another pesticide were associated with a decreased risk [78]. The association between serum levels of certain chlorinated pesticides and type 2 diabetes was stronger in people who do not identify as white than those that do [79]. A study on pregnant African American and Dominican women in New York City found that pesticide levels in cord plasma were negatively associated with fetal growth [80, 81]. A study on mothers and newborns from Cincinnati found that urinary maternal levels of organophosphate metabolites were more strongly associated with decreased birth weight among Black newborns than white newborns [82]. This same study also found that those urinary metabolites were associated with shorter gestation time only in white mothers and not Black mothers. Non-Hispanic and Hispanic whites were grouped together for this study and it's been previously shown that similar metabolites in Latina women were associated with decreased gestational duration [83].

Attempts to pool cohorts from multiple epidemiological studies also identified some racial and ethnic heterogeneity among associations with pesticide exposure and various neurological and reproductive outcomes; with those who identify as Black or Hispanic showing stronger negative associations between pesticide exposure and certain negative effects compared to those who identify as white [84, 85].

Disproportionate pesticide exposures are often associated with human health harms in low-income and BIPOC communities in the USA, however the true scope of harm is often unknowable due to the inherent difficulties in documenting these harms in underserved and overburdened communities.

Internationally While the focus of this study is the disproportionate pesticide impacts in the USA, it is important to understand that these issues exist across political boundaries. In fact, by being a major manufacturer and exporter of pesticides, the USA plays a role in how these impacts are realized abroad.

Surveys conducted across Africa, Asia and Latin America have found that people in farming communities often lack access to, or cannot afford, suitable Personal Protective Equipment (PPE) for pesticide application and subsequently suffer from headaches, nausea, dizziness, blurred vision and excessive sweating [86]. A recent study estimates that around 385 million cases of acute pesticide poisoning occur each year worldwide, with the majority of that harm occurring in developing countries [87]. A report for the World Health Organization and United Nations Environment Programme identified women and children as the most vulnerable to pesticide impacts worldwide [88].

If there is one constant we've identified with regards to pesticide exposure and harm, it is that the most vulnerable individuals and communities will routinely be the ones shouldering a disproportionate burden of the societal harm caused by pesticides.

How disproportionate pesticide impacts are currently perpetuated

Rooted in U.S. law, regulations, policies and regulatory practice

Below we discuss various aspects of the pesticide regulatory framework in the USA and how they function to maintain the status quo with regards to disproportionate pesticide impacts to environmental justice communities. This is not an exhaustive list, but areas where we believe have the most impact to on-the-ground communities. Each subsection identifies laws, regulations, policies and/or regulatory practices that are responsible for perpetuating disproportionate harm to people of color and low-income communities.

Double standard for pesticide safety

As the major pesticide law in the USA, the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) controls the approval, sale, and distribution of pesticides. Together with the Federal Food, Drug and Cosmetic Act (FFDCA), which governs the allowable residues of pesticides on food, these two laws form the basis for pesticide regulation in the USA. Twenty-five years ago, Congress passed the Food Quality Protection Act of 1996 (FQPA), which amended FIFRA and the FFDCA [89]. Specifically, the FQPA put in place a new safety standard of a "…reasonable certainty that no harm will result…" to people exposed to pesticides through food and all other non-occupational exposure routes [89, 90]. However, all occupational pesticide exposures to people still default to the previous safety standard of no "…unreasonable risk to man or the environment, taking into account the economic, social, and environmental costs and benefits of the use of any pesticide…" [91].

In practice what this means is that for the general population, exposed mainly to pesticides through their diet, water and residential use, EPA takes a risk-only approach – approving a pesticide only if the agency determines that it will not result in significant harm. Yet for farmworkers and those exposed to pesticides mainly through their work, EPA takes a cost-benefit approach whereby harm to workers is allowed as long as the purported benefit of the pesticide, presumably to the grower, sufficiently offsets those harms.

Having two separate safety thresholds for different populations of people institutionalizes the practice of prioritizing some people's lives over others and, by design, leads to enormous disparities in who is being harmed by pesticides. With the farmworker population overwhelmingly identifying as Hispanic or Latinx, this creates an enormous environmental justice issue.

The EPA seemingly recognizes this terrible double-standard, and in 2009 published a proposed policy document aimed at strengthening its occupational risk assessment entitled "Revised Risk Assessment Methods for Workers, Children of Workers in Agricultural Fields, and Pesticides with No Food Uses" [92]. This document identifies ways EPA can more closely align the occupational and non-occupational risk assessment, stating: "No scientific justification exists for distinguishing between otherwise identical exposures based on whether they occurred on-the-job or not" [92].

Following fierce opposition from the American Chemistry Council and the pesticide industry [93–95], this 12 year-old proposed policy still remains in draft form. While the EPA has implemented a few of the components of this draft policy already, the agency has made only minimal progress in implementing the more consequential proposed policy changes [96].

Inadequate worker protections from pesticides

In addition to a long and much broader history of farmworker "exceptionalism," where farmworkers have consistently been excepted from basic labor rights, farmworkers also lack many basic occupational safety protections from pesticide exposure [12]. While most occupational sector safety standards are overseen by the U.S. Occupational Safety and Health Administration (OSHA), the agency has largely relegated the realm of agriculture to the EPA, which has since exerted its authority over pesticide worker safety with the Worker Protection Standard (WPS) regulation issued under FIFRA [12, 97]. The very fact that the agency in charge of approving pesticides is the same one that's in charge of establishing and enforcing worker standards is troubling to say the least.

In 2015 the WPS was strengthened, providing further protections for farmworkers than what they had been afforded in the past [98]. Despite these improvements (some of which were targeted for removal in a subsequent rulemaking [99]), worker protections from pesticides remain grossly substandard.

Biological monitoring of workplace chemical exposures is common in many industries and OSHA has developed over 25 chemical standards that are to be used to screen workers that are exposed to hazardous substances as part of their work [100]. Yet despite farmworkers coming into constant, often daily, contact with chemical pesticides that are known to be harmful, there is no national requirement for employers to provide medical monitoring for farmworkers seeking to prevent chronic, harmful pesticide exposures. This is even more worrisome given that perceptions of pesticide exposure at the workplace don't always correlate with actual exposure [59].

Some states, like California and Washington, have implemented biological monitoring programs for certain pesticide classes in an effort to protect farmworkers in those states [101, 102]. What these state programs have identified is cause for concern; in cases where pesticide exposure resulted in physiological effects to workers, many were not even the result of a violation of the WPS or the pesticide label, suggesting that following the directions on the label is not necessarily protective of pesticide harm [103]. Since some pesticide exposures can lead to adverse effects in the absence of readily noticeable symptoms [104], biological monitoring is absolutely necessary to prevent or reduce harm from chemical exposure.

While the WPS does provide some legal protections for farmworkers, lack of compliance monitoring and enforcement provides little incentive for employers to follow the rules. Nearly all workplace inspections are conducted by the states, leading to major inconsistencies from state to state. In 1998, five states conducted no workplace inspections for WPS compliance and 11 states conducted fewer than ten [105].

While these numbers have modestly improved since then, only a small minority of workplaces are inspected in any given year. Data from EPA's ECHO database indicate that, for the most recent five years that data are available, just over 1% of pesticide-using agricultural operations were inspected for WPS violations (Table 1). This means that at the current rate of inspection it will take nearly 100 years to inspect all facilities that fall under the Standard. During this period the few inspections that were conducted found a considerable number of violations – there was an average violation rate of 49%, indicating that nearly one WPS violation was found for every two facilities that were inspected (Table 1). Despite the majority of

Table 1 Worker protection standard compliance and violation enforcement from 2015–2019

Year	Total WPS Facilities	Facilities Inspected	Violations Found	No Action/ Only Warning	Enforcement Action Taken	Inspection Rate	Violation Rate	Enforcement Rate
2019	304,106	3475	1903	1595	308	1.1%	54.8%	16.2%
2018	304,106	3774	2057	1676	381	1.2%	54.5%	18.5%
2017	304,106	3418	2296	1997	299	1.1%	67.2%	13.0%
2016	304,106	3320	1142	789	353	1.1%	34.4%	30.9%
2015	304,106	3557	1199	925	274	1.2%	33.7%	22.9%
5-yr Avg	304,106	3509	1719	1396	323	1.2%	49.0%	18.8%

violations being for highly consequential failures such as failure to provide pesticide safety training, failure to centrally post vital information about pesticide use on the premises, and failure to provide proper PPE, only about 19% of violations led to any action other than a warning (Table 1) [106].

WPS violations appear to be very common despite the low number of inspections that are conducted every year by the EPA, the states, and tribes. A near-50% violation rate is *very* high and indicates that a significant portion of the estimated 1.8 million workers and handlers who work in these facilities are not receiving legally-mandated protections from pesticides. Furthermore, 80% of violators don't even receive a slap on the wrist after they are found to have violated the law. Without the prospect of facing any meaningful consequence, there is no deterrent for unscrupulous employers to follow the rules, which perpetuates exploitative working conditions.

Export of dangerous pesticides to developing countries

It's been estimated that 385 million cases of unintentional, acute pesticide poisoning (UAPP) occur each year worldwide, with the greatest number of poisonings happening in developing regions of the world in southern and south-eastern Asia and east Africa [87]. FIFRA section 17 (a)(2) allows for the manufacture and export of pesticides to other countries that are not registered in the USA if certain labelling and notification requirements are met – this includes the export of pesticides that have never been approved in the USA or cancelled due to human health or environmental concerns [107]. The extent of the export of pesticides that are prohibited in the USA is substantial. An analysis of U.S. customs shipping records found that between 2001–2003 the USA exported nearly 28 million pounds of pesticides that were not allowed to be used in the country, averaging 13 tons/day [108]. This included many pesticides that the USA had banned due to human and environmental health concerns and others that were subject to regulation under international treaty, like dinoseb, mercury-based pesticides, endosulfan and pentachlorophenol [108].

In 2009 the EPA Office of the Inspector General (EPA-OIG) analyzed EPA's compliance with FIFRA section 17(a). The EPA-OIG found that EPA does not ensure that an importing country is notified (as required by law) that a pesticide found to be harmful to human health – or a pesticide for which no EPA assessment had been conducted – is being exported to their country [109]. In fact, EPA notified the importing countries for only 3% of such pesticide exports in 2007, prompting the EPA-OIG to conclude that importing countries may not be aware of potential hazards associated with pesticides they import from the USA [109].

Organophosphate (OP) and carbamate insecticides are known neurotoxins responsible for many pesticide poisonings around the world due to their high acute toxicity [110–112]. Between the years of 2015–2019, unregistered pesticide products containing 26 different OP or carbamate insecticides were manufactured or formulated in the USA for export (Additional file 1). These products were exported to 53 different nations, 79% of which are considered low-to-middle income countries (LMICs) by the Organisation for Economic Co-operation and Development (OECD), and eligible for financial development and welfare assistance (Fig. 4 and Additional file 1). Of the 42 nations that imported unregistered products containing OP/carbamate ingredients that are completely prohibited for use in the USA, LMICs made up 81% (Fig. 4).

Similar trends were identified when stratifying nations by how much of their agricultural workforce is estimated to be poisoned by pesticides each year. Seventy two percent of nations importing unregistered products that contain any OP/carbamate ingredients from the USA are estimated to have >30% of their agricultural workforce poisoned by pesticides each year (Fig. 4 and Additional file 1). That proportion increases to 78% of importing nations for unregistered products containing an OP/

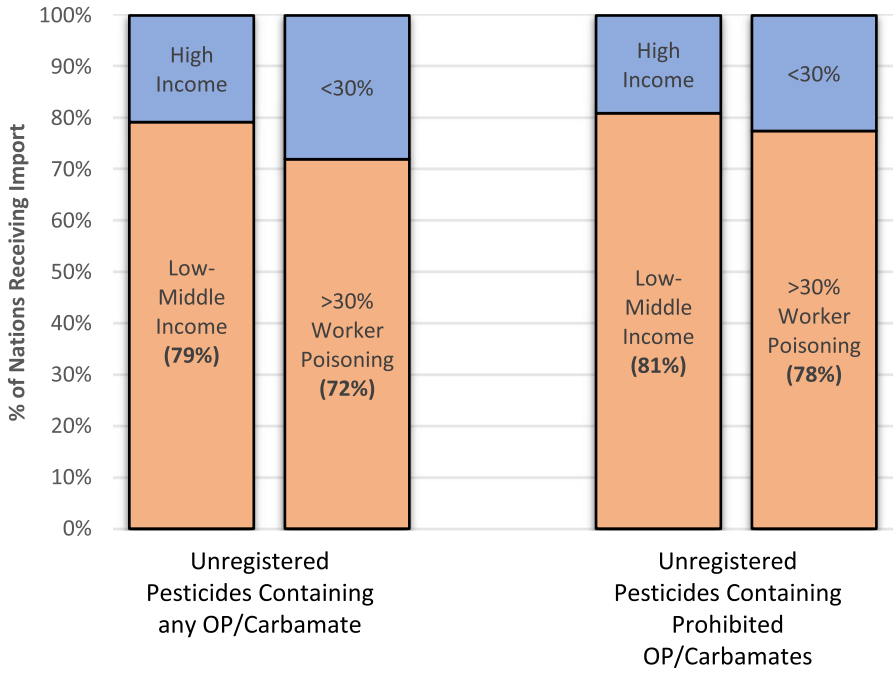


Fig. 4 Export of Unregistered Pesticides to Different Nations Stratified by Wealth and % Workforce Poisoned. The first two bars represent the percentage of nations receiving import of unregistered pesticides containing any organophosphate (OP) or carbamate active ingredients from the USA. The first bar stratifies these nations by Gross National Income (GNI) – the two categories being high-income or low-to-middle income as defined by the World Bank. The second bar stratifies these nations by the percent of agricultural workers in each country that are estimated to experience an unintentional pesticide poisoning each year – the two categories being >30 and < 30%. The third and fourth bars represent the percentage of nations receiving import of unregistered pesticides containing prohibited organophosphate (OP) or carbamate active ingredients from the USA. The third and fourth bars are stratified identically to the first two bars. The only difference between "Unregistered Pesticides Containing any OP/Carbamate" and "Unregistered Pesticides Containing Prohibited OP/Carbamates" is that the former contain OP/Carbamates that are allowed for use in other, registered products in the USA while the latter contain OP/Carbamates that are completely banned for use in any product in the USA

carbamate ingredient that is completely prohibited for use in the USA (Fig. 4).

Allowing the manufacture and export of pesticides that have been banned in the USA, or whose safety has not been properly vetted, not only puts at risk vulnerable people in other countries but also places a higher burden on fenceline communities in the USA that live near the polluting facilities that manufacture them.

Failure to implement executive order 12898

Executive Order 12898, "Federal Action to Address Environmental Justice in Minority Populations and Low-income Populations," was signed by President Bill Clinton in 1994 to direct federal agencies to use existing laws to prevent BIPOC and low-income populations from being disproportionately burdened by the impacts of environmental pollutants [113]. Despite the clear intent of the order, and the clear potential for pesticides to disproportionately impact BIPOC and low-income communities, the EPA pesticide office has routinely failed to adequately implement this order more than 25 years after it was signed.

In multiple EPA-OIG investigations in 2004 and 2006, the watchdog agency found that EPA had not even implemented guidance for how the agency could begin to comply with the Order [114, 115]. Sixty percent of responding offices had not performed the necessary reviews required by the Order 12 years after it was signed and 87% said that management had not even requested such reviews be undertaken [115]. These general conclusions have been confirmed at EPA and other federal agencies by academic researchers [116, 117].

An analysis of final rule-making actions by the EPA between the years of 1994–2012 found that EPA overwhelmingly utilizes pro forma acknowledgement of EO 12898 that an agency action would have no impact on environmental justice communities [118]. This contrasts greatly with the miniscule number of "affirmative" uses of the Order in final rules where the action would have beneficial impacts on those same communities [118].

In our experience, pro forma acknowledgement of EO 12898 is standard practice at the EPA pesticide office, with all recent human health pesticide risk assessments containing the same boilerplate language that the EPA considered environmental justice concerns in its assessment by analyzing the dietary patterns of certain ethnic subgroups (some examples here [119–121]). Yet, other than analyzing some differing exposures via diet, there are no other analyses currently undertaken to quantify or mitigate higher exposures to BIPOC or low-income communities more than 25 years after such actions were required.[1]

Failure to account for unintended (off-label) pesticide use or provide adequate training and support

When faced with the decision of whether to approve a pesticide that can cause harm to people, the EPA will often impose use restrictions on the pesticide label, such as PPE requirements, meant to mitigate harm from the pesticide. These restrictions can range from relatively minor to excruciatingly complex, as evidenced by a recent 9th Circuit Court of Appeals ruling that a recent pesticide approval was unlawful, in part, because the label directions were impossible to follow [122].

Unintended or "off-label" pesticide use is common and can have tangible consequences [123]. For example, when three women who worked on the same farm during their pregnancies all gave birth to children with congenital anomalies, it was subsequently found that the farm they worked at failed to prevent entry into treated fields after pesticide spraying and that the pesticide label requirements were not followed [124].

EPA approves pesticides assuming that all pesticide label directions can and will be followed, yet that assumption is often at odds with reality. Five requirements must be met for a pesticide label to serve its intended function: 1) the user must have access to the label or the internet if the full label is too big to fit on the container, 2) the label must be in a language the user can understand, 3) the user must be literate, 4) the user must be able to understand the technical language in the label directions, and 5) the user must have the ability or support to implement the safety precautions (PPE, mixing instruments, etc.) [125].

These five requirements are often not met in the United States population, including in farmworkers. A study of binational farmworkers that mixed and loaded pesticides on US farms found that nearly a quarter used no protective equipment the last time they worked with chemicals [126]. A survey of Oregon farmworkers found that 61% had reported breathing in pesticides from the surrounding air, 39% had touched plants with pesticide residue, and over one third had been sprayed with pesticides directly from a plane or tractor – all scenarios the pesticide label is supposed to prevent [127]. A quarter of surveyed North Carolina farmworkers were asked by their employer to enter fields too soon after pesticides had been applied, in violation of the label [128].

Often, unintended pesticide use is due to a lack of training or support [68]. Anywhere from 14–65% of surveyed farmworkers across multiple states reported receiving no pesticide safety instruction by their employer [13, 128–131]. Of North Carolina farmworkers that did receive pesticide training, less than half fully understood it [129]. Few were provided PPE or safety equipment [128, 132, 133]. Despite only 28% of farmworkers reporting that they can read English "well," it is still not required that pesticide companies provide pesticide labels in a language other than English [13, 134].

The EPA often recites the adage, "the label is the law." Ignoring the reality on the ground that pesticides are widely used in a manner not in compliance with the label – regardless of what laws or regulations are in place to prevent it – ultimately disadvantages those who are suffering the burdens of those exposures the most.

Ineffective post-approval follow-up

New pesticides are often approved with just a handful of pesticide toxicity studies done by the pesticide companies seeking approval. While pesticide law requires the EPA to re-analyze the safety of pesticides every 15 years to incorporate new science and other information [135], in practice this effort is often marred by a lack of follow-up data on the most highly-exposed people and regressive practices that often prevent meaningful incorporation of high-quality epidemiological studies.

The U.S. government is estimated to undercount agricultural injuries by 70–95%, which is more than any other industry [136, 137]. The inherent difficulties in monitoring a workforce that is predominantly migrant and seasonal is exacerbated by an ineffective, underfunded system to monitor and compile incidents of harm. Pesticide incident reporting is overseen by states governed by a patchwork of laws and regulations that range from semi-robust to non-existent [138]. Most, if not all, are plagued by funding deficiencies and undercounting [138]. The federal government's response to this was to develop a federal-state hybrid surveillance system called the Sentinel Event Notification System for Occupational Risk

[1] While no other analyses are currently undertaken, EPA does state that: "Further considerations are also currently in development as [EPA's Office of Pesticide Programs] has committed resources and expertise to the development of specialized software and models that consider exposure to other types of possible bystander exposures and farm workers as well as lifestyle and traditional dietary patterns among specific subgroups." See references [119–121].

(SENSOR)-Pesticides program [139]. In the SENSOR-Pesticides program, 12 of the 50 states have historically agreed to submit information to the CDC in exchange for some federal funds [140]. Only seven of those states submit non-occupational pesticide related injuries [140]. In 2019–2020, only three states received federal support for participation in the program [141].

While the SENSOR-Pesticides program was an improvement upon the state-by-state approach and allowed the federal government to monitor trends and standardize incident collection protocols among participating states, it is not robust enough to adequately capture pesticide exposure incidents at the national level. In most states, occupational incident reporting is exclusively the responsibility of healthcare providers and those who have been poisoned [138]. Barriers, such as lack of health insurance, language access, transportation, availability during hours of facility operation, immigration status, and fear of retaliation or further oppression, prevent many farmworkers from seeking care at a medical facility or reporting poisonings even when their injuries are serious [67–69, 142]. The few that decide to seek medical care are often seen by physicians that have received very little training on how to diagnose or report pesticide poisonings [69]. The result is a vast underestimate of the true scope of harm to this largely Latinx community. And because non-occupational injuries from pesticides are often compiled solely from reports to Poison Control Centers – utilization of which is known to be much lower for BIPOC and people of lower socioeconomic status [64–66] – a systemic issue exists with the underlying data that the program is built on.

An underfunded surveillance system that relies exclusively on a dataset that extensively underrepresents harm to BIPOC and lower-income communities is designed to fail. While the SENSOR-Pesticides program was built with the best of intentions, its failure to encompass all states and address the underlying deficiency of the data it uses has severely diminished its effectiveness.

In addition to reported incidents of pesticide harm, another line of evidence that can be used to assess the real-world consequences of a pesticide's approval is epidemiology. One benefit of epidemiology over the typical *in vivo* toxicology studies done on animals is that epidemiological studies can give a regulatory body information about disparate impacts to specific populations of people that may be at higher risk. In fact many epidemiological studies, like the Center for the Health Assessment of Mothers and Children of Salinas (CHAMACOS) and Columbia Center of Children's Environmental Health studies, were specifically designed for that purpose [80, 143].

Historically, epidemiological studies have not been accounted for or incorporated into EPA's pesticide risk assessments and, therefore, had little impact on the agency's overall decisions. With recommendations from the National Research Council of the National Academy of Science, EPA embarked on a process to incorporate epidemiology into its risk assessments that culminated in finalized guidance in 2016 [144]. In conjunction with a 2016 risk assessment of the pesticide chlorpyrifos that had partially incorporated epidemiological studies in a quantitative manner for the first time, this was seen as a major step forward for public health [145].

Yet despite these positive initial steps, intense lobbying and pressure from the pesticide industry has had a chilling effect on the agency's use of epidemiology in its recent assessments [146]. The EPA's pesticide office has continually failed to incorporate these studies in its quantitative risk assessments for pesticides – even those with robust epidemiological datasets, like paraquat, atrazine and 2,4-D [147–149]. And while chlorpyrifos was ultimately prohibited on food crops by the EPA in 2021 (following a court order), the agency reversed its initial 2016 decision to partially incorporate epidemiological studies into its quantitative risk assessment using dose reconstruction [150]. This was done in violation of a scientific advisory panel's recommendations [151] and likely played a major role in allowing non-food uses of the pesticide to remain an ongoing threat to farmworkers and the general population.

By consistently analyzing incident numbers that are recognized to drastically underestimate the true scope of harm from pesticides – and continually failing to incorporate follow up epidemiological studies designed to uncover risks that were missed during the approval process – EPA is actively obstructing its own ability to respond to evidence of disparate impacts to BIPOC and communities of low-income and wealth.

Children lack necessary protections

The FQPA implemented an additional margin of safety meant to protect children, the most highly susceptible population to chemical poisons [89, 152]. This statutorily required safety margin came in the form of a default safety factor that would effectively reduce the amount of pesticide considered "safe" by 10-fold to account for the heightened susceptibility of young people who are still developing and growing (hereafter "FQPA children's safety factor"). This was accompanied by a newly implemented aggregate assessment that directed EPA to assess non-occupational risk from multiple, combined exposure pathways, such as residential use and food exposures.

Widely lauded by the public health community, FQPA's protections for children were strong, and EPA's initial interpretation of the plain language of their statutory requirement was encouraging. In an early guidance

document, EPA stipulated that it would err on the side of applying the FQPA children's safety factor when there was scientific uncertainty about its necessity and even consider raising it in some cases [153].

Yet despite these positive initial steps, implementation of the FQPA children's safety factor has been dismal from the outset. By 2001 EPA had only applied an extra margin of safety for children in 13 of 44 instances for organophosphate pesticides, and was chastised by its own watchdog agency in 2006 for primarily measuring its achievements under FQPA in terms of how often it met its registration deadlines rather than how it reduced risk to children [154, 155]. A review of 59 pesticides by the National Research Council found that EPA only implemented a FQPA children's safety factor for 11 of them – with the full 10x margin of safety only being used for five [156]. A 2013 analysis by the United States Government Accountability Office (GAO) found that, out of 412 pesticide decisions, EPA retained the default 10x FQPA children's safety factor only 22% of the time – it reduced the safety margin 75% of the time and increased it 3% [157]. A recent in-depth analysis of 47 non-organophosphate pesticides found that only 13% of acute food exposures and 12% of chronic food exposures incorporated any FQPA children's safety factor whatsoever – and when it was included it was often in lieu of, not in combination with, a separate database uncertainty factor [158].

EPA's justification for rarely incorporating the protective safety factor comes from the language of the law itself, which gives the EPA discretion to reduce the 10x FQPA children's safety factor if such a determination can be made "…on the basis of reliable data…" [159]. Yet EPA's current practice is such that the only time it retains the FQPA children's safety factor is in the rare case where there is overtly severe developmental toxicity in rodent studies, on the level of serious structural malformations or death [156, 158]. When it decides to reduce or eliminate the FQPA children's safety factor it is often based entirely on two or three rodent studies funded by the pesticide registrant, often conducted in the same laboratory [160].

Even in the few cases where EPA does incorporate a FQPA children's safety factor, it is largely viewed as a moving target by the pesticide industry. Following a 2011 EPA decision to reduce the FQPA children's safety factor for a class of pesticides called pyrethroids from 10x to 3x [161], a group of companies that sell pyrethroids developed a model that resulted in the complete elimination of the pyrethroid FQPA children's safety factor in 2019 [162]. This happened even after multiple Scientific Advisory Panels found serious deficiencies with the model the registrants used [163, 164]. Ultimately, the consequences of such a move translated into the continued approval of uses of pyrethroids that would otherwise have been cancelled due to human health concerns – mainly those uses in people's homes where exposures to children are often the highest.

Ultimately any disproportionate effects of pesticides on BIPOC or communities of low-income and wealth are going to be magnified even higher in their children because children will always be more susceptible to developmental toxins than adults [165, 166]. With 53% of migrant children having an unmet health need compared to 2.2% of all U.S. children, many BIPOC children may also have greater sensitivity to pesticides due to compounding stressors or other factors [165, 167, 168]. By using its discretion to overwhelmingly reduce protections for children instead of retaining them, EPA is perpetuating a system that propagates undue risk to lower-income children of color.

How disproportionate pesticide impacts can be alleviated

The most consequential and important recommendation we have is for the USA to adopt the Precautionary Principle, which guides environmental policy in the European Union (EU) [169]. In fact, we believe it is impossible to truly "solve" this environmental injustice in the context of our current system, which masquerades as scientific norm in a country that has consistently normalized oppression to people of color. It is this system that attempts to monetize people's lives and well-being, attempting to determine whether any resulting harm from the action is "worth it" (with the implicit message that some people's lives are not worth as much as others). It is a system that unduly benefits the entrenched, capitalist agrochemical regime by consistently prioritizing powerful economic markets at the expense of people's lives and well-being.

However, under the Precautionary Principle we ask "How little harm is possible" rather than "How much harm is allowable" [170]. Being proactive instead of reactive, it's a simple change of perspective that can mean the difference of life or death to countless BIPOC and people living in poverty. Use of the Precautionary Principle can be compatible with a thriving agricultural sector, as evidenced by the EU's incredibly high export value of agricultural commodities [171]. The Precautionary Principle is often derided as "extreme" and "radical" by those in the USA profiting from the current, broken system. However, the very fact that it is considered "extreme" or "radical" to ensure that everyone has the right to a healthy environment and life further proves to us just how unjust our current system is.

Given the realities of today, we fully acknowledge that this paradigm change within FIFRA itself is likely

unattainable in the near term. While the Precautionary Principle should be the ultimate goal, advocating for a more just system also includes making an unjust system better. Below we lay out seven Actions that can, and should, be implemented immediately to reduce pesticide harm to BIPOC and low-income communities in the USA and beyond.

Action #1 – eliminate or reduce the pesticide safety double standard

Any double standard for different groups of people is unacceptable when it comes to protections from harmful pollutants. The confluence of three different pesticide laws (FIFRA, FFDCA and FQPA) to exclude a largely Latinx farmworker population from protections that everybody else is afforded stands today as one of the most overtly racist aspects of current pesticide law. The clear response to this should be to amend FQPA or FIFRA to ensure that the "reasonable certainty that no harm will result" safety threshold be extended to include those exposed to pesticides through their work. This is the current safety threshold that must already be met for those exposed to pesticides through multiple pathways, including their diet and other non-occupational exposures.

Absent a legislative fix, there are things EPA can do right now within its current authority to reduce the protection gap between farmworkers and the general public. The first is to immediately implement the entirety of EPA's 2009 guidance document "Revised Risk Assessment Methods for Workers, Children of Workers in Agricultural Fields, and Pesticides with No Food Uses" [92].

However, this alone is not enough.

The second thing EPA should do under its current authority is to finally, and formally, define "no unreasonable adverse effects" in a way that appropriately recognizes and reduces harm to agricultural workers. Since 1972, the core statutory requirement of FIFRA has been for EPA to balance the costs and benefits when deciding whether to approve a pesticide. However, this has never been done transparently and amounts to more of a subjective exercise subject to the whims of political pressure, undue influence, and a culture that makes it difficult to say "no." Defining what types of harms are not acceptable to workers by setting forth clear standards would help ensure that that the EPA cannot generically allow the harms to workers be outweighed by the purported benefits of a pesticide in the agency's registration decisions.

Action #2 – implement a system to adequately monitor and account for harms to environmental justice communities

While the SENSOR-Pesticides program is better than nothing, it is wholly inadequate to monitor and surveil harm from pesticides to environmental justice communities in the USA. We must develop a well-funded, nationwide monitoring system to incorporate data from *all* states and standardize reporting and collection to the federal government. This national monitoring and surveillance system must incorporate occupational *and* non-occupational harm.

However, without addressing the inherent issues that lead to underreporting, any national system is destined to fail in its purpose. The federal government must also implement measures to reduce incident underreporting, particularly in BIPOC and low-income communities. This could include things like requiring employers to report incidents or face steep fines (similar to what is proposed in the "Protect America's Children from Toxic Pesticides Act" (PACTPA) [172]), educating clinicians on how to diagnose and report pesticide poisoning, explicitly requiring public schools and other federally-funded facilities that use pesticides to report incidents, and allowing for anonymous reporting from those who might fear retaliation.

Just as important, EPA must implement a regulatory framework that is inclusive and not dismissive of epidemiological data. Current guidance and practice are simply unacceptable. Particularly as the agency moves away from reliance on *in vivo* animal experiments [173], human epidemiology – done by independent researchers with a lens towards marginalized communities – must play a larger role in EPA's registration decisions. Above all, this will require that the agency stand up to the pesticide industry instead of cowering to it.

Action #3 – strengthen worker protections

EPA must require medical monitoring for those who work occupationally with pesticides, as is common for most other occupations that work closely with dangerous chemicals. This can be done immediately for organophosphates and carbamates following the framework implemented in Washington and California [101, 102]. However, only monitoring these two classes is not sufficient. EPA can and should require pesticide registrants to supply a clinical test capable of confirming a pesticide overexposure from their products via its authority under FIFRA section 6(a)(2) for any pesticide or pesticide class implicated in worker harm. This would significantly improve access to health care for farmworkers, aid in Workers' Compensation claims and reduce harmful exposures. This would also aid in achieving Action #2.

The importance of the pesticide label to the safe use of a pesticide cannot be understated. Given the widespread use of pesticides by non-English speakers in the USA, the fact that pesticide labels are only required to be provided in English is entirely unacceptable. The EPA has

the clear authority to mandate labels be provided in languages other than English in order to protect the public [174]. The agency should mandate, at a minimum, that all pesticide labels immediately be provided in the Spanish language. Ultimately, along the lines of what is proposed in PACTPA [172], EPA should strive to require pesticide labels be provided in any language where information exists that at least 500 people who speak that same language use a particular pesticide product.

Action #4 – reduce unintended pesticide harms

The more complex the pesticide label and the more restrictions put in place to protect people or the environment, the higher likelihood that there will be unintended pesticide uses that can result in serious harms. The *practicality* of label restrictions for both agriculture and residential use must become an integral part of the registration decision. This is completely unaccounted for in current pesticide approval decisions. Such an approach will require data on label compliance and noncompliance to give the agency information about what restrictions/mitigations are commonly followed and which are not. This approach would be guided by data and science instead of the current approach, which is based solely on the incorrect assumption that all labels can and will be followed 100% by everyone.

By engaging with the farmworker community, EPA can also identify ways to strengthen training requirements for workers in ways that are engaging and the information more likely to be retained. EPA must publicly commit to implementing reasonable requirements in a timely fashion based on input and meetings with farmworkers and their representatives.

Perhaps most important is for the EPA to strictly enforce all existing requirements in the Worker Protection Standard. This would require appropriating resources for inspection and enforcement activities and holding unscrupulous employers accountable to the full extent possible under the law.

Action #5 – adequately protect those most vulnerable to pesticide harm – children

EPA should fully incorporate the 10x FQPA children's safety factor across the board for all pesticides when analyzing harm to children, and increase it when data indicate that greater safety buffer is needed. We recognize that EPA has the discretion to reduce or eliminate the FQPA children's safety factor if it so chooses, but this exception has swallowed the rule. Sometimes the agency does have studies in its possession that can be interpreted to imply that a safety buffer is not necessary; however, in practice, every decision to reduce the FQPA children's safety factor is made under an enormous amount of scientific uncertainty. Often only a few studies done in the same laboratory and funded by the pesticide companies are available for review, or certain peer reviewed studies or epidemiological studies are ignored or discounted in some manner. This would meet very few scientists' definition of "reliable data," yet that is the statutory definition of the data EPA uses when opting to eliminate the FQPA children's safety factor. Pesticide companies are even combining their resources to form separate corporate entities with the sole intent to "address" the FQPA children's safety factor for their products – and have been successful in eliminating these protections [162, 175]. Rarely, if ever, is there any instance when an abundance of research from multiple different labs without a financial conflict of interest all find that young children or the developing fetus are not more susceptible to pesticide poisoning than an adult. Yet eliminating the FQPA children's safety factor is the norm, not the exception.

We propose a regulatory rethinking of what the FQPA children's safety factor represents and an acknowledgement that its intended purpose when Congress proposed it was not for EPA to regularly cast it aside. While all children are more susceptible to pesticide harm than adults, some children – particularly BIPOC and those in low-income or low-wealth families – will often carry a higher burden of exposure [165, 166]. Widespread utilization of the FQPA children's safety factor is one way to protect this subpopulation of the most vulnerable of the vulnerable. EPA has an enormous opportunity with its discretion under current law to immediately put in place greater protections aimed at preventing harm to the next generation – implementing the FQPA children's safety factor across the board is one easy way to accomplish this.

Action #6 – prohibit export of unregistered pesticides to other countries

Current law allows for the export of pesticides that are not registered in the USA – even those that have been banned here due to human health or environmental harms. This practice must end. The most harmful of these prohibited pesticides are largely going to lower income countries that have higher rates of pesticide poisonings (Fig. 4 and Additional file 1). If a pesticide has not met our standards for safety, we should not actively provide it to other countries that have even fewer protections and safeguards than we do. To do so makes us complicit in any harm that it causes. The European Commission has already begun implementing this moral imperative in the EU [37].

The USA must also ratify the Rotterdam and Stockholm Conventions. The USA is a signatory on both treaties, however we remain one of the few countries left in

the world that has not ratified either [176, 177]. That puts us in a gray area for compliance purposes. Some of the extremely hazardous pesticides we've exported in recent years – like alachlor, carbofuran and phorate – are listed in Annex III of the Rotterdam convention and subject to Prior Informed Consent (PIC), which is a mechanism by which countries can opt out of receiving harmful chemicals through trade [178]. The USA has even violated this international treaty as recently as two years ago by exporting carbofuran to the African country of Mauritius in 2019 after the country specifically informed the Rotterdam Committee in 2018 that it does not consent to carbofuran imports [179, 180].

Action #7 – assess and rectify regulatory capture within the EPA pesticide office

The pesticide office at EPA is plagued by an enormous amount of chemical industry influence [181, 182]. There are many reasons for this, but the end result is the same – industry interests are often put above public health interests and harmful products stay on the market. A culture such as this is incompatible with environmental justice and scientific integrity. This makes it difficult for EPA to implement changes that positively affect disenfranchised and marginalized communities and will always be an impediment to true change within the agency.

We believe a third-party audit of how EPA's operating procedures and management practices allow for undue industry influence and what effects it has on environmental justice communities is long overdue. The National Research Council is one example of an independent party that could study this matter and report back to EPA on recommended strategies to further separate the regulators from the regulated in a manner that would benefit BIPOC and low-income communities and, by extension, the broader public.

Shifting the culture in the EPA's pesticide office is critical to ensuring that any measures taken to reduce the disproportionate impacts on environmental justice communities are realized.

Conclusions

Exposure to many, if not most, pollutants fall along racial, ethnic, or sociodemographic lines in the USA – and pesticides are no exception. Disparities in exposure and harm from pesticides are widespread, impacting BIPOC and low-income communities in both the rural and urban settings and occurring throughout the entire lifecycle of the pesticide from production to end-use. The root causes of these disparities involve hundreds of years of systematic oppression kept in place through structural racism and classism in the USA. Despite many of the atrocities that gave rise to these disparities being seemingly in the past, there are ways in which the federal government perpetuates these disparities and hinders progress even today. Here we've identified laws and regulatory practices and policies that allow for such disparities to remain entrenched in everyday life for environmental justice communities. While the true fix is to shift the USA to a more just system of preventing pollution exposure to everyone regardless of skin tone or income, there are actions that can be taken right now to make our unjust regulatory system work better for everyone and begin to rectify the grave injustices it has perpetuated.

Abbreviations

BIPOC: Black, Indigenous and People of Color; CAA: Clean Air Act; CDC: U.S. Centers for Disease Control and Prevention; CHAMACOS: Center for the Health Assessment of Mothers and Children of Salinas; CWA: Clean Water Act; ECHO: Enforcement and Compliance History Online Database; EPA: United States Environmental Protection Agency; EPA-OIG: EPA Office of the Inspector General; EU: European Union; FFDCA: Federal Food, Drug and Cosmetic Act; FIFRA: Federal Insecticide, Fungicide, and Rodenticide Act; FQPA: Food Quality Protection Act of 1996; GAO: United States Government Accountability Office; GNI: Gross National Income; LMIC: Low-to-middle income country; NAICS: North American Industry Classification System; OC: Organochlorine; OECD: Organisation for Economic Co-operation and Development; OP: Organophosphate; OSHA: U.S. Occupational Safety and Health Administration; PACTPA: Protect America's Children from Toxic Pesticides Act; PIC: Prior Informed Consent; PPE: Personal Protective Equipment; RCRA: Resource Conservation and Recovery Act; SENSOR: Sentinel Event Notification System for Occupational Risk; TEK: Traditional Ecological Knowledge; UAPP: Unintentional, acute pesticide poisoning; WPS: Worker Protection Standard.

Supplementary Information

The online version contains supplementary material available at https://doi.org/10.1186/s12889-022-13057-4.

Additional file 1: Supplemental Methods. This file contains the methodology used for the literature review and the data collection for the Figures and Table in the manuscript.

Acknowledgements

The authors would like to thank Brett Hartl, William Snape and Lori Ann Burd at the Center for Biological Diversity for review of parts of the manuscript and thoughtful edits and input.

Authors' contributions

ND conceptualized the project and instigated the formation of a coalition of experts in environmental justice and grassroots organizations familiar with on-the-ground harm from pesticides. ND, RDB, JE, IF, JL, AKL, DNM, and FS participated in calls to discuss the structure of the review, points of focus, inadequacies in federal regulation and future directions. ND prepared an initial manuscript and compiled data for the Figs. ND, RDB, JE, IF, JL, AKL, DNM, and FS discussed the results and contributed specific knowledge of the relevant literature and policy proposals. ND, RDB, JE, IF, JL, AKL, DNM, and FS contributed to the editing and finalization of the manuscript and figures. The authors read and approved the final manuscript.

Funding

The authors received no specific funding for this work. Publication fees were paid for by The Center for Biological Diversity.

Availability of data and materials
All data generated or analyzed during this study are publicly available at the cited links.

Declarations

Ethics approval and consent to participate
Not applicable.

Consent for publication
Not applicable.

Competing interests
The authors declare that they have no competing interests.

Author details
[1]Center for Biological Diversity, Portland, OR, USA. [2]Texas Southern University, Houston, TX, USA. [3]Farmworker Association of Florida, Apopka, FL, USA. [4]Farmworker Justice, Washington, DC, USA. [5]Advance Carolina, Raleigh, NC, USA. [6]Migrant Clinicians Network, Salisbury, MD, USA. [7]Northwest Center for Alternatives to Pesticides, Eugene, OR, USA. [8]Spelman College, Atlanta, GA, USA.

Received: 10 December 2021 Accepted: 22 March 2022
Published online: 19 April 2022

References

1. Unsworth J. History of Pesticide Use. International Union of Pure and Applied Chemistry. 2010. http://agrochemicals.iupac.org/index.php?option=com_sobi2&sobi2Task=sobi2Details&catid=3&sobi2Id=31. Accessed 2 Sep 2021.
2. 7 U.S.C. § 136(a)(1); 2021. https://www.law.cornell.edu/uscode/text/7/136. Accessed 19 Oct 2021.
3. Berkes F. Traditional ecological knowledge in perspective. Traditional Ecological Knowledge: Concepts and Cases, J.T. Inglis, Ed., Canadian Museum of Nature/International Development Research Centre, International Program on Traditional Ecological Knowledge International Development Research Centre. 1993: 1-9. ISBN 1-895926-00-9. Available here: https://library.um.edu.mo/ebooks/b10756577a.pdf.
4. Kinkela D. DDT and the American century: Global Health, environmental politics, and the pesticide that changed the world: University of North Carolina Press; 2011.
5. Mohai P, Pellow D, Roberts JT. Environmental justice. Annu Rev Environ Resour. 2009;34:405–30.
6. Tessum CW, Paolella DA, Chambliss SE, Apte JS, Hill JD, Marshall JD. $PM_{2.5}$ polluters disproportionately and systemically affect people of color in the United States. Sci Adv. 2021;7:eabf4491.
7. Williams DR, Priest N, Anderson NB. Understanding associations among race, socioeconomic status, and health: patterns and prospects. Health Psychol. 2016;35:407–11.
8. Atwood D, Paisley-Jones C. Pesticides industry sales and usage 2008–2012 market estimates. Washington, D.C.: US Environmental Protection Agency; 2017.
9. Horst M, Marion A. Racial, ethnic and gender inequities in farmland ownership and farming in the U.S. Agric Hum Values. 2019;36:1–16.
10. Perea J. The echoes of slavery: recognizing the racist origins of the agricultural and domestic worker exclusion from the National Labor Relations act. Ohio State Law J. 2011;72:95–138.
11. Zatz MS, Calavita K, Gamboa E. Using and abusing Mexican farmworkers: the bracero program and the INS. Law Soc Rev. 1993;27:851.
12. Liebman AK, Wiggins MF, Fraser C, Levin J, Sidebottom J, Arcury TA. Occupational health policy and immigrant workers in the agriculture, forestry, and fishing sector: occupational health policy and immigrant workers. Am J Ind Med. 2013;56:975–84.
13. Hernandez T, Gabbard S. Findings from the National Agricultural Workers Survey (NAWS) 2015–2016: a demographic and employment profile of United States farmworkers; 2018.
14. Henderson S, Wells R. Environmental racism and the contamination of black lives: a literature review. J Afr Am St. 2021;25:134–51.
15. Hwang J, Ding L. Unequal displacement: gentrification, racial stratification, and residential destinations in Philadelphia. Am J Sociol. 2020;126:354–406.
16. Coffey E, Walz K, Chizewer D, Benfer EA, Templeton MN, Weinstock R. Poisonous Homes: The Fight for Environmental Justice in Federally Assisted Housing. Shriver Center on Poverty Law and Earth Justice; 2020. Available here: https://www.povertylaw.org/wp-content/uploads/2020/06/environmental_justice_report_final.pdf. Accessed 8 June 2021.
17. Pastor M, Sadd J, Hipp J. Which came first? Toxic facilities, minority move-in, and environmental justice. J Urban Aff. 2001;23:1–21.
18. Mohai P, Saha R. Which came first, people or pollution? Assessing the disparate siting and post-siting demographic change hypotheses of environmental injustice. Environ Res Lett. 2015;10:115008.
19. De Silva DG, McComb RP, Schiller AR, Slechten A. Firm behavior and pollution in small geographies. Eur Econ Rev. 2021;136:103742.
20. Surgan MH, Congdon T, Primi C, Lamster S, Louis-Jacques J. Pest Control in Public Housing, Schools and Parks: Urban Children at Risk. Environmental Protection Bureau, Office of the New York State Attorney General; 2002. Available here: http://www.marketvisiontv.com/sites/default/files/pdfs/bureaus/environmental/pest_control_public_housing.pdf. Accessed 9 Aug 2021.
21. Bullard R, Mohai P, Saha R, Wright B. Toxic wastes and race at twenty: why race still matters after all of these years. Environmental Law. 2008;38:371–411.
22. Orum P, Moore R, Roberts M, Sanchez J. Who's in Danger? Race, Poverty, and Chemical Disasters. A demographic analysis of chemical disaster vulnerability zones. Environmental Justice and Health Alliance for Chemical Policy Reform, Coming Clean and Center for Effective Government; 2014. Available here: https://comingcleaninc.org/assets/media/images/Reports/Who's%20in%20Danger%20Report%20FINAL.pdf. Accessed 17 Feb 2021.
23. White R. Life at the Fenceline: Understanding Cumulative Health Hazards in Environmental Justice Communities. Coming Clean, The Environmental Justice Health Alliance for Chemical Policy Reform and The Campaign for Healthier Solutions; 2018. Available here: https://ej4all.org/assets/media/documents/Life%20at%20the%20Fenceline%20-%20English%20-%20Public.pdf. Accessed 2 Mar 2021.
24. Starbuck A, White R. Living in the Shadow of Danger: Poverty, Race and Unequal Chemical Facility Hazards. Center for Effective Government; 2016. Available here: https://www.foreffectivegov.org/sites/default/files/shadow-of-danger-highrespdf.pdf. Accessed 2 Mar 2021.
25. Collins MB, Munoz I, JaJa J. Linking 'toxic outliers' to environmental justice communities. Environ Res Lett. 2016;11:015004.
26. Ash M, Boyce JK. Racial disparities in pollution exposure and employment at US industrial facilities. Proc Natl Acad Sci U S A. 2018;115:10636–41.
27. Broughton E. The Bhopal disaster and its aftermath: a review. Environ Health. 2005;4:6.
28. U.S. Chemical Safety and Hazard Investigation Board. Pesticide Chemical Runaway Reaction - Pressure Vessel Explosion. Investigation Report, No. 2008–08-I-WV, Bayer CropScience, LP, Institute, WV, August 28, 2008. 2011. Available here: https://permanent.fdlp.gov/gpo49945/Bayer_Report_Final.pdf. Accessed 3 Sept 2021.
29. U.S. Census Bureau. American Community Survey 5-year estimates. Retrieved from Census Reporter Profile page for Census Tract 104, Kanawha, WV. 2019. https://censusreporter.org/profiles/14000US54039010400-census-tract-104-kanawha-wv/. Accessed 30 Jul 2021.
30. U.S. Census Bureau. American Community Survey 1-Year Estimates Detailed Tables - West Virginia. Race. Table ID: B02001. 2019. https://data.census.gov/cedsci/table?t=Race%20and%20Ethnicity&g=0400000US54&tid=ACSDT1Y2019.B02001&hidePreview=false. Accessed 13 Feb 2021.
31. U.S. Census Bureau. American Community Survey 5-year estimates. Retrieved from Census Reporter Profile page for 40210. 2019. https://censusreporter.org/profiles/86000US40210-40210/. Accessed 30 Jul 2021.
32. Van Velzer R. Nearly 8 Years After Pollution Was Found, Black Leaf Site Will Be Cleaned. WFPL. 2018. Available here: https://wfpl.org/nearly-8-years-after-pollution-was-found-black-leaf-site-will-be-cleaned/. Accessed 4 Sept 2021.

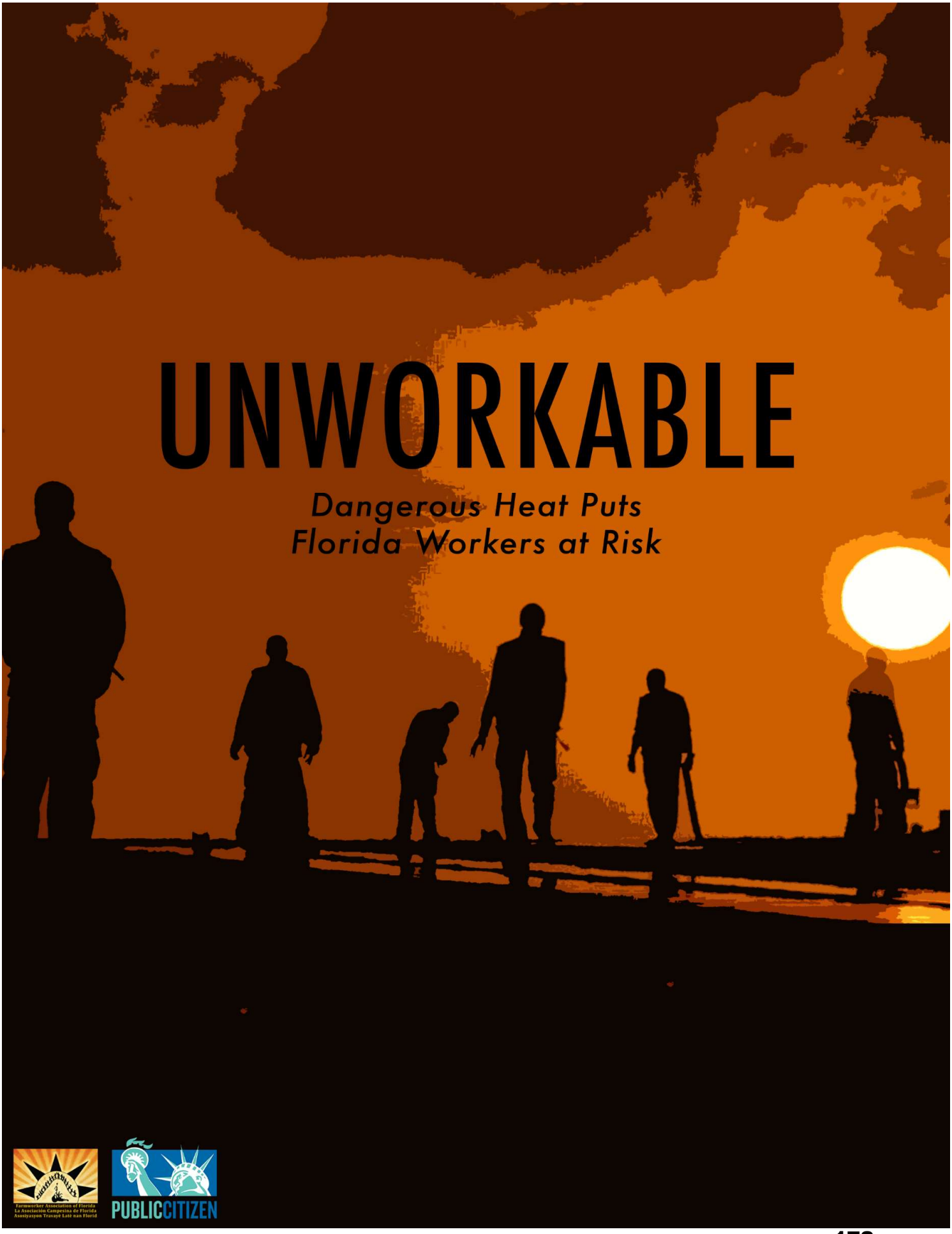
33. U.S. Census Bureau. American Community Survey 1-Year Estimates Detailed Tables - Kentucky. Race. Table ID: B02001. 2019. https://data.census.gov/cedsci/table?t=Race%20and%20Ethnicity&g=0400000US21&tid=ACSDT1Y2019.B02001&hidePreview=false. Accessed 13 Feb 2021.
34. U.S. Census Bureau. American Community Survey 1-Year Estimates Detailed Tables - Kentucky. Poverty Status in The Past 12 Months. Table ID: S1701. 2019. https://data.census.gov/cedsci/table?t=Income%20and%20Poverty&g=0400000US21&tid=ACSST1Y2019.S1701&hidePreview=false. Accessed 13 Feb 2021.
35. Butler B. Richmond Superfund Site Remains Contaminated Despite EPA Cleanup. KPIX-CBS. 2012. Available here: https://sanfrancisco.cbslocal.com/2012/01/05/contamination-at-richmond-superfind-site-worse-than-before-epa-clean-up/. Accessed 2 Mar 2021.
36. U.S. Census Bureau. American Community Survey 1-Year Estimates Detailed Tables - Richmond City, CA. ACS Demographic and Housing Estimates. Table ID: DP05. 2019. https://data.census.gov/cedsci/table?q=richmond,%20california&tid=ACSDP1Y2019.DP05&hidePreview=false. Accessed 13 Feb 2021.
37. U.S. EPA. Press Release - Judge Freezes Assets and Appoints Receiver at Pesticides Distributor in St. Joseph, Missouri. 2022. https://www.epa.gov/newsreleases/judge-freezes-assets-and-appoints-receiver-pesticides-distributor-st-joseph-missouri. Accessed 9 Feb 2022.
38. Hoffmann M. Lawsuit: Company continues to leak chemicals into water supply. News-Press NOW 2021. Available here: https://www.newspressnow.com/news/local_news/public_safety/lawsuit-company-continues-to-leak-chemicals-into-water-supply/article_e6a15b84-cfb2-11eb-bdbe-27d1523b962b.html. Accessed 9 Feb 2022.
39. United Nations Human Rights Council. Report of the Special Rapporteur on the right to food. A/HRC/34/48. 2017. Available here: https://documents-dds-ny.un.org/doc/UNDOC/GEN/G17/017/85/PDF/G1701785.pdf?OpenElement. Accessed 24 May 2021.
40. Landrigan PJ, Fuller R, Acosta NJR, Adeyi O, Arnold R, Basu N, et al. The lancet commission on pollution and health. Lancet. 2018;391:462–512.
41. Cushing L, Faust J, August LM, Cendak R, Wieland W, Alexeeff G. Racial/ethnic disparities in cumulative environmental health impacts in California: evidence from a statewide environmental justice screening tool (CalEnviroScreen 1.1). Am J Public Health. 2015;105:2341–8.
42. Donley N. Lost in the mist: how glyphosate use disproportionately threatens California's Most impoverished counties; 2015. https://doi.org/10.13140/RG.2.2.17895.80800.
43. Weller M. There's Something in the Air, and It Causes Childhood Cancers. Californians for Pesticide Reform; 2021. Available here: https://www.pesticidereform.org/wp-content/uploads/2021/12/FINAL-202111-CPR-Childhood-Cancer-v4.pdf. Accessed 8 Feb 2022.
44. Belova A, Greco SL, Riederer AM, Olsho LEW, Corrales MA. A method to screen U.S. environmental biomonitoring data for race/ethnicity and income-related disparity. Environ Health. 2013;12:114.
45. Nguyen VK, Kahana A, Heidt J, Polemi K, Kvasnicka J, Jolliet O, et al. A comprehensive analysis of racial disparities in chemical biomarker concentrations in United States women, 1999–2014. Environ Int. 2020;137:105496.
46. Sjödin A, Jones RS, Caudill SP, Wong L-Y, Turner WE, Calafat AM. Polybrominated Diphenyl ethers, polychlorinated biphenyls, and persistent pesticides in serum from the National Health and nutrition examination survey: 2003–2008. Environ Sci Technol. 2014;48:753–60.
47. Attina TM, Malits J, Naidu M, Trasande L. Racial/ethnic disparities in disease burden and costs related to exposure to endocrine-disrupting chemicals in the United States: an exploratory analysis. J Clin Epidemiol. 2019;108:34–43.
48. Gray S, Ross Z, Walker B. Every breath You take: airborne pesticides in the San Joaquin ValleyEnvironmental Working Group; 2001.
49. California Environmental Health Tracking Program. Agricultural pesticide use near public schools in California. California Department of Public Health. 2014. Available here: https://trackingcalifornia.org/cms/file/agricultural-pesticides-near-schools/report. Accessed 28 Aug 2021.
50. Goldman P, Brimmer JK, Ruiz V. Pesticides in the Air – Kids at Risk: Petition to EPA to Protect Children From Pesticide Drift. Earthjustice and Farmworker Justice; 2009. Available here: https://earthjustice.org/sites/default/files/library/legal_docs/petition-pesticides-in-the-air-kids-at-risk.pdf. Accessed 5 Aug 2021.
51. Arcury TA, Chen H, Quandt SA, Talton JW, Anderson KA, Scott RP, et al. Pesticide exposure among Latinx children: comparison of children in rural, farmworker and urban, non-farmworker communities. Sci Total Environ. 2021;763:144233.
52. Landrigan PJ, Claudio L, Markowitz SB, Berkowitz GS, Brenner BL, Romero H, et al. Pesticides and inner-city children: exposures, risks, and prevention. Environ Health Perspect. 1999;107(suppl 3):431–7.
53. Julien R, Adamkiewicz G, Levy JI, Bennett D, Nishioka M, Spengler JD. Pesticide loadings of select organophosphate and pyrethroid pesticides in urban public housing. J Expo Sci Environ Epidemiol. 2008;18:167–74.
54. Whyatt RM, Barr DB, Camann DE, Kinney PL, Barr JR, Andrews HF, et al. Contemporary-use pesticides in personal air samples during pregnancy and blood samples at delivery among urban minority mothers and newborns. Environ Health Perspect. 2003;111:749–56.
55. Whyatt RM, Camann DE, Kinney PL, Reyes A, Ramirez J, Dietrich J, et al. Residential pesticide use during pregnancy among a cohort of urban minority women. Environ Health Perspect. 2002;110:507–14.
56. Muscat JE, Britton JA, Djordjevic MV, Citron ML, Kemeny M, Busch-Devereaux E, et al. Adipose concentrations of organochlorine compounds and breast cancer recurrence in Long Island, New York. Cancer Epidemiol Biomark Prev. 2003;12:1474–8.
57. Arcury TA, Grzywacz JG, Talton JW, Chen H, Vallejos QM, Galván L, et al. Repeated pesticide exposure among North Carolina migrant and seasonal farmworkers. Am J Ind Med. 2010;53:802–13. Available here: https://doi.org/10.1002/ajim.20856.
58. Curl C, Meierotto L, Som Castellano RL. Assessment of risk factors for health disparities among Latina farm workers: Boise State University; 2020.
59. Runkle JD, Tovar-Aguilar JA, Economos E, Flocks J, Williams B, Muniz JF, et al. Pesticide risk perception and biomarkers of exposure in Florida female farmworkers. J Occup Environ Med. 2013;55:1286–92.
60. Salvatore AL, Bradman A, Castorina R, Camacho J, López J, Barr DB, et al. Occupational behaviors and farmworkers' pesticide exposure: findings from a study in Monterey county, California. Am J Ind Med. 2008;51:782–94.
61. Curl CL, Fenske RA, Kissel JC, Shirai JH, Moate TF, Griffith W, et al. Evaluation of take-home organophosphorus pesticide exposure among agricultural workers and their children. Environ Health Perspect. 2002;110:A787–A792. Available here: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1241133/.
62. Cox S, Niskar AS, Narayan KMV, Marcus M. Prevalence of self-reported diabetes and exposure to Organochlorine pesticides among Mexican Americans: Hispanic health and nutrition examination survey, 1982–1984. Environ Health Perspect. 2007;115:1747–52.
63. Larsen AE, Gaines SD, Deschênes O. Agricultural pesticide use and adverse birth outcomes in the San Joaquin Valley of California. Nat Commun. 2017;8:302.
64. Forrester MB. Association between Sociodemographic factors and exposures and utilization of poison centers in Texas, 1998–2002. J Toxic Environ Health A. 2005;68:755–61.
65. Litovitz T, Benson BE, Youniss J, Metz E. Determinants of U.S. poison center utilization. Clin Toxicol. 2010;48:449–57.
66. Otaluka ON, Corrado R, Brooks DE, Nelson DB. A survey of poison center knowledge and utilization among urban and rural residents of Arizona. Toxicol Rep. 2015;2:203–4.
67. Feldman SR, Vallejos QM, Quandt SA, Fleischer AB, Schulz MR, Verma A, et al. Health care utilization among migrant Latino farmworkers: the case of skin disease. J Rural Health. 2009;25:98–103.
68. Reeves M, Schafer KS. Greater risks, fewer rights: U.S. farmworkers and pesticides. Int J Occup Environ Health. 2003;9:30–9.
69. McCauley LA, Anger WK, Keifer M, Langley R, Robson MG, Rohlman D. Studying health outcomes in farmworker populations exposed to pesticides. Environ Health Perspect. 2006;114:953–60.
70. U.S. EPA. Regulatory Impact Analysis of Worker Protection Standard for Agricultural Pesticides. Report number EPA/735/R/92/002. Biological and Economic Analysis Division Office of Pesticide Programs; 1992. Available here: https://nepis.epa.gov/Exe/ZyPDF.cgi?Dockey=P100LYPD.PDF. Accessed 2 Sept 2021.
71. U.S. General Accounting Office. Hired Farmworkers: Health and Well-Being at Risk. Report number GAO/HRD-92-46. Human Resources

Division; 1992. Available here: https://www.gao.gov/assets/hrd-92-46.pdf. Accessed 23 Apr 2021.
72. Stanbury M, Rosenman KD. Occupational health disparities: a state public health-based approach: occupational health disparities. Am J Ind Med. 2014;57:596–604.
73. Calvert GM, Beckman J, Prado JB, Bojes H, Schwartz A, Mulay P, et al. Acute occupational pesticide-related illness and injury —United States, 2007–2011. MMWR Morb Mortal Wkly Rep. 2016;63:11–6.
74. Mills PK, Dodge JL, Bush J, Thompson Y, Shah P. Agricultural exposures and breast cancer among Latina in the San Joaquin Valley of California. J Occup Environ Med. 2019;61:552–8.
75. Marks AR, Harley K, Bradman A, Kogut K, Barr DB, Johnson C, et al. Organophosphate pesticide exposure and attention in young Mexican-American children: the CHAMACOS study. Environ Health Perspect. 2010;118:1768–74.
76. Sagiv SK, Bruno JL, Baker JM, Palzes V, Kogut K, Rauch S, et al. Prenatal exposure to organophosphate pesticides and functional neuroimaging in adolescents living in proximity to pesticide application. Proc Natl Acad Sci U S A. 2019;116:18347–56.
77. Polemi KM, Nguyen VK, Heidt J, Kahana A, Jolliet O, Colacino JA. Identifying the link between chemical exposures and breast cancer in African American women via integrated in vitro and exposure biomarker data. Toxicology. 2021;463:152964.
78. Codru N, Schymura MJ, Negoita S, Rej R, Carpenter DO. The Akwesasne task force on the environment. Diabetes in relation to serum levels of polychlorinated biphenyls and chlorinated pesticides in adult native Americans. Environ Health Perspect. 2007;115:1442–7.
79. Song Y, Chou EL, Baecker A, You N-CY, Song Y, Sun Q, et al. Endocrine-disrupting chemicals, risk of type 2 diabetes, and diabetes-related metabolic traits: a systematic review and meta-analysis. J Diabetes. 2016;8:516–32.
80. Whyatt RM, Rauh V, Barr DB, Camann DE, Andrews HF, Garfinkel R, et al. Prenatal insecticide exposures and birth weight and length among an urban minority cohort. Environ Health Perspect. 2004;112:1125–32.
81. Perera FP, Rauh V, Tsai W-Y, Kinney P, Camann D, Barr D, et al. Effects of transplacental exposure to environmental pollutants on birth outcomes in a multiethnic population. Environ Health Perspect. 2003;111:201–5.
82. Rauch SA, Braun JM, Barr DB, Calafat AM, Khoury J, Montesano MA, et al. Associations of prenatal exposure to organophosphate pesticide metabolites with gestational age and birth weight. Environ Health Perspect. 2012;120:1055–60.
83. Eskenazi B, Harley K, Bradman A, Weltzien E, Jewell NP, Barr DB, et al. Association of *in utero* organophosphate pesticide exposure and fetal growth and length of gestation in an agricultural population. Environ Health Perspect. 2004;112:1116–24.
84. Engel SM, Bradman A, Wolff MS, Rauh VA, Harley KG, Yang JH, et al. Prenatal Organophosphorus pesticide exposure and child neurodevelopment at 24 months: an analysis of four birth cohorts. Environ Health Perspect. 2016;124:822–30.
85. Harley KG, Engel SM, Vedar MG, Eskenazi B, Whyatt RM, Lanphear BP, et al. Prenatal exposure to Organophosphorous pesticides and fetal growth: pooled results from four longitudinal birth cohort studies. Environ Health Perspect. 2016;124:1084–92.
86. Pesticide Action Network Asia Pacific. Communities in peril: global report on health impacts of pesticide use in agriculture; 2010.
87. Boedeker W, Watts M, Clausing P, Marquez E. The global distribution of acute unintentional pesticide poisoning: estimations based on a systematic review. BMC Public Health. 2020;20:1875.
88. Goldmann L. Childhood Pesticide Poisoning: Information for Advocacy and Action. Report prepared for the Food and Agriculture Organization (FAO), the United Nations Environment Programme (UNEP), and the World Health Organization (WHO); 2004. Available here: https://www.who.int/ceh/publications/pestpoisoning.pdf. Accessed 9 Feb 2022.
89. U.S. EPA. Summary of the Food Quality Protection Act. Public Law 104–170 (1996). https://www.epa.gov/laws-regulations/summary-food-quality-protection-act. Accessed 19 Aug 2021.
90. 21 U.S.C. § 346a(b)(2)(A)(ii). https://www.law.cornell.edu/uscode/text/21/346a. Accessed 21 Oct 2021.
91. 7 U.S.C. § 136(bb). https://www.law.cornell.edu/uscode/text/7/136. Accessed 21 Oct 2021.
92. U.S. EPA. Revised Risk Assessment Methods for Workers, Children of Workers in Agricultural Fields, and Pesticides with No Food Uses 2009. Available here: https://www.regulations.gov/document/EPA-HQOPP-2009-0889-0002. Accessed 20 Aug 2021.
93. American Chemistry Council Biocides Panel. Comments on Policy Paper on Revised Risk Assessment Methods For Workers, Children of Workers in Agricultural Fields, and Pesticides with No Food Uses, Notice of Availability. 2010. https://www.regulations.gov/comment/EPA-HQ-OPP-2009-0889-0029. Accessed 30 Nov 2021.
94. CropLife America. Comments on EPA's Revised Risk Assessment Methods for Workers, Children of Workers in Agricultural Fields, and Pesticides with No Food Uses. 2010. https://www.regulations.gov/comment/EPA-HQ-OPP-2009-0889-0030. Accessed 30 Nov 2021.
95. Dow AgroSciences. Comments Of Dow Agrosciences LLC, Policy Paper On Revised Risk Assessment Methods For Workers, Children Of Workers In Agricultural Fields, And Pesticides With No Food Uses. 2010. https://www.regulations.gov/comment/EPA-HQ-OPP-2009-0889-0032. Accessed 30 Nov 2021.
96. Personal email communication between Nathan Donley and EPA's Office of Pesticide Programs Health Effects Division Director Dana Vogel. 2021.
97. Bohme SR. EPA's proposed worker protection standard and the burdens of the past. Int J Occup Environ Health. 2015;21:161–5.
98. U.S. EPA. Pesticides; Agricultural Worker Protection Standard Revisions. 80 Fed. Reg. 67495–67574. 2015. Available here: https://www.federalregister.gov/documents/2015/11/02/2015-25970/pesticides-agricultural-worker-protection-standard-revisions. Accessed 21 Oct 2021.
99. U.S. EPA. Pesticides; Agricultural Worker Protection Standard; Revision of the Application Exclusion Zone Requirements. 85 Fed. Reg. 68760–68782. 2020. Available here: https://www.federalregister.gov/documents/2020/10/30/2020-23411/pesticides-agricultural-worker-protection-standard-revision-of-the-application-exclusion-zone. Accessed 21 Oct 2021.
100. U.S. DOL. Occupational Safety and Health Administration. Medical Screening and Surveillance: Standards. General Industry (29 CFR 1910 Subpart Z). https://www.osha.gov/medical-surveillance/standards. Accessed 7 Aug 2021.
101. WA State Dept. of Labor & Industries. Safety and Health - Safety Topics: Cholinesterase. https://lni.wa.gov/safety-health/safety-topics/industry/cholinesterase. Accessed 23 Sep 2021.
102. CA EPA Office of Environmental Health Hazard Assessment. Pesticides: Cholinesterase Monitoring of Agricultural Pesticide Applicators 2015. https://oehha.ca.gov/pesticides/program/cholinesterase-monitoring-agricultural-pesticide-applicators. Accessed 3 Oct 2021.
103. Farm Worker Pesticide Project, Farmworker Justice Fund, United Farm Workers. Messages from Monitoring: Farm Workers, Pesticides and the Need for Reform. 2005. Available here: http://lib.ncfh.org/pdfs/5922.pdf/. Accessed 6 Oct 2021.
104. Rothlein J, Rohlman D, Lasarev M, Phillips J, Muniz J, McCauley L. Organophosphate pesticide exposure and neurobehavioral performance in agricultural and nonagricultural Hispanic workers. Environ Health Perspect. 2006;114:691–6.
105. U.S. General Accounting Office. Pesticides: Improvements Needed to Ensure the Safety of Farmworkers and Their Children. Report number GAO/RCED-00-40. Resources, Community, and Economic Development Division; 2000. Available here: https://www.gao.gov/assets/rced-00-40.pdf. Accessed 23 June 2021.
106. U.S. EPA. Enforcement and Compliance History Online (ECHO) Database. Analyze Trends: Pesticide Dashboard https://echo.epa.gov/trends/comparative-maps-dashboards/state-pest-dashboard?state=National. Accessed 3 Dec 2021.
107. 40 C.F.R. § 168.75 - Procedures for exporting unregistered pesticides - purchaser acknowledgement statements. Available here: https://www.law.cornell.edu/cfr/text/40/168.75. Accessed 29 Oct 2021.
108. Smith C, Kerr K, Sadripour A. Pesticide exports from U.S. ports, 2001–2003. Int J Occup Environ Health. 2008;14:176–86.
109. U.S. EPA Office of Inspector General. EPA Needs to Comply with the Federal Insecticide, Fungicide, and Rodenticide Act and Improve Its Oversight of Exported Never-Registered Pesticides. Report No. 10-P-0026. 2009. Available here: https://www.epa.gov/sites/default/files/2015-11/documents/20091110-10-p-0026.pdf. Accessed 23 Apr 2021.

110. King AM, Aaron CK. Organophosphate and Carbamate poisoning. Emerg Med Clin North Am. 2015;33:133–51.
111. Eyer P. The role of Oximes in the Management of Organophosphorus Pesticide Poisoning. Toxicol Rev. 2003;22:165–90.
112. Calvert GM, Karnik J, Mehler L, Beckman J, Morrissey B, Sievert J, et al. Acute pesticide poisoning among agricultural workers in the United States, 1998-2005. Am J Ind Med. 2008;51:883–98.
113. Exec. Order No. 12898, 59 Fed. Reg. 7629–7633. February 16, 1994. Available here: https://www.federalregister.gov/documents/1994/02/16/94-3685/federal-actions-to-address-environmental-justice-in-minority-populations-and-low-income-populations. Accessed 21 Oct 2021.
114. U.S. EPA Office of Inspector General. EPA Needs to Consistently Implement the Intent of the Executive Order on Environmental Justice. Report No 2004-P-00007. 2004. Available here: https://www.epa.gov/sites/default/files/2015-12/documents/20040301-2004-p-00007.pdf. Accessed 12 Apr 2021.
115. U.S. EPA Office of Inspector General. EPA Needs to Conduct Environmental Justice Reviews of Its Programs, Policies, and Activities. Report No. 2006-P-00034. 2006. Available here: https://www.epa.gov/sites/default/files/2015-11/documents/20060918-2006-p-00034.pdf. Accessed 16 Apr 2021.
116. Konisky DM. Environmental justice delayed: failed promises, Hope for the future. Environ Sci Policy Sustain Dev. 2016;58:4–15.
117. Binder D, Crawford C, Gauna E, Jarman MC, Kaswan A, Mank BC, et al. A survey of Federal Agency Response to President Clinton's executive order no. 12898 on environmental justice. SSRN J. 2001. https://doi.org/10.2139/ssrn.2322248.
118. Provost C, Gerber BJ. Political control and policy-making uncertainty in executive orders: the implementation of environmental justice policy. J Pub Pol. 2019;39:329–58.
119. U.S. EPA. Atrazine. Draft Human Health Risk Assessment for Registration Review. 2018. Available here: https://www.regulations.gov/document/EPA-HQ-OPP-2013-0266-1159. Accessed 25 Apr 2021.
120. U.S. EPA. Fluindapyr: Human Health Risk Assessment for Section 3 Registration and Tolerance Requests for a New Active Ingredient Proposed for Use on Cereal Grains Crop Group 15 except Rice; Forage, Fodder and Straw of Cereal Grains Crop Group 16; Nut, Tree, Group 14-12; Soybean; Ornamentals; and Turf. 2020. Available here: https://www.regulations.gov/document/EPA-HQ-OPP-2018-0551-0020. Accessed 25 Apr 2021
121. U.S. EPA. Oxytetracycline/Oxytetracycline Hydrochloride/Oxytetracycline Calcium: Draft Human Health Risk Assessment in Support of Registration Review and Tolerance Establishment in/on Citrus Fruit Crop Group 10–10. 2016. Available here: https://www.regulations.gov/document/EPA-HQ-OPP-2015-0820-0008. Accessed 25 Apr 2021.
122. Nat'l Family Farm Coalition v. USEPA. United States Court of Appeals for The Ninth Circuit. No. 19–70115. 2020. Available here: https://cdn.ca9.uscourts.gov/datastore/opinions/2020/06/03/19-70115.pdf. Accessed 3 June 2021
123. The Center for Biological Diversity. Comments on the National Marine Fisheries Service Biological Opinion Issued Under the Endangered Species Act for Chlorpyrifos, Diazinon, and Malathion 2018. https://www.regulations.gov/comment/EPA-HQ-OPP-2018-0141-0132. Accessed 5 Apr 2021.
124. Calvert GM, Alarcon WA, Chelminski A, Crowley MS, Barrett R, Correa A, et al. Case report: three farmworkers who gave birth to infants with birth defects closely grouped in time and place—Florida and North Carolina, 2004–2005. Environ Health Perspect. 2007;115:787–91.
125. Rother H-A. Pesticide labels: protecting liability or health? – unpacking "misuse" of pesticides. Curr Opinion Environ Sci Health. 2018;4:10–5.
126. Mines R, Mullenax N, Saca L. The Binational Farmworker Health Survey. California Institute for Rural Studies; 2001. Available here: http://lib.ncfh.org/pdfs/2k12/4827.pdf. Accessed 4 May 2021.
127. Farquhar SA, Goff NM, Shadbeh N, Samples J, Ventura S, Sanchez V, et al. Occupational health and safety status of indigenous and Latino farmworkers in Oregon. J Agric Saf Health. 2009;15:89–102.
128. Robinson E, Nguyen HT, Isom S, Quandt SA, Grzywacz JG, Chen H, et al. Wages, wage violations, and pesticide safety experienced by migrant farmworkers in North Carolina. New Solut. 2011;21:251–68.
129. Whalley LE, Grzywacz JG, Quandt SA, Vallejos QM, Walkup M, Chen H, et al. Migrant farmworker field and camp safety and sanitation in eastern North Carolina. J Agromed. 2009;14:421–36.
130. Curl CL, Meierotto L, Castellano RLS, Spivak MR, Kannan K. Measurement of urinary pesticide biomarkers among Latina farmworkers in southwestern Idaho. J Expo Sci Environ Epidemiol. 2021;31:538–48.
131. Shipp EM, Cooper SP, Burau KD, Bolin JN. Pesticide safety training and access to field sanitation among migrant farmworker mothers from Starr County, Texas. J Agric Saf Health. 2005;11:51–60.
132. Cameron L, Lalich N, Bauer S, Booker V, Bogue HO, Samuels S, et al. Occupational health survey of farm workers by camp health aides. J Agric Saf Health. 2006;12:139–53.
133. Farquhar S, Samples J, Ventura S, Davis S, Abernathy M, McCauley L, et al. Promoting the occupational health of indigenous farmworkers. J Immigr Minor Health. 2008;10:269–80.
134. U.S. EPA. Spanish Translation Guide for Pesticide Labeling 2020. https://www.epa.gov/pesticide-labels/spanish-translation-guide-pesticide-labeling. Accessed 3 Aug 2021.
135. U.S. EPA. Reevaluation: Review of Registered Pesticides. Registration Review Process 2021. https://www.epa.gov/pesticide-reevaluation/registration-review-process. Accessed 8 Oct 2021.
136. Leigh JP, Du J, McCurdy SA. An estimate of the U.S. government's undercount of nonfatal occupational injuries and illnesses in agriculture. Ann Epidemiol. 2014;24:254–9.
137. U.S. EPA Office of Inspector General. EPA Needs to Evaluate the Impact of the Revised Agricultural Worker Protection Standard on Pesticide Exposure Incidents. Report No. 18-P-0080. 2018. Available here: https://www.epa.gov/sites/default/files/2018-02/documents/_epaoig_20180215-18-p-0080.pdf. Accessed 8 Oct 2021.
138. Brandt-Rauf SI, Forst L, Calahorrano AA, Davis BD, Flores M, Friedman EJ, et al. Toward the Creation of a Public Health Surveillance System for Pesticide Related Illness/Injury in Illinois. University of Illinois Chicago Environmental and Occupational Health Sciences School of Public Health; 2018. Available here: http://illinoisinjuryprevention.org/PesticideDocument_final_TOC.pdf. Accessed 8 Oct 2021.
139. U.S. Centers for Disease Control and Prevention. The National Institute for Occupational Safety and Health (NIOSH). About the NIOSH Pesticide Surveillance Program. https://www.cdc.gov/niosh/topics/pesticides/overview.html. Accessed 8 Dec 2021.
140. Namulanda G, Monti MM, Mulay P, Higgins S, Lackovic M, Schwartz A, et al. Acute nonoccupational pesticide-related illness and injury — United States, 2007–2011. MMWR Morb Mortal Wkly Rep. 2016;63:5–10.
141. Alarcon WA. The CDC/NIOSH Sentinel Event Notification System for Occupational Risks (SENSOR) Pesticides Program. Pesticide Program Dialogue Committee Meeting October 27-28, 2021. 2021. https://www.epa.gov/system/files/documents/2021-10/sensor-cdc-niosh-sentinal-event-notification-system-for-occupational-risk-program.pdf. Accessed 5 Nov 2021.
142. Harrison JL. Neoliberal environmental justice: mainstream ideas of justice in political conflict over agricultural pesticides in the United States. Environmental Politics. 2014;23:650–69.
143. UC Berkeley School of Public Health. Center for Environmental Research and Children's Health. Research Programs: CHAMACOS Study. https://cerch.berkeley.edu/research-programs/chamacos-study. Accessed 21 Sep 2021.
144. U.S. EPA. Office of Pesticide Programs' Framework for Incorporating Human Epidemiologic & Incident Data in Risk Assessments for Pesticides. 2016. Available here: https://www.regulations.gov/document/EPA-HQ-OPP-2008-0023-0058. Accessed 9 Oct 2021.
145. U.S. EPA. Chlorpyrifos: Revised Human Health Risk Assessment for Registration Review. 2016. Available here: https://www.regulations.gov/document/EPA-HQ-OPP-2015-0653-0454. Accessed 23 Apr 2021.
146. Hakim D, Lipton E. Pesticide Studies Won E.P.A.'s Trust, Until Trump's Team Scorned 'Secret Science'. New York Times 2018. Available here: https://www.nytimes.com/2018/08/24/business/epa-pesticides-studies-epidemiology.html. Accessed 2 Oct 2021.

147. U.S. EPA. Paraquat Dichloride Interim Registration Review Decision Case Number 0262. 2021. Available here: https://www.regulations.gov/document/EPA-HQ-OPP-2011-0855-0307. Accessed 2 Oct 2021.
148. U.S. EPA. Atrazine Interim Registration Review Decision Case Number 0062. 2020. Available here: https://www.regulations.gov/document/EPA-HQ-OPP-2013-0266-1605. Accessed 2 Oct 2021.
149. U.S. EPA. 2,4-D. Revised Human Health Risk Assessment for Registration Review. 2017. Available here: https://www.regulations.gov/document/EPA-HQ-OPP-2012-0330-0086. Accessed 3 Dec 2021.
150. U.S. EPA. Chlorpyrifos; Tolerance Revocations. 86 Fed. Reg. 48315–48336. 2021. Available here: https://www.federalregister.gov/documents/2021/08/30/2021-18091/chlorpyrifos-tolerance-revocations. Accessed 22 Oct 2021.
151. FIFRA Scientific Advisory Panel. Minutes No. 2016–01. A Set of Scientific Issues Being Considered by the Environmental Protection Agency Regarding Chlorpyrifos: Analysis of Biomonitoring Data. 2016. Available here: https://www.epa.gov/sites/default/files/2016-07/documents/chlorpyrifos_sap_april_2016_final_minutes.pdf. Accessed 4 Aug 2021.
152. National Research Council. Pesticides in the diets of infants and children. Washington, D.C.: National Academies Press; 1993.
153. U.S. EPA. Determination of the Appropriate FQPA Safety Factor(s) in Tolerance Assessment. 2002. Available here: https://www.epa.gov/sites/default/files/2015-07/documents/determ.pdf. Accessed 4 Sept 2021.
154. Consumers Union of United States. A Report Card For The EPA: Successes And Failures In Implementing The Food Quality Protection Act. 2001. Available here: https://hygeia-analytics.com/wp-content/uploads/2021/04/ReportCard_final.pdf. Accessed 15 Oct 2021.
155. U.S. EPA Office of Inspector General. Measuring the Impact of the Food Quality Protection Act: Challenges and Opportunities. Report No. 2006-P-00028. 2006. Available here: https://www.epa.gov/sites/default/files/2015-11/documents/20060801-2006-p-00028.pdf. Accessed 3 July 2021.
156. National Research Council. Toxicity testing for assessment of environmental agents: interim report. Washington, D.C.: National Academies Press; 2006.
157. U.S. Government Accounting Office. Environmental Health. EPA Has Made Substantial Progress but Could Improve Processes for Considering Children's Health. Report number GAO-13-254 2013. Available here: https://www.gao.gov/assets/gao-13-254.pdf. Accessed 23 June 2021.
158. Naidenko OV. Application of the food quality protection act children's health safety factor in the U.S. EPA pesticide risk assessments. Environ Health. 2020;19:16 s12940–020–0571–6.
159. 21 U.S.C. § 346a(b)(2)(C). Available here: https://www.law.cornell.edu/uscode/text/21/346a. Accessed 22 Oct 2021.
160. Thayer K, Houlihan J. Pesticides, human health, and the food quality protection act. William Mary Environ Law Policy Rev. 2004;28:257–312.
161. U.S. EPA. Re-Evaluation of the FQPA Safety Factor for Pyrethroid Pesticides. 2011. Available here: https://www.regulations.gov/document/EPA-HQ-OPP-2011-0746-0011. Accessed 8 Oct 2021.
162. U.S. EPA. USEPA Office of Pesticide Programs' Re-Evaluation of the FQPA Safety Factor for Pyrethroids: Updated Literature and CAPHRA Program Data Review. 2019. Available here: https://www.epa.gov/sites/default/files/2019-08/documents/2019-pyrethroid-fqpa-caphra.pdf. Accessed 8 Oct 2021.
163. FIFRA Scientific Advisory Panel. Minutes No. 2015–02. A Set of Scientific Issues Being Considered by the Environmental Protection Agency Regarding Research to Evaluate the Potential for Juvenile Sensitivity to Pyrethroids. 2015. Available here: https://www.regulations.gov/docket/EPA-HQ-OPP-2015-0130. Accessed 4 Aug 2021.
164. Portier K, Barton H, Fenner-Crisp P, Haddad S, Lin Z, Lumen A, et al. External Peer Review of EPA's Physiologically based Pharmacokinetic (PBPK) Model for Deltamethrin and Permethrin and PBPK-Pharmacodynamic (PBPK-PD) Model for Carbaryl 2018. Available here: https://www.regulations.gov/document/EPA-HQ-OPP-2010-0230-0069. Accessed 7 Oct 2021.
165. Mott L. The disproportionate impact of environmental health threats on children of color. Environ Health Perspect. 1995;103:33.
166. Landrigan PJ, Fuller R, Fisher S, Suk WA, Sly P, Chiles TC, et al. Pollution and children's health. Sci Total Environ. 2019;650:2389–94.
167. Weathers A, Minkovitz C, O'Campo P, Diener-West M. Access to Care for Children of migratory agricultural workers: factors associated with unmet need for medical care. Pediatrics. 2004;113:e276–82.
168. Nichols M, Stein AD, Wold JL. Health status of children of migrant farm workers: farm worker family health program, Moultrie, Georgia. Am J Public Health. 2014;104:365–70.
169. Science for Environment Policy. The Precautionary Priniple: decision making under uncertainty. Future Brief 18. Produced for the European Commission DG Environment by the Science Communication Unit, UWE, Bristol; 2017. Available here: https://ec.europa.eu/environment/integration/research/newsalert/pdf/precautionary_principle_decision_making_under_uncertainty_FB18_en.pdf. Accessed 2 Dec 2021.
170. Bullard R, Mohai P, Saha R, Wright B. Toxic Wastes and Race at Twenty: 1987—2007. United Church of Christ; 2007. Available here: https://www.ucc.org/wp-content/uploads/2021/03/toxic-wastes-and-race-at-twenty-1987-2007.pdf. Accessed 30 Oct 2021.
171. Donley N. The USA lags behind other agricultural nations in banning harmful pesticides. Environ Health. 2019;18:44.
172. Protect America's Children from Toxic Pesticides Act, S. 3283, 117th Congress. Introduced into the Senate on 11/30/2021. Available here: https://www.congress.gov/bill/117th-congress/senate-bill/3283/text. Accessed 8 Dec 2021.
173. U.S. EPA. EPA New Approach Methods: Efforts to Reduce Use of Animals in Chemical Testing. 2021. https://www.epa.gov/research/epa-new-approach-methods-efforts-reduce-use-animals-chemical-testing. Accessed 23 Oct 2021.
174. 40 C.F.R. § 156.10(a)(3). Available here: https://www.law.cornell.edu/cfr/text/40/156.10. Accessed 29 Oct 2021.
175. U.S. DOJ Antitrust Division. Notice Pursuant to the National Cooperative Research and Production Act of 1993; Council for the Advancement of Pyrethroid Human Risk Assessment, L.L.C. 76 Fed. Reg. 60530. 2011. Available here: https://www.federalregister.gov/documents/2011/09/29/2011-24874/notice-pursuant-to-the-national-cooperative-research-and-production-act-of-1993-council-for-the. Accessed 29 Oct 2021.
176. Stockholm Convention. Status of Ratifications - Parties and Signatories. http://www.pops.int/Countries/StatusofRatifications/PartiesandSignatoires/tabid/4500/Default.aspx. Accessed 21 Oct 2021.
177. Rotterdam Convention. Status of Ratifications - Parties and Signatories. http://www.pic.int/Countries/Statusofratification/PartiesandSignatories/tabid/1072/language/en-US/Default.aspx. Accessed 21 Oct 2021.
178. Rotterdam Convention. Annex III Chemicals. http://www.pic.int/TheConvention/Chemicals/AnnexIIIChemicals/tabid/1132/language/en-US/Default.aspx. Accessed 21 Oct 2021.
179. Rotterdam Convention. Database of Import Responses. http://www.pic.int/Procedures/ImportResponses/Database/tabid/1370/language/en-US/Default.aspx. Accessed 21 Oct 2021.
180. U.S. EPA. FOIA response to the Center for Biological Diversity regarding FIFRA 17(a)(2) Exports. January 11, 2021. Tracking number: EPA-2021-000860. Available here: https://foiaonline.gov/foiaonline/action/public/search/quickSearch?query=EPA-2021-000860. Accessed 29 Oct 2021.
181. Lerner S. The Department of Yes: How Pesticide Companies Corrupted the EPA and Poisoned America. The Intercept 2021. Available here: https://theintercept.com/2021/06/30/epa-pesticides-exposure-opp/. Accessed 23 Oct 2021.
182. Boone MD, Bishop CA, Boswell LA, Brodman RD, Burger J, Davidson C, et al. Pesticide regulation amid the influence of industry. BioScience. 2014;64:917–22.

Publisher's Note


UNWORKABLE
Dangerous Heat Puts
Florida Workers at Risk
Farmworker Association of Florida
La Asociación Campesina de Florida
Asosiyasyon Travayè Latè nan Florid
PUBLICCITIZEN

Acknowledgments

This report was written by David Arkush, managing director of Public Citizen's Climate Program, Valerie Mac, PhD, RN, Assistant Professor, Nell Hodgson Woodruff School of Nursing, Emory University, and Jeannie Economos, coordinator of the Farmworker Association of Florida's Pesticide Safety and Environmental Health Project, with assistance from WeCount! and Shanna Devine, worker safety advocate for Public Citizen's Congress Watch division.

About Public Citizen

Public Citizen is a national non-profit organization with more than 500,000 members and supporters. We represent consumer interests through lobbying, litigation, administrative advocacy, research, and public education on a broad range of issues including consumer rights, product safety, financial regulation, worker safety, safe and affordable health care, campaign finance reform and government ethics, fair trade, climate change, and corporate and government accountability.

About the Farmworker Association of Florida

The Farmworker Association of Florida is a 35-year old, statewide, non-profit, grassroots farmworker membership organization with five offices in Central and South Florida and a membership of over 10,000 Haitian, Hispanic and African American families and includes farmworkers who work in the vegetable, citrus, mushroom, tropical fruit, fern and foliage industries in the state. The mission of the organization is to build power among farmworker and rural, low-income communities to respond to and gain control over the social, political, economic, workplace, health and environmental justice issue that impact their lives. The organization's guiding vision is a social environment where farmworkers' contribution, dignity, and worth are acknowledged, appreciated, and respected through economic, social, and environmental justice. This vision includes farmworkers being treated as equals, and not exploited and discriminated against based on race, ethnicity, immigrant status, gender, or socioeconomic status.

Public Citizen's Climate Program
215 Pennsylvania Ave. S.E.
Washington, D.C. 20003
P: (202) 546-4996
F: (202) 547-7392

Apopka Area Office (Headquarters)
1264 Apopka Blvd.
Apopka, FL 32703
P: (407) 886-5151

Introduction

Due to greenhouse gas pollution, temperatures have been rising rapidly in recent decades. One important and often overlooked effect of rising global temperatures is that heat-related injuries and illnesses are increasing as well. Under the administration of President Donald Trump, the U.S. government has been working aggressively to intensify rather than mitigate the problem of heat stress by accelerating the burning of fossil fuels. It is therefore critical that other jurisdictions both work to mitigate climate change and begin protecting the populations that are most vulnerable to its harms. This report discusses the problem of heat stress generally, then focuses on Florida outdoor workers, showing that they work in dangerous heat conditions a high proportion of the time and their health is suffering as a result.

Heat Is a Major and Growing Public Health Problem in Florida.

Heat was the leading weather-related killer in the U.S. over the past 30 years,[1] and the problem is growing worse due to climate change. The human body must stay within a narrow temperature range to remain healthy. The body's temperature can be raised by heat in the environment or heat that the body generates internally, especially with physical activity. When the body cannot disperse heat quickly enough, it can progress toward serious injury or death. Heat exhaustion results from prolonged heat exposure and loss of fluids and salt, usually from sweating. Symptoms include headache, nausea, dizziness, weakness, irritability, thirst, heavy sweating, elevated body temperature, or decreased urination. If heat exhaustion goes untreated, it can progress to heat stroke, a life-threatening condition in which the body rapidly loses the ability to control its temperature. Symptoms include confusion, slurred speech, hot and dry skin or profuse sweating, seizures, and loss of consciousness (coma).[2]

Excessive heat stress can harm anyone, but some populations are at greater risk.

All people are at risk of heat illness, which can occur in temperatures as mild as the 70s (Fahrenheit).[3] But some populations are more vulnerable than others.

Children. Physiological differences in infants and children, particularly those under age 4, impair their ability to manage heat.[4] Compared to adults, children have a greater ratio of surface area to body mass, which means environmental heat affects them more strongly. Moreover, children do not sweat as easily as adults, which impairs their ability to cool down. And children will not feel thirsty until they have lost two percent of their body weight as sweat, at which point they are already dehydrated.[5] One particular caution is that children should not be left in parked vehicles, in which temperatures can rise faster than a child's ability to regulate his or her internal temperature. According to the National Weather Service, dozens of children left in parked vehicles die from hyperthermia each year.[6] The majority of these deaths occur in children age three and younger.[7] Likewise, children and parents should exercise additional caution when children are playing sports of otherwise exerting themselves in the heat.

Seniors. Older adults are also at significant increased risk of heat illness. According to the National Institute of Aging, most heat-related deaths occur in people over 50 years old.[8] Several factors

increase their vulnerability. Older adults are more likely to have chronic medical conditions like heart, lung, or kidney disease that impair the body's normal responses to heat. They also may have poorer blood circulation or less efficient sweat glands, and are more likely to be taking medications that can impair the body's ability to regulate or respond to heat.[9] For the same reasons, individuals with chronic medical conditions can be especially vulnerable to excessive heat.

Older adults who lack air conditioning or fans are at increased risk of overheating, as the nation witnessed from the tragic deaths at a Florida nursing home in the aftermath of Hurricane Irma. The Rehabilitation Center at Hollywood Hills lost power during the storm and waited until the following day to request emergency medical services. Eight people between the ages of 70 and 99 died, and initial reports indicated that excessive heat was a significant factor in the loss of life.[10] That incident was not the facility's first encounter with electricity problems. In 2016 the Florida Agency for Healthcare Administration, the agency tasked with regulating the state's nursing homes, found that the nursing home "failed to maintain the emergency generator."[11]

Low-income individuals also are more likely to be exposed to heat and can be more vulnerable to heat stress due to lack of access to air conditioning or fans, poorer quality of dwellings, lack of access to public services, and more.[12] In addition, pregnant women are more vulnerable because they are more prone to dehydration and their bodies must work harder to keep cool.[13]

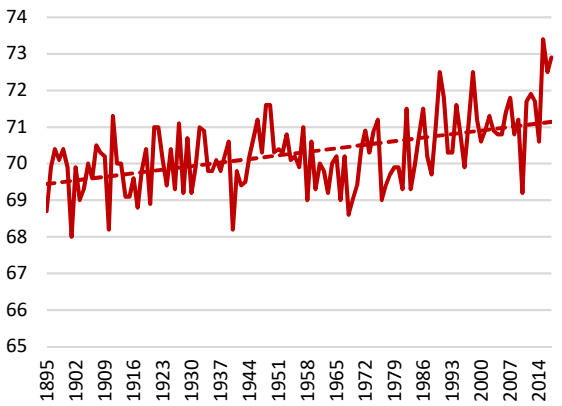
Workers. As this report discusses in greater depth below, occupation is a major risk factor for heat illness. Many indoor and outdoor workers are exposed to dangerously high temperatures in the course of their job. Because they are working, workers typically have less ability to engage in natural responses to dehydration and heat, such as drinking water, resting, and moving to a shadier or cooler space. Farm workers and construction workers are the highest risk populations. This is due in part to greater heat exposure. But workers in these sectors often are especially vulnerable for other reasons. Many attempt to work through discomfort or illness without complaint because they cannot afford to lose work time or fear losing their jobs. They may speak little or no English, may not know their rights, or may lack proper work permits and fear deportation if they raise health concerns that could be perceived as complaints.

Climate change is exacerbating heat stress, and the Trump administration is exacerbating climate change.

The threat of heat illness is rising due to global warming. Seventeen of the 18 hottest years on record have occurred since 2001.[14] According to the Fourth U.S. National Climate Assessment, average annual temperatures in the contiguous U.S. have already risen by 1.2°F (0.7°C) for the period 1986–2016 relative to 1901–1960 and by 1.8°F (1.0°C) for the period 1895–2016.[15] As shown in Figure 1, Florida temperatures are on a similar trajectory. This warming trend is projected to continue and accelerate. When average temperatures rise, the number and intensity of extremely hot days rises more rapidly.[16]

Florida already has one of the highest rates of heat-related hospitalizations in the nation, even when the data are adjusted for age.[17] In 2016, the most recent year for which data are available, Florida had 1,112 hospitalizations.[18] These figures are almost certainly undercounts, as many of the illnesses that can result from heat stress, such as stroke or heart attack, often are not recognized or documented as having anything to do with heat.

Figure 1: Florida Average Annual Temperature 1895–2017 (°F)



Source: National Oceanic and Atmospheric Association

At present, there is no sign that rising heat will stop. The Trump administration has been working aggressively for policies that accelerate greenhouse gas pollution and invite more, and more rapid, global warming. The administration's most significant actions include:

- Announcing a U.S. withdrawal from the Paris Climate Accord and attempts to undermine that agreement rhetorically.
- Repeal of the Clean Power Plan, the nation's first-ever limits on carbon pollution from power plants.[19]
- Rolling back fuel economy standards.[20]
- Repealing two regulations that would have limited methane leaking, venting and flaring on federal and tribal lands.[21]

Together, these actions are a major step backward on climate change at a time when the need for progress is more urgent than ever.

Florida Workers Routinely Labor in Dangerous Heat and Suffer Predictable Harm to Their Health.

Florida's outdoor laborers routinely work in dangerous heat conditions.

A comparison of recent temperature records with safety recommendations from the National Institute of Occupational Safety and Health (NIOSH), part of the U.S. Centers for Disease Control and Prevention, indicates that Florida's outdoor workers routinely labor in dangerous conditions.

In 2016, NIOSH updated its recommendation — originally issued in 1972 and updated in 1986 — for temperature limits over which workers should be protected from heat. Currently, U.S. workers are not protected by any federal rule on heat stress. A group of more than 130 organizations, including Public Citizen and the Farmworker Association of Florida, petitioned the U.S. Occupational Safety and Health Administration (OSHA) in July 2018, urging the agency to enact a rule that largely follows NIOSH's recommendations.[22] The safety limits that NIOSH recommends are similar to those issued by the American Conference of Governmental Industrial Hygienists, the American Industrial Hygiene Association, and the International Organization for Standardization,[23] as well as those used by the U.S. military and some other nations.[24]

Safety thresholds for heat stress are based on a combination of two sources of heat: environmental and metabolic (body-generated). Workers engaged in heavier labor produce more metabolic heat and therefore need protection at lower environmental temperatures. For this reason, the limits for safe temperature vary by workload. In addition, when assessing environmental heat, it is important to account for factors other than air temperature that influence the body's experience of heat and its ability to cool itself, such as humidity, wind, and direct sunlight. Like most heat stress exposure limits, NIOSH's recommended limits are given in "wet bulb globe temperature" (WBGT), a measure that accounts for air temperature, humidity, wind, and radiant energy such as direct sunlight.[25]

Employers can use a number of interventions to protect workers from heat that rises above safe levels.[26] For outdoor laborers, the simplest and most common interventions recommended by NIOSH are to provide rest breaks and shade (or air conditioning if possible). Workers also should be given adequate potable water to drink when working in heat: one cup of water every 15–20 minutes, plus replacement of electrolytes during periods of prolonged sweating.[27] Researchers and community organizations, collaborating with large agricultural employers, have implemented effective interventions for heat stress and dehydration that actually improved worker productivity in Central America.[28] There is a paucity of similar endeavors in the U.S.

Most agricultural and construction workers perform at least "moderate" work, the equivalent of normal walking and moderate lifting. It is likely that many if not most frequently perform some "heavy" (heavy material handling, walking at a fast pace) and "very heavy" (pick and shovel work) work as well. For moderate work, NIOSH recommends a WBGT limit of 82.4°F. For heavy and very heavy work, it recommends limits of 78.8°F and 77°F, respectively.[29] At those WBGTs, workers are at heightened risk of illness and should be protected from the heat in some manner, such as by providing shade, rest breaks, or both.

Table 1. Metabolic work rates

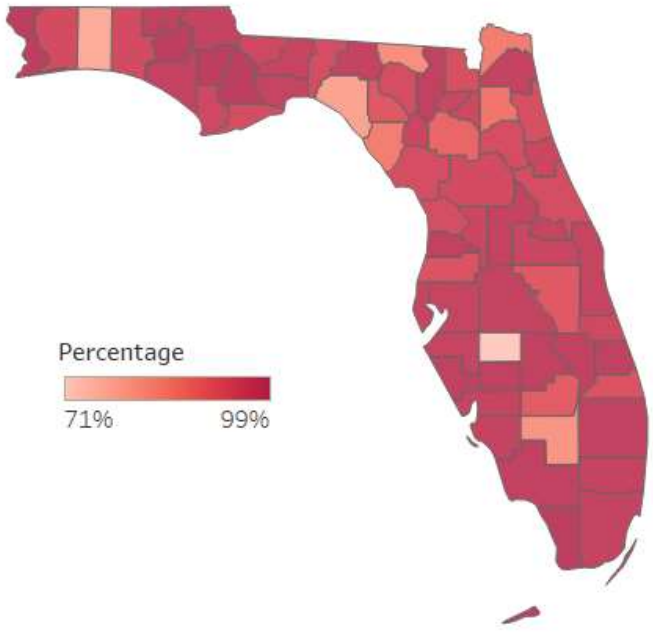
Work Category	Metabolic Rate (Watts)	Examples
Rest	115	Sitting
Light	180	Sitting, standing, light arm/hand work and occasional walking
Moderate	300	Normal walking, moderate lifting
Heavy	415	Heavy material handling, walking at a fast pace
Very Heavy	520	Pick and shovel work

Adapted from: ACGIH "2017 TLVs and BEIs" Table 3 and presented here as shown in OSHA, TECHNICAL MANUAL: HEAT STRESS, https://pubc.it/2JhxB4W (viewed on Oct. 25, 2018).

A review of hourly average WBGT records for the period May 1 to September 30, 2018, reveals that outdoor workers in every Florida county were exposed to heat above these thresholds — meaning dangerous levels of heat — an extraordinary proportion of the time.

In every Florida county, there was at least one hour when the average WBGT exceeded NIOSH's recommended limit for workers engaged in very heavy labor (77°F) on 71 percent of days or more (108 of 153 days).[30] In fact, temperatures reached that level on 90 percent of days or more in at least 59 of 67 counties, and possibly in all counties.[31] At least fifteen counties exceeded it on 99 percent of days. See Figure 2 and see Table 6 in the Appendix.

Figure 2: Percentage of days from May 1 to Sept. 30 in each Florida county during which the average WBGT exceeded NIOSH's safe limit for very heavy labor (77°F) for at least one hour



Source: WeatherSTEM

"I worked for more than 15 years (in a nursery) and we women were exposed a lot on the job, because we had to complete our production quotas daily, and to fulfill our production, we waited to drink water so that we didn't have to go to the bathroom so often."

–Maria Piñeda

Regarding the safe threshold for heavy labor (78.8°F), every county exceeded that limit for at least one hour on at least 66 percent of days (101 days out of 153). Fifty-nine counties exceeded it on 85 percent of days or more, and 51 did so on at least 90 percent of days.

For moderate labor, the WBGT limit is 82.4°F. Every county exceeded that limit for at least one hour on 56 percent of days. Fifty-eight counties exceeded it on at least 75 percent of days. For full data on all counties for moderate, heavy, and very heavy labor, see Table 6 in the Appendix. For data on light work, see Table 8 in the Appendix.

Of particular significance are counties with large numbers of outdoor workers. According to the U.S. Census Bureau, the top 10 counties by number of agricultural and construction workers are home to 422,000, or about 61 percent of employees in those sectors across the state. (The Census Bureau vastly undercounts the number of agricultural and construction workers,[32] but its numbers may fairly represent the relative distribution of these populations among Florida counties.)

Table 2: Percentage of days from May 1 to Sept. 30 during which the WBGT exceeded NIOSH's safe threshold for at least one hour, for three levels of exertion, in the top 10 Florida counties by population of agricultural and construction workers

County	Rank	Number of workers	Very Heavy (77°F)	Heavy (78.8°F)	Moderate (82.4°F)
Miami-Dade	1	98,203	98%	94%	84%
Broward	2	59,533	98%	95%	81%
Palm Beach	3	52,541	99%	96%	88%
Hillsborough	4	50,405	97%	95%	87%
Orange	5	38,702	97%	92%	85%
Lee	6	29,197	98%	93%	85%
Pinellas	7	24,810	97%	95%	82%
Duval	8	24,724	98%	96%	90%
Polk	9	23,371	98%	94%	83%
Collier	10	20,471	99%	97%	89%

Sources: U.S. Census Bureau (number of workers), WeatherSTEM (hourly average WBGT)

All of the Florida counties with a high population of outdoor workers experienced an extraordinarily high proportion of days on which the WBGT exceeded safe thresholds for at least one hour. All exceeded the safe threshold for very heavy labor (77°F) on at least 97 percent of days, for heavy labor (78.8°F) on 92 percent of days, and for moderate labor (82.4°F) on 81 percent of days. See Table 2.

Also noteworthy are counties in which outdoor workers make up a large proportion of the employed workforce, irrespective of their absolute numbers. For example, Hendry County has roughly 5,000 agricultural or construction workers. This is a far cry from Miami-Dade County's 98,000, but workers

in these two sectors make up more than 34 percent of Hendry's workforce, compared to 8 percent of Miami-Dade's. In counties with a high percentage of outdoor workers, medical providers and policymakers should be particularly aware of and responsive to occupational heat risks.

> "[W]hen someone is feeling bad, you need to sit for 5, 10 minutes to refresh yourself and that is so that you don't get dizzy from the heat, but, we don't because people have fear of retaliation from the bosses, then that would be good (to know your rights.)"
>
> *–H0204*

Like the counties with high absolute numbers of agricultural and construction workers, those with a large percentage of the workforce in these sectors also experienced a high number of days on which the heat exceeded NIOSH's safe thresholds for at least one hour, as shown in Table 3. Every county exceeded the threshold for very heavy labor on at least 71 percent of days, for heavy labor on at least 66 percent of days, and for moderate labor on at least 56 percent of days.

Moreover, these numbers are likely understated. Counties with the lowest percentages of days when WBGTs exceeded safe thresholds are the same counties with large gaps in the data. Hamilton, Hardee, and Hendry counties are missing 16, 39, and 23 percent of data entries, respectively.[33] These gaps likely explain some of the days on which WBGTs appear not to have exceeded safe thresholds.

Table 3: Percentage of days from May 1 to Sept. 30 during which the WBGT exceeded NIOSH's safe threshold for a least one hour, for three levels of exertion, in the top 10 Florida counties by percentage of workforce employed in agriculture or construction.

County	Rank	Number of workers	Percentage of workforce	Very Heavy (77°F)	Heavy (78.8°F)	Moderate (82.4°F)
Hendry*	1	5,260	34.4%	81%	77%	69%
DeSoto	2	4,132	33.0%	99%	97%	86%
Hardee*	3	2,834	29.9%	71%	66%	56%
Glades	4	817	22.5%	92%	87%	76%
Okeechobee	5	2,768	20.5%	99%	95%	87%
Calhoun	6	877	19.0%	99%	95%	82%
Lafayette	7	429	16.8%	92%	88%	78%
Liberty	8	463	16.8%	99%	92%	84%
Levy	9	2,306	16.1%	95%	93%	82%
Hamilton*	10	596	15.3%	82%	78%	69%

Sources: U.S. Census Bureau (number of workers), WeatherSTEM (hourly average WBGT)

* Hendry, Hardee, and Hamilton counties are missing 23, 39, and 16 percent data entries, respectively.

Another useful metric is the percentage of daytime hours during which the WBGT exceeded safe thresholds. In each of the top 10 Florida counties by population of agricultural and construction

workers, temperatures exceeded NIOSH's safe limit for moderate labor at least 45 percent of the time between the hours of 7 a.m. and 7 p.m. The highest proportion was 56 percent of the time in Collier, Duval, and Palm Beach counties. For heavy labor, the WBGT exceeded the safety threshold at least 66 percent of the time in every county, with the highest figure being 79 percent in Palm Beach County. It exceeded the limit for very heavy labor at least 75 percent of the time in all counties, with the highest being Broward and Palm Beach counties, at 87 percent, with Miami-Dade and Pinellas close behind at 86 and 85 percent, respectively. See Table 4.

"[To protect yourself from the heat, you need to] drink liquids, lots of liquids, to try to protect myself from the sun with clothing . . . . I wear a long-sleeve shirt, cover my head, and, if possible, avoid direct sunlight. That is what is important, but at times, you are not able to do it. That's the way the work is and the bosses at times do not care about your well-being. They only care about themselves. That is the problem."

–H0309

Table 4: Percentage of hours between 7 a.m. and 7 p.m. during which the average temperature exceeded NIOSH's safe thresholds for three levels of exertion in the top 10 counties by population of agricultural and construction workers.

County	Rank	Number of workers	Very Heavy (77°F)	Heavy (78.8°F)	Moderate (82.4°F)
Miami-Dade	1	98,203	86%	75%	47%
Broward	2	59,533	87%	77%	48%
Palm Beach	3	52,541	87%	79%	56%
Hillsborough	4	50,405	75%	68%	50%
Orange	5	38,702	79%	68%	47%
Lee	6	29,197	79%	69%	50%
Pinellas	7	24,810	85%	76%	52%
Duval	8	24,724	81%	73%	56%
Polk	9	23,371	76%	66%	45%
Collier	10	20,471	83%	76%	56%

Sources: U.S. Census Bureau (number of workers), WeatherSTEM (hourly average WBGT)

The top 10 counties by proportion of the employed workforce in agriculture or construction also had many hours between 7 a.m. and 7 p.m. when the WBGT exceeded NIOSH's recommended limits. For moderate work, the WBGT exceeded the threshold at least 32 percent of the time in every county, and at least 40 percent of the time in most of the counties, with a high of 53 percent in DeSoto and Okeechobee counties. For heavy labor, the figures are at least 50 percent of the time in each county, and more than 60 percent in most, with a high of 72 percent in Okeechobee County. For very heavy labor, the temperature exceeded the safe limit at least 56 percent of the time in every county, and more than 70 percent of the time in most counties, with a high of 82 percent in Okeechobee County. See Table 5.

As with the percentage of days during which the WBGT exceeded safe limits for at least one hour, these figures are likely underestimates for certain counties due to gaps in the data. Among the few counties that are missing a relatively large number of data points for hourly average WBGT, the missing data are concentrated during the warmer months.[34]

Table 5: Percentage of hours between 7 a.m. and 7 p.m. during which the average temperature exceeded NIOSH's safe thresholds for three levels of exertion, in the top 10 counties by percentage of workforce employed in agriculture or construction.

County	Rank	Number of workers	Percentage of workforce	Very Heavy (77°F)	Heavy (78.8°F)	Moderate (82.4°F)
Hendry	1	5,260	34.4%	72%	62%	42%
DeSoto	2	4,132	33.0%	78%	70%	53%
Hardee	3	2,834	29.9%	65%	57%	37%
Glades	4	817	22.5%	70%	59%	32%
Okeechobee	5	2,768	20.5%	82%	72%	53%
Calhoun	6	877	19.0%	72%	62%	43%
Lafayette	7	429	16.8%	56%	50%	35%
Liberty	8	463	16.8%	72%	62%	44%
Levy	9	2,306	16.1%	72%	62%	41%
Hamilton	10	596	15.3%	70%	61%	40%

Sources: U.S. Census Bureau (number of workers), WeatherSTEM (hourly average WBGT)

For data on WBGTs between the hours of 7 a.m. and 7 p.m. for moderate, heavy, and very heavy labor in all counties, see Table 7 in the Appendix. For data on light labor during those hours, see Table 8 in the Appendix.

The health of Florida workers is suffering from working in excessive heat.

Given the prevalence of dangerous heat levels, it is no surprise that individual workers report heat illness symptoms and show indications of heat stress in startlingly high numbers. Researchers at Emory University and the Farmworker Association of Florida recently studied farmworkers in multiple Florida locations and found multiple indicators of health harms related to heat stress.

In the Girasoles (Sunflower) Study, funded by NIOSH, researchers looked comprehensively into the heat hazards experienced by agricultural workers in Florida over three workdays. The study, led by Linda McCauley, PhD, RN, had three main components: (1) survey data about work practices, demographic information, behaviors around heat, and barriers to heat-illness prevention at the worksite, as well as self-reported heat-related illness symptoms; (2) biological data to measure dehydration and examine blood chemistry results; and (3) physiologic biomonitoring. Study locations were in Central and South Florida and included the towns of Pierson, Apopka, Fellsmere, Immokalee, and Homestead.

Researchers examined worksite and regional temperatures, as well as information about the kind of work tasks performed and the duration of the workday. Participants also reported the types of beverages they drank during hot weather and barriers to heat illness prevention at the worksite,

including insufficient hydration breaks. The Girasoles team used physiologic biomonitoring to gather information about participants' levels of exertion and data that described their physiologic responses to the heat. After ingesting a temperature pill, participants wore sensors to monitor their core body temperature, heart rate, activity, and energy expenditure.

> I have been working for two years in different jobs including construction, picking tomatoes, in roofing, in plant nurseries, etcetera. Around a year ago, when I was working on a very hot day, my nose began to bleed. They gave me permission to go buy medicine, which I paid for and then went home, around 4 in the afternoon. Where I work now, in a plant nursery, they give us drinking water and let us take a five-minute break in the shade every four hours. I have never received any training on the job about how to protect myself from the sun.
>
> *–Enrique, 18 years old*

During the study, the average heat index experienced by the workers was 91.4°F (33°C). Heat index is an environmental heat stress measure calculated from air temperature and humidity combined. Employers may be able to access it more easily than WBGT and can use it as a substitute.[35] Study results showed that over four in five workers had core temperatures that exceeded 38°C (100.4°F) on at least one of the study days.[36] This temperature is the recommended physiologic limit for core temperature, at which the risk of serious heat injury rises steeply for many individuals.[37]

Beyond body core temperature that exceeded recommended limits, multiple participants were found to meet criteria for acute kidney injury on at least one of the three study days. Over one in three workers experienced acute kidney injury stage 1 or higher on at least one study day according to the change in their blood creatinine levels from before the workday to after. Approximately half of the workers were dehydrated prior to going to work, and that proportion increased to over three-fourths after the workday. The likelihood of a worker developing acute kidney injury during a workday increased by nearly 50 percent for each 5-degree F increase in heat index.[38]

Workers also frequently reported heat-related illness symptoms. Most common were heavy sweating, headache, dizziness, and muscle cramps, with female participants having three times the odds of experiencing three or more symptoms compared to male participants.[39]

> I have been working in agriculture for 16 years. Once in 2003 when I was picking tomatoes in a place called Quincy [Florida], it was very hot. I just couldn't take it anymore and I fainted. There was no one working around me and no one noticed. I came to sometime later, and didn't receive any assistance. Where I work now [in a plant nursery], they give us drinking water, but don't let us rest in the shade. My employer says only if we feel bad can we rest a little in the shade. I haven't received any training to protect myself from the sun. I would like it if we received more protection, but the supervisors demand more production from us to look good with their superiors.
>
> *–Elena, 30 years old*

> "In the mornings, we would start work in the fields where it is very hot, because in the mornings, you don't feel it so much, right? But between noon and 2pm in the afternoon, there is a very intense heat. What they should do in the afternoons is move us to an area where there is a little bit of a breeze or air circulation or a little bit of shade during the time when it is hottest. And, they should give us water or ice. This is what we would like, what the employers ought to give us, that they give us a little bit of consideration on this."
>
> *–H0302*[1]

The Girasoles Study sets the foundation for future heat stress adaptation and heat illness prevention efforts by documenting that agricultural workers in Florida are at risk for heat illness and other heat-related health impacts. Next steps for this project include the translation of research findings into trainings and pilot-testing heat adaptive interventions for Florida agricultural workers.

To engage with agricultural workers and employers about heat illness prevention, data from the Girasoles Study was used to develop heat illness prevention trainings by a team of researchers through the Pesticide & Heat Stress Education for Latino Farmworkers that is Culturally Appropriate (PISCA) project led by Dr. Joseph G. Grzywacz and Dr. Antonio Tovar. This training also includes information on how to use a smart phone app developed by OSHA and NIOSH that calculates local heat index, the current heat risk level, and provides heat illness prevention recommendations.[40]

In addition to providing heat illness prevention trainings like the PISCA project's, it is of paramount importance for community groups, researchers, and health care providers to work directly with employers to implement NIOSH- and OSHA-recommended water, rest, and shade protections at the workplace. Additional next steps include piloting the implementation of heat-adaptive interventions in Florida agricultural workplaces. The collaborative implementation of heat illness prevention actions and interventions can provide physiologic documentation to identify the most effective approaches for implementing the recommended interventions and allow for the evaluation of associated productivity and health status improvements.

Conclusion

It is no surprise that Florida is hot. But less recognized is that the heat is harming Floridians — and it is rapidly growing worse. Outdoor workers are one of the most vulnerable populations. They routinely work in dangerous heat, and their health suffers severely as a result. At a time when federal policy aims to accelerate rather than mitigate global warming, Florida workers need protection from heat more than ever.

Appendix

Table 6: Percentage of days between May 1 and Sept. 30 in each Florida county in which the WBGT exceeded NIOSH's safe thresholds for three levels of exertion for at least one hour

County	Very heavy labor (77°F)	Heavy labor (78.8°F)	Moderate labor (82.4°F)
Alachua	90%	86%	65%
Baker	94%	88%	82%
Bay	98%	95%	84%
Bradford	96%	93%	84%
Brevard	97%	95%	88%
Broward	98%	95%	81%
Calhoun	99%	95%	82%
Charlotte	97%	93%	81%
Citrus	95%	89%	69%
Clay	87%	81%	72%
Collier	99%	97%	89%
Columbia	99%	95%	85%
DeSoto	99%	97%	86%
Dixie	86%	82%	73%
Duval	98%	96%	90%
Escambia	99%	99%	86%
Flagler	97%	91%	84%
Franklin	95%	90%	77%
Gadsden	96%	93%	84%
Gilchrist	97%	91%	82%
Glades	92%	87%	76%
Gulf	96%	90%	77%
Hamilton	82%	78%	69%
Hardee	71%	66%	56%
Hendry	81%	77%	69%
Hernando	99%	93%	84%
Highlands	99%	94%	85%
Hillsborough	97%	95%	87%
Holmes	99%	95%	85%
Indian River	96%	93%	84%
Jackson	98%	93%	83%
Jefferson	95%	92%	84%
Lafayette	92%	88%	78%
Lake	98%	95%	88%

County	Very heavy labor (77°F)	Heavy labor (78.8°F)	Moderate labor (82.4°F)
Lee	98%	93%	85%
Leon	97%	93%	83%
Levy	95%	93%	82%
Liberty	99%	92%	84%
Madison	98%	97%	90%
Manatee	97%	92%	80%
Marion	95%	91%	78%
Martin	93%	90%	84%
Miami-Dade	98%	94%	84%
Monroe	99%	95%	84%
Nassau	86%	83%	77%
Okaloosa	77%	75%	65%
Okeechobee	99%	95%	87%
Orange	97%	92%	85%
Osceola	92%	88%	80%
Palm Beach	99%	96%	88%
Pasco	93%	89%	81%
Pinellas	97%	95%	82%
Polk	98%	94%	83%
Putnam	95%	91%	84%
Santa Rosa	95%	92%	76%
Sarasota	99%	95%	85%
Seminole	97%	92%	84%
St. Johns	94%	90%	82%
St. Lucie	99%	96%	88%
Sumter	97%	93%	83%
Suwannee	95%	89%	78%
Taylor	78%	77%	67%
Union	97%	92%	86%
Volusia	95%	91%	86%
Wakulla	97%	93%	79%
Walton	95%	90%	78%
Washington	99%	95%	85%

Source: WeatherSTEM

Table 7: Percentage of hours between 7 a.m. and 7 p.m. from May 1 to Sept. 30, when the average WBGT exceeded NIOSH's safe thresholds for three levels of exertion in each Florida county

County	Very Heavy (77°F)	Heavy (78.8°F)	Moderate (82.4°F)
Alachua	66%	54%	24%
Baker	71%	63%	42%
Bay	73%	66%	46%
Bradford	71%	64%	45%
Brevard	78%	71%	52%
Broward	87%	77%	48%
Calhoun	72%	62%	43%
Charlotte	74%	66%	47%
Citrus	76%	65%	36%
Clay	73%	63%	41%
Collier	83%	76%	56%
Columbia	77%	68%	49%
DeSoto	78%	70%	53%
Dixie	76%	67%	47%
Duval	81%	73%	56%
Escambia	78%	69%	48%
Flagler	77%	68%	48%
Franklin	76%	64%	38%
Gadsden	73%	65%	47%
Gilchrist	76%	67%	46%
Glades	70%	59%	32%
Gulf	76%	67%	43%
Hamilton	70%	61%	40%
Hardee	65%	57%	37%
Hendry	72%	62%	42%
Hernando	76%	67%	48%
Highlands	78%	68%	50%
Hillsborough	75%	68%	50%
Holmes	73%	65%	46%
Indian River	74%	69%	52%
Jackson	71%	62%	44%
Jefferson	76%	69%	52%
Lafayette	56%	50%	35%
Lake	79%	69%	51%
Lee	79%	69%	50%
Leon	79%	70%	49%
Levy	72%	62%	41%
Liberty	72%	62%	44%
Madison	76%	69%	53%
Manatee	74%	65%	46%
Marion	74%	64%	39%

County	Very Heavy (77°F)	Heavy (78.8°F)	Moderate (82.4°F)
Martin	77%	67%	45%
Miami-Dade	86%	75%	47%
Monroe	97%	90%	80%
Nassau	78%	70%	50%
Okaloosa	77%	67%	45%
Okeechobee	82%	72%	53%
Orange	79%	68%	47%
Osceola	79%	69%	49%
Palm Beach	87%	79%	56%
Pasco	74%	66%	46%
Pinellas	85%	76%	52%
Polk	76%	66%	45%
Putnam	75%	66%	45%
Santa Rosa	81%	69%	44%
Sarasota	83%	73%	54%
Seminole	77%	67%	47%
St. Johns	79%	69%	43%
St. Lucie	84%	75%	56%
Sumter	75%	66%	44%
Suwannee	59%	52%	34%
Taylor	70%	62%	46%
Union	77%	67%	50%
Volusia	81%	72%	50%
Wakulla	60%	55%	38%
Walton	70%	61%	40%
Washington	74%	65%	48%

Source: WeatherSTEM

Table 8: Percentage of days and daytime hours from May 1 to Sept. 30, when the average WBGT exceeded NIOSH's safe threshold for light work in each Florida county

County	Light (86°F)	Light (86°F)
Alachua	4%	0%
Baker	46%	13%
Bay	61%	23%
Bradford	56%	19%
Brevard	65%	23%
Broward	47%	12%
Calhoun	60%	18%
Charlotte	58%	18%
Citrus	15%	2%
Clay	38%	10%
Collier	77%	29%
Columbia	70%	25%
DeSoto	71%	24%
Dixie	52%	21%
Duval	80%	35%
Escambia	62%	23%
Flagler	58%	17%
Franklin	39%	11%
Gadsden	62%	22%
Gilchrist	57%	17%
Glades	20%	3%
Gulf	39%	10%
Hamilton	31%	9%
Hardee	21%	6%
Hendry	47%	14%
Hernando	52%	16%
Highlands	65%	21%
Hillsborough	69%	22%
Holmes	63%	24%
Indian River	71%	27%
Jackson	55%	18%
Jefferson	68%	28%
Lafayette	41%	10%
Lake	71%	26%
Lee	67%	21%
Leon	63%	23%
Levy	46%	10%
Liberty	52%	17%
Madison	76%	32%
Manatee	50%	13%
Marion	24%	6%
Martin	43%	13%

County	Light (86°F)	Light (86°F)
Miami-Dade	39%	9%
Monroe	65%	27%
Nassau	59%	25%
Okaloosa	35%	15%
Okeechobee	69%	27%
Orange	50%	14%
Osceola	66%	25%
Palm Beach	67%	26%
Pasco	43%	12%
Pinellas	59%	20%
Polk	48%	12%
Putnam	56%	17%
Santa Rosa	39%	13%
Sarasota	59%	22%
Seminole	57%	14%
St. Johns	44%	9%
St. Lucie	76%	31%
Sumter	58%	18%
Suwannee	41%	10%
Taylor	48%	20%
Union	65%	25%
Volusia	53%	14%
Wakulla	58%	17%
Walton	44%	14%
Washington	64%	25%

Source: WeatherSTEM

Table 9: WeatherSTEM stations used for this analysis, by Florida county

County	Station
Alachua	University of Florida
Baker	Baker County High School
Bay	Deane Bozeman School
Bradford	Lawtey Elementary School
Brevard	PAC Academy
Broward	HT Birch State Park
Calhoun	Blountstown Middle School
Charlotte	Port Charlotte Middle School
Citrus	Marine Science Station
Clay	Lake Asbury Junior High
Collier	Naples Botanical Garden
Columbia	Melrose Park Elementary School
DeSoto	West Elementary School
Dixie	Dixie County High School
Duval	Jacksonville Country Day School
Escambia	West Florida High School
Flagler	Buddy Taylor Middle School
Franklin	Franklin County School
Gadsden	West Gadsden Middle School
Gilchrist	GCEM Trenton High School
Glades	Moore Haven Middle-High School
Gulf	Gulf County Emergency Operations Center
Hamilton	Hamilton County High School
Hardee	Wauchula Elementary School
Hendry	Upthegrove Elementary School
Hernando	Challenger K8 School of Science and Math
Highlands	Eagle Ranch Orange Groves
Hillsborough	Florida Learning Garden
Holmes	Holmes County High School
Indian River	Oslo Middle School
Jackson	Cottondale High School
Jefferson	Jefferson County Middle/High School
Lafayette	Lafayette High School
Lake	Mount Dora Middle School
Lee	Estero Fire Rescue
Leon	Tallahassee Community College
Levy	LCEM Williston Middle High School
Liberty	W.R. Tolar K-8 School
Madison	Agner Farm
Manatee	Manatee Technical College
Marion	Dr. N H Jones Elementary School
Martin	South Fork High School

County	Station
Miami-Dade	University of Miami
Monroe	Marathon High School
Nassau	Yulee Middle School and High School
Okaloosa	Choctawhatchee High School
Okeechobee	Central Elementary School
Orange	Rosen Centre
Osceola	Poinciana High School
Palm Beach	Addison Mizner Elementary School
Pasco	Pine View Middle School
Pinellas	Bay Point Middle School
Polk	Winston Academy of Engineering
Putnam	Putnam County Emergency Services
Santa Rosa	Woodlawn Beach Middle School
Sarasota	Ringling Museum of Art
Seminole	Heathrow Elementary School
St. Johns	Aerospace Academy at St. Augustine High School
St. Lucie	Southport Middle School
Sumter	South Sumter High School
Suwannee	Branford High School
Taylor	Big Bend Technical College
Union	Lake Butler Middle School
Volusia	Embry Riddle Aeronautical University
Wakulla	Wakulla High School
Walton	Walton County Emergency Management
Washington	Florida Panhandle Technical College

Table 10: Percentage of 3,672 data points missing, by Florida county

County	Percentage
Alachua	0%
Baker	1%
Bay	0%
Bradford	1%
Brevard	0%
Broward	0%
Calhoun	1%
Charlotte	1%
Citrus	0%
Clay	13%
Collier	0%
Columbia	0%
DeSoto	0%
Dixie	15%
Duval	0%
Escambia	0%
Flagler	0%
Franklin	0%
Gadsden	2%
Gilchrist	2%
Glades	0%
Gulf	0%
Hamilton	16%
Hardee	39%
Hendry	23%
Hernando	0%
Highlands	0%
Hillsborough	0%
Holmes	1%
Indian River	3%
Jackson	0%
Jefferson	7%
Lafayette	0%
Lake	0%
Lee	0%
Leon	1%
Levy	0%
Liberty	1%
Madison	1%
Manatee	2%
Marion	0%
Martin	0%

County	Percentage
Miami-Dade	0%
Monroe	4%
Nassau	13%
Okaloosa	30%
Okeechobee	0%
Orange	0%
Osceola	8%
Palm Beach	0%
Pasco	3%
Pinellas	0%
Polk	0%
Putnam	0%
Santa Rosa	2%
Sarasota	0%
Seminole	0%
St. Johns	0%
St. Lucie	0%
Sumter	4%
Suwannee	1%
Taylor	24%
Union	1%
Volusia	0%
Wakulla	1%
Walton	3%
Washington	0%

ENDNOTES

[1] National Weather Service, *Weather Fatalities*, (viewed on Oct. 17, 2018) https://pubc.it/2z0StID.

[2] Centers for Disease Control and Prevention, *Heat Stress – Heat-related Illness*, (viewed on Oct. 17, 2018) https://pubc.it/2z1MAuO.

[3] National Weather Service, *Children, Pets and Vehicles*, (viewed on Oct. 8, 2018), https://bit.ly/2Mbyobw.

[4] Mayo Clinic, *Heat Exhaustion*, (viewed on Oct. 17, 2018), https://mayocl.in/2t2xfaj.

[5] *Id.*

[6] *Id.*; NoHeatStroke.org, Heatstroke Deaths of Children in Vehicles (viewed on Oct. 8, 2018), https://bit.ly/2yqmIbU.

[7] American Academy of Pediatrics, *Heat Stress Tips for Young Children*, (viewed on Oct. 8, 2018), https://bit.ly/2GifRTJ.

[8] National Institute on Aging, *Hot Weather Safety for Older Adults*, (viewed on Oct. 8, 2018), https://bit.ly/2wdPuKM.

[9] National Institutes of Health, Press Release, , *Heat-Related Health Dangers for Older Adults Soar During the Summer* (Jun. 27, 2018), https://bit.ly/2N4Gwbk; *Heat Exhaustion*, MAYO CLINIC (viewed on Oct. 8, 2018), https://mayocl.in/2t2xfaj; Centers for Disease Control and Prevention, *Heat and Older Adults*, (viewed on Oct. 8, 2018), https://bit.ly/2r8qz8e.

[10] Jamie Wells, *Why Florida Nursing Home Death Counts Were So High after Hurricane Irma*, AMERICAN COUNCIL ON SCIENCE AND HEALTH (Sept. 15, 2017), https://bit.ly/2IKOCnM.

[11] Travis Fedschun, *Florida Nursing Home Where 8 Died After Hurricane Irma Previously Cited for Generator Issues*, FOX NEWS (Sept. 18. 2017), https://fxn.ws/2C7uwCZ.

[12] *Populations of Concern*, GLOBALCHANGE.GOV (viewed on Oct. 8, 2018), https://bit.ly/2OMkXjq.

[13] *Reproductive Health and the Workplace*, CENTERS FOR DISEASE CONTROL AND PREVENTION (viewed on Oct. 17, 2018), https://pubc.it/2EERnbZ.

[14] Henry Fountain et al., *2017 Was One of the Hottest Years on Record. And That Was Without El Niño*, N.Y. TIMES, http://pubc.it/2Bd5Pki.

[15] FOURTH NATIONAL CLIMATE ASSESSMENT (NCA4), VOLUME I, CLIMATE SCIENCE SPECIAL REPORT, https://pubc.it/2yVDvE3.

[16] *Id*.

[17] *See* Ekta Choudhary & Ambarish Vaidyanathan, *Heat Stress Illness Hospitalizations—Environmental Public Health Tracking Program*, 20 States, 2001–2010, 63 SURVEILLANCE SUMMARIES 1 (2014) https://pubc.it/2z0552M.

[18] The Centers for Disease Control and Prevention, National Environmental Public Health Tracking Network, https://ephtracking.cdc.gov/DataExplorer/#/.

[19] Lisa Friedman, *Trump's Plan for Coal Emissions: Let Coal States Regulate Them*, N.Y. TIMES, Aug. 17, 2018, https://pubc.it/2yYDLSH.

[20] Coral Davenport, *E.P.A. Takes a Major Step to Roll Back Clean Car Rules*, N.Y. TIMES, May 31, 2018, https://pubc.it/2yWvP4h.

[21] Lisa Friedman, *Trump Administration Formally Rolls Back Rule Aimed at Limiting Methane Pollution*, N.Y. TIMES, Sept. 18, 2018, https://pubc.it/2yYAIdd; Marianne Lavelle, *Trump Targets Obama's Methane Rules in Latest Climate Policy Rollbacks*, INSIDE CLIMATE NEWS, Sept. 18, 2018, https://pubc.it/2yVoEtb.

[22] *See* Public Citizen, *Petition to OSHA for a Heat Standard*, https://pubc.it/2yVwumB.

[23] *See, e.g.*, NIOSH, CRITERIA FOR A RECOMMENDED STANDARD: OCCUPATIONAL EXPOSURE TO HEAT AND HOT ENVIRONMENTS 70, 104 (2016) (hereinafter NIOSH 2016 RECOMMENDATIONS).

[24] *Id*. 107.

[25] *Id*. 113.

[26] *Id*. 8–10.

[27] *Id*. viii.

[28] T. Bodin et al., *Intervention to Reduce Heat Stress and Improve Efficiency Among Sugarcane Workers in El Salvador: Phase 1*, 73 OCCUP. ENVIRON. MED. 409 (2016).

[29] NIOSH 2016 RECOMMENDATIONS 70.

[30] The analysis in this report uses hourly average WBGTs from WeatherSTEM, https://pubc.it/2Sm7i1h. In many Florida counties, WeatherSTEM has multiple stations. Where there was a choice between stations, an attempt was made to use the station that had the most complete data and was most centrally located. For a list of the stations used, see Table 9 in the Appendix.

[31] The remaining eight counties are missing enough data points for hourly average WBGT that the absence of data, rather than low temperatures, may be the reason why they did not hit this mark. The amount of data missing for these counties ranges from 13 percent (Nassau County) to 39 percent (Hardee County). Note that detailed WBGT data of the type used in this analysis are rare. As a whole, the value of the data set easily exceeds the drawbacks of missing some entries. For the percentage of data points missing for each county, see Table 10 in the Appendix.

[32] *See, e.g.*, U.S. GOVERNMENT ACCOUNTABILITY OFFICE, REPORT TO THE RANKING MINORITY MEMBER, COMMITTEE ON GOVERNMENT REFORM, HOUSE OF REPRESENTATIVES, DECENNIAL CENSUS, LESSONS LEARNED FOR LOCATING AND COUNTING MIGRANT AND SEASONAL FARM WORKERS 4 (July 2003), https://pubc.it/2SaSItM. The analysis in this report uses the Census Bureau's data only to identify particular counties that may merit closer scrutiny based on the composition of their workforce. The data are likely to be adequate for that purpose so long as the undercounting of particular populations occurs roughly equally in all counties.

[33] WeatherSTEM CEO and Founder Edward Mansouri explained by email to Public Citizen that the missing data entries likely stem from a lack of maintenance at some sites. WeatherSTEM does not have the resources to maintain all of the stations itself, and some hosts are more attentive than others to ensuring that their WeatherSTEM unit has unbroken power supply and network access. For the number of entries missing for each county, see Table 10 in the Appendix.

[34] For example, Hendry County is missing data for 684 hours (23 percent of the total possible), and the missing entries are split almost evenly between July and for September. None are in May, the coolest month. The missing entries for Hamilton and Hardee counties also are skewed toward the warmer months, though not as dramatically.

[35] AW Tustin et al., *Evaluation of Occupational Exposure Limits for Heat Stress in Outdoor Workers—United States, 2011–2016*, 67 MORBIDITY & MORTALITY WEEKLY REPORT 733(2018).

[36] Vicki Hertzberg et al., *Novel Analytic Methods Needed or Real-Time Continuous Core Body Temperature Data*, 39 WESTERN J. NURSING RESEARCH 95 (2017).

[37] *See, e.g.*, NIOSH 2016 RECOMMENDATIONS 97–98.

[38] J. Mix et al., *Hydration Status, Kidney Function, and Kidney Injury in Florida Agricultural Workers*, 60 J. OCCUP. & ENV. MED., e253 (2018).

[39] *Id*.; A.D. Mutic et al., *Classification of Heat-Related Illness Symptoms Among Florida Farmworkers*, 50 J. NURSING SCHOLARSHIP 74 (2018).

[40] The app can be accessed at https://itunes.apple.com/us/app/osha-niosh-heat-safety-tool/id1239425102?mt=8.

Received: 8 June 2018 | Revised: 17 July 2019 | Accepted: 18 July 2019

DOI: 10.1002/ajim.23035

RESEARCH ARTICLE

AMERICAN JOURNAL OF INDUSTRIAL MEDICINE WILEY

Physical activity and work activities in Florida agricultural workers

Jacqueline M. Mix PhD, MPH[1] | Lisa Elon MS, MPH[2] | Valerie Vi Thein Mac PhD, OHD, RN, FNP-C[1] | Joan Flocks JD[3] | Jeannie Economos[4] | Antonio J. Tovar-Aguilar PhD[4] | Vicki S. Hertzberg[1] | Linda A. McCauley PhD, RN[1]

[1]Nell Hodgson Woodruff School of Nursing, Emory University, Atlanta, Georgia

[2]Department of Biostatistics and Bioinformatics, Rollins School of Public Health, Emory University, Atlanta, Georgia

[3]Center for Governmental Responsibility, Levin College of Law, University of Florida, Gainesville, Florida

[4]Farmworker Association of Florida, Apopka, Florida

Correspondence
Jacqueline M. Mix, PhD, MPH, Nell Hodgson Woodruff School of Nursing, Emory University, 1520 Clifton Rd NE, Room 341, Atlanta, GA 30322.
Email: jacqueline.mix@emory.edu

Funding information
National Institute for Occupational Safety and Health, Grant/Award Number: R01OH010657

Abstract

Background: Laboring in hot and humid conditions is a risk factor for heat-related illnesses. Little is known about the amount of physical activity performed in the field setting by agricultural workers, a population that is among those at highest risk for heat-related mortality in the United States.

Methods: We measured accelerometer-based physical activity and work activities performed in 244 Florida agricultural workers, 18 to 54 years of age, employed in the fernery, nursery, and crop operations during the summer work seasons of 2015-2017. Environmental temperature data during the participant's workdays were collected from the Florida Automated Weather Network and used to calculate wet bulb globe temperature (WBGT). Generalized linear mixed model regression was used to examine the association between WBGT on physical activity, stratified by the agricultural sector.

Results: Fernery workers had the highest overall volume of physical activity, spending nearly 4 hours in moderate to vigorous activity per workday. Activity over the course of the workday also differed by the agricultural sector. A reduction on average physical activity with increasing environmental temperature was observed only among crop workers.

Conclusions: The quantity and patterns of physical activity varied by the agricultural sector, sex, and age, indicating that interventions that aim to reduce heat-related morbidity and mortality should be tailored to specific subpopulations. Some workers did not reduce overall physical activity under dangerously hot environmental conditions, which has implications for policies protecting worker health. Future research is needed to determine how physical activity and climatic conditions impact the development of heat-related disorders in this population.

KEYWORDS
agricultural workers, heat exposure, heat illness, physical activity

1 | INTRODUCTION

Agricultural workers frequently perform strenuous physical activities in hot and humid conditions, which can result in dangerous increases in core body temperature.[1,2] Thermoregulatory mechanisms work to maintain internal body temperature within a safe range, but harsh environmental conditions can disrupt normal dissipation of heat, which can lead to heat stress and physiologic strain.[3,4] Heat-related illnesses (HRI) can result, which range from heat cramps to sequelae such as heat exhaustion, and in severe cases, heatstroke and death.[4] Agricultural workers are particularly vulnerable to heat-related mortality; between 2000 and 2010, heat-related fatalities among agricultural workers accounted for 22% of industry sector deaths, with a mortality rate over 35 times higher than the general population of occupational workers.[5]

In the United States, there is no federal standard mandating worker protection from heat stress. Two states, California[6] and Washington,[7] have implemented standards protecting outdoor workers from heat stress and only Minnesota has implemented standards protecting indoor workers from heat stress.[8] Without such standards, workers at the highest risk of HRI such as agricultural workers, are left on their own to monitor their conditions. Yet, agricultural workers have little personal control over their work environments and are seldom provided with amenities such as hazard or overtime pay, workday breaks, minimum wages, insurance coverage, or other protections afforded to workers in other professions. In addition, many workers are paid a piece-rate based on the amount of product harvested, which can lead to a strong economic incentive to work quickly, thus increasing physiologic risks.[9,10]

Physical activity in hot environments has been studied extensively in athletes and in laboratory and military settings,[2] but less is known about physical activity performed among US agricultural workers in the field setting who are uniquely vulnerable to HRI.[11] A recent article reviewing the literature on energy expenditure in various agricultural tasks found only a handful of relevant publications from the past 35 years, and these focused on small numbers of workers.[12] Although mechanical harvesting is being considered and/or being implemented in various agricultural sectors, hand-harvesting by agricultural workers of many noncommodity crops continues to be necessary. Characterizing physical activity and work tasks in this population are important for informing the development of safety interventions and policies among agricultural populations, especially in states without protective standards. The aims of this study were to (a) use accelerometry to objectively quantify physical activity in the summer months among Florida agricultural workers; (b) examine patterns of physical activity over the workday by agricultural work type; (c) investigate the impact of environmental heat on physical activity performed during the workday; and (d) describe the tasks and physical movements that workers performed.

2 | METHODS

2.1 | Study design and population

We analyzed data from the *Girasoles* (Sunflower) study, which was aimed to assess physiologic responses to environmental heat exposure in Florida agricultural workers during the workday. This project was a collaborative effort between university researchers at Emory University and the Farmworker Association of Florida (FWAF), a 35-year-old grassroots community-based membership organization. The FWAF has over 10 000 members statewide who work in various agricultural operations including ferneries, nurseries, and field crops. Trained community health workers from the FWAF used community outreach strategies to recruit a convenience sample of agricultural workers from five different agricultural communities in central and south Florida during the summer work seasons from 2015 to 2017. Data collection for each community occurred as follows: Pierson, FL (May to July 2015); Apopka, FL (August 2015 and June 2016); Immokalee, FL (September to October 2016); Fellsmere, FL (May 2017); and Homestead, FL (July to August, 2017).

Workers were eligible for the study if they were (a) 18 to 54 years of age at the time of the study; (b) English, Spanish, or Creole-speaking; and (c) had worked in agricultural settings for at least 1 month before study participation. Workers were excluded if they had a history of Type 1 diabetes or were currently pregnant. A prior feasibility study found the research protocol used was acceptable to this study population.[13]

2.2 | Data collection and study variables

Study participants were asked to complete an initial survey, anthropometric assessment, and to wear an accelerometer device for three consecutive workdays. The survey was adapted from a previous survey used with agricultural worker populations[14] and elicited information on sociodemographic variables, work characteristics, and HRI factors. Sociodemographic variables included (age, sex, nationality, marital status, and years of education); and work characteristics (years worked in agriculture, number of days worked per week, and type of crops currently working with). Community health workers administered the survey in the participant's primary language.

The agricultural sector was classified into three major categories according to the crops workers reported working with at the time of study: fernery, nursery, or field-crop work. Body mass index (BMI) was calculated from measured height and weight (kg/m^2) and was classified into normal weight (18.5-24.99), overweight (25.0-29.99), and obese (≥30) based on the World Health Organization criteria.[15] There were no workers in our sample that had a measured BMI less than 18.5.

On each workday, participants came to the study field office before and after going to work. Before work, a triaxial accelerometer (Actigraph GT3X+, Pensacola FL) was positioned at the worker's right iliac crest, which the participant was instructed to wear for the entire

workday until returning to the study office after work. The accelerometer recorded acceleration on three individual planes of motion (vertical, anteroposterior, and mediolateral) every 30 seconds during the workday, which is summarized as vector magnitude counts, an indicator of the volume of physical activity.[16] After work, participants returned to the study office, where research staff removed the accelerometer equipment and were instructed to note any noncompliance.

A brief survey was administered to participants after work to collect information about specific work tasks that participants performed during their workday. Work tasks reported by participants included planting/potting, cultivating, harvesting/picking crops, loading/packing/transporting, cutting/trimming, moving plants or trees, washing plants or trees, weeding, cleaning the worksite, and mixing or spraying pesticides. In addition, participants provided information about the physical movements associated with the work tasks they performed including bending, walking, standing, cutting, twisting, lifting, sitting, kneeling, reaching, and squatting.

Ambient temperature and relative humidity during the participants' observed workdays were obtained from the Florida Automated Weather Network, which records data every 15 minutes at monitoring stations located in the study communities. A monitoring station was present in each of the five communities under study. The heat index, which approximates the apparent temperature by combining air temperature and moisture into a single scale, was calculated by using the National Weather Service algorithm.[17] Wet bulb globe temperature in the sun (WBGT) was estimated using the following formula:

$$\mathrm{WBGT} = 0.7\left(T_{\mathrm{pwb}} + 1\right) + 0.2(T_{\mathrm{db}} + \Delta T_{\mathrm{g\text{-}d}}) + 0.1\,T_{\mathrm{db}},$$

where T_{pwb} is the wet bulb (°C), T_{db} is the ambient air temperature (°C) at 2 m, and $\Delta T_{\mathrm{g-d}} = 8$.[18]

2.3 | Accelerometer data processing

We adapted accelerometer data-processing methods used in the National Health and Nutrition Examination Survey (NHANES)[19] to fit our study design. To assess physical activity occurring specifically during work, we included accelerometer data only if it occurred between a worker's self-reported workday start and stop time. Raw vector magnitude counts for every 30 seconds were summed and collapse into 1-minute counts to obtain the vector magnitude counts per minute (CPM). We defined invalid data as CPM that were not biologically plausible (CPM ≥ 16 000) or were a constant value greater than zero for 10 minutes or greater, which is an indicator of accelerometer malfunction.[20] We also defined nonwear time as CPM with a consecutive string of zeroes of 10 minutes or more. Additional quality-control checks were performed by visually inspecting plots of CPM by work hour among each individual participant for every workday. As we did not identify invalid data, all accelerometer data were utilized for summary measures.

To determine the amount of time spent in sedentary, light, or moderate to vigorous physical activity during the workday, we used thresholds derived from accelerometer calibration studies that measured the association between activity counts and measured energy expenditure.[19] Criteria established by Sasaki et al[21] and Aguilar-Farías et al[22] for categorizing the intensity of work activity using vector magnitude was used in our study as follows: sedentary activity: 0 to less than 200 CPM; light activity: 200 to less than 2690 CPM; and moderate to vigorous activity: 2690 CPM or above. The cumulative time per day spent in sedentary, light and moderate to vigorous activity was derived by summing all of the minutes which met the relevant threshold criteria for each activity level for each study day. In addition, we also calculated the time spent in sustained bouts of moderate to vigorous activity. Sustained bouts were defined as 10 or more consecutive minutes with the CPM meeting the moderate to vigorous activity threshold, with an allowance for interruptions of up to 2 minutes below the threshold.[19]

2.4 | Data analysis

Sociodemographic, health-related, and work-related data were summarized by calculating means and standard deviations for continuous variables and frequency counts and percentages for categorical variables. To summarize heat index (HI) and WBGT, we calculated the average for each participant's workday and then calculated an average for all three workdays. We summarized physical activity by summing the CPM for each participant's workday, and then calculated the median CPM of total observed workdays. Overall, a total of 702 total workdays were examined; 39 of these workdays came from 23 participants who were not observed for all three workdays; however, 91% (221 of 244) of participants were observed for all three workdays. Participants with fewer than 3 days of data did not differ in median CPM (1981, Quartile 1 [Q1] 1136, Q3: 2548) compared to workers with all three workdays (2010 [Q1: 1240; Q3: 3013]), $P = .3021$. In addition, the intraclass correlation coefficient of median vector magnitude was 0.71, which suggests that participant activity was similar over their workdays and that having 1 to 2 workdays should not introduce bias.

We assessed the pattern of physical activity over the workday by agricultural sector using functional data analysis methods.[23] For each participant, every workday's CPM vs time function was smoothed using a local regression method, LOESS, a locally weighted scatterplot smoothing technique based on nonparametric regression, which gives more weight to the points near the data points where the response is estimated.[24] Smoothing parameters were chosen based on the lowest Akaike information criterion (AIC). Next, the median of each participant's workday function was calculated and LOESS smoothed. Then, the median curve for each work type was calculated; the displayed curves use a smoothing parameter of 0.01. This technique has been previously used in our cohort to examine core temperature data.[25] For each minute of the workday, we evaluated the relationship between CPM and work type using analysis of variance. To adjust for multiple comparisons we applied a

nonparametric permutation test[26]: for each minute, agricultural sector assignments were randomly permuted and a new test was run; this was repeated 400 times and maximal test statistics were noted. The null hypothesis of no difference between agricultural sector at any minute was rejected if the observed statistic for the actual assignments was in the top 5% of the maximal statistics.

We summarized median CPM by sex, agricultural sector, age, and BMI. The average percent of nonsedentary time (time spent in light activity and moderate to vigorous activity) was calculated and further analyzed using compositional data methods.[27] Generalized linear mixed models (GLMM) were used to test the difference between the percentage of time spent in moderate to vigorous activity by sex and agricultural sector (fernery, nursery, or field crop).

To evaluate the association between WBGT and overall CPM, we used GLMM. We constructed models stratified by primary agricultural work type to account for heteroscedasticity of the residuals. Further residual diagnostics indicated the need for data trimming and robust regression bisquare down-weighting.[28] We used a quadratic term in the model for field-crop workers to properly fit the data. Continuous variables were centered to provide an interpretation of the intercept to represent the average daily CPM for a 38-year-old male with a BMI of 29 who works 8 hours on a day with an average WBGT of 28.3°C. Each model was adjusted for sex, BMI, and hours worked per day.

Last, we examined self-reported work tasks and physical movements used to perform work tasks. We classified the task or movement as "ever" or "never" reporting on at least one of their workdays. All analyses were performed with SAS version 9.4 software (Cary, NC).

3 | RESULTS

A total of 257 participants were enrolled in the study. We restricted analyses to workers who had at least 1 day of accelerometer monitoring data and reported which agricultural sector they were currently working in on the baseline survey, excluding 13 participants. Of the 244 workers in the analytic sample, 65 worked in ferneries, 102 in nurseries, and 77 with field crops (81% with vegetables).

Sociodemographic, anthropometric, and work characteristics of the analytic sample are reported in Table 1. The mean age of participants was 38.2 (standard deviation [SD], 8.7), and the majority were female (62.7%), from Mexico (66.4%), and unmarried (58.4%). Average years of education was 6.7 (SD, 3.5), mean BMI was 28.7 (SD, 4.8), mean years in agriculture was 12.2 (SD, 8.1), and the average workday was 7.8 hours long. The mean heat index to which participants were exposed was 32.3°C and mean WBGT was 28.3°C.

Nationality, years worked in agriculture, hours worked per day, and environmental characteristics differed substantially by the primary agricultural sector. Fernery workers were nearly all from Mexico (93.9%), had been working in agriculture the longest (14.6 years), and worked shorter days (6.2 hours vs 7.8 [field crop] and 8.7 [nursery]). Nursery workers experienced the highest average HI (33.7°C) and WBGT (28.8°C).

CPM and time spent in sedentary, light, and moderate to vigorous physical activity also differed significantly by the agricultural sector (Table 2). Despite having the shortest workdays, fernery workers engaged in the largest amount of moderate to vigorous activity (220 minutes or 3.7 hours per day) and sustained bouts of such activity (231 minutes or 3.9 hours per day), and the least amount of light activity and sedentary activity (75 and 24 minutes, respectively). Physical activity was lowest among nursery workers.

Results describing the pattern of physical activity over the course of the day using functional data analysis are shown in Figure 1. Statistical comparisons after 9 hours were not considered robust because of sparse data. Fernery workers had significantly higher median CPM throughout the day compared to all other agricultural sector types. The pattern of activity over the workday among fernery workers differed from that among nursery and field-crop workers, with more intense activity occurring in the morning than the afternoon. Nursery and field-crop workers had well-defined midday breaks, with mornings and afternoons having about equal levels of activity. The presence of such dips in the median CPM indicates that many participants took their midday break at the same time.

The proportion of the day spent in moderate to vigorous physical activity was greatest for fernery workers and least for nursery workers (Figure 2). Within the agricultural sector, some sex differences were observed; female fernery workers spent more of their workday engaged in moderate to vigorous activity than did males coworkers, although the difference was not statistically significant (71% vs 61%; $P = .092$). Among nursery workers, the proportion of the day spent in moderate to vigorous activity among females was significantly lower than among males (17% vs 33%; $P < .0001$). Male and female field-crop workers both spent a little over a third of their day in moderate to vigorous activity.

The relationship of physical activity and age, displayed by agricultural sector and sex, is shown in Figure 3 and Table 3. An association between physical activity and age was found only in fernery workers. In male fernery workers, CPM increased slightly with age; in contrast, CPM among female fernery workers decreased with age. Average physical activity declined among field-crop workers as average WBGT exceeded about 28°C; this trend was not seen among other workers (Table 3 and Figure S1).

Work tasks such as loading outdoors and weeding were frequently reported among all agricultural sectors, while tasks such as cutting, moving plants, cultivating, and loading indoors varied (Figure 4A). Work tasks more frequently reported in fernery workers were cutting, loading outdoors, and harvesting. Types of physical movements performed are reported in Figure 4B. Overall, most workers reported working in a hot environment, walking, bending, standing, and lifting. Workers in ferneries more frequently performed bending and clipping movements. Some differences in work tasks and physical movements were observed by the sex. In ferneries, females more frequently reported harvesting work tasks than males (34% vs 9%, $P = .04$); in nurseries, females more

TABLE 1 Sociodemographic, health, work, and environmental characteristics by the primary agricultural sector, Girasoles Study, 2015-2017

	Agricultural sector				
	Overall (*n* = 244)	Fernery (*n* = 65)	Nursery (*n* = 102)	Field crop (*n* = 77)	*P* value*
Sociodemographic characteristics					
Age, mean (SD), y	38.2 (8.7)	37.0 (7.2)	38.9 (9.4)	38.2 (8.8)	.39
Sex, n (%)					.05
Male	91 (37.3)	23 (35.4)	31 (30.4)	37 (48.1)	
Female	153 (62.7)	42 (64.6)	71 (69.6)	40 (51.9)	
Nationality, n (%)					<.0001
Mexico	162 (66.4)	61 (93.9)	67 (65.7)	34 (44.2)	
Central America	50 (20.5)	0 (0)	31 (30.4)	19 (24.7)	
Caribbean	28 (11.5)	1 (1.5)	3 (2.9)	24 (31.2)	
United States	4 (1.6)	3 (4.6)	1 (1.0)	0 (0)	
Marital status					.02
Married	101 (41.6)	36 (55.4)	35 (34.3)	30 (39.5)	
Not married	142 (58.4)	29 (44.6)	67 (65.7)	46 (60.5)	
Education, mean (SD), y	6.7 (3.5)	6.8 (3.0)	7.1 (3.5)	6.0 (3.8)	.12
Body mass index, mean (SD), kg/m^2	28.7 (4.8)	29.4 (4.1)	28.6 (4.5)	28.4 (5.7)	.45
Body mass index categories, n (%)					.13
Normal (18.50-24.99)	51 (20.9)	9 (13.9)	21 (20.6)	21 (27.2)	
Overweight (25.0-29.99)	110 (45.1)	28 (43.1)	52 (51.0)	30 (39.0)	
Obese (≥30)	83 (34.0)	28 (43.1)	29 (28.4)	26 (33.8)	
Work characteristics					
Years in agriculture, mean (SD)	12.2 (8.1)	14.6 (6.4)	12.1 (8.2)	10.2 (8.6)	.001
Hours worked per day, mean (SD)	7.8 (1.8)	6.2 (1.7)	8.7 (1.2)	7.8 (1.6)	<.0001
Work start time, median [Q1, Q3]	07:30 [07:00-08:00]	07:00 [06:30-07:25]	07:30 [07:15-08:00]	07:30 [07:00-08:00]	<.0001
Work stop time, median [Q1, Q3]	15:30 [14:30-16:30]	13:00 [12:00-14:40]	16:30 [16:00-17:00]	15:30 [15:00-16:15]	<.0001
Environmental characteristics					
Ambient temperature, mean (SD), °C	28.5 (1.6)	28.1 (1.9)	29.2 (1.2)	27.8 (1.3)	<.0001
Relative humidity, mean (SD), %	76.2 (8.2)	76.6 (7.1)	74.0 (7.4)	78.9 (9.3)	<.0001
Heat index, mean (SD), °C	32.3 (3.1)	31.4 (3.1)	33.7 (2.8)	31.3 (2.7)	<.0001
WBGT, °C	28.3 (1.5)	27.9 (1.3)	28.8 (1.3)	27.9 (1.6)	<.0001

Abbreviation: WBGT, wet bulb globe temperature.
*P values derived from the one-way analysis of variance or the Kruskal-Wallis test, whichever was appropriate for the variable distribution.

TABLE 2 Summary of physical activity measures by primary agricultural work type, Girasoles Study, 2015-2017

	Agricultural sector								
	Overall (*n* = 244)		Fernery (*n* = 65)		Nursery (*n* = 102)		Field crop (*n* = 77)		
Physical activity measure	Median	IQR	Median	IQR	Median	IQR	Median	IQR	*P* value
Counts per minute									
Vector magnitude	1988	1215-2896	3759	2727-5081	1249	915-1818	2056	1482-2596	<.0001
Activity level[a]	Minutes per day								
Sedentary	52	31-86	24	14-45	69	42-102	58	40-88	<.0001
Light	243	141-343	75	46-145	332	262-389	235	170-290	<.0001
Moderate-vigorous	146	71-219	220	167-283	91	40-143	158	97-211	<.0001
Moderate-vigorous[b]	96	14-204	231	165-289	29	0-83	121	46-185	<.0001

Abbreviation: IQR, interquartile range.
[a]Activity levels are defined as the following vector magnitude counts per minute cutoffs: sedentary: 0 to less than 200; light: 200 to less than 2690; moderate to vigorous: 2690 or higher.
[b]Sustained bouts of activity of 10 consecutive minutes or more, allowing for up to a 2-minute interruption.

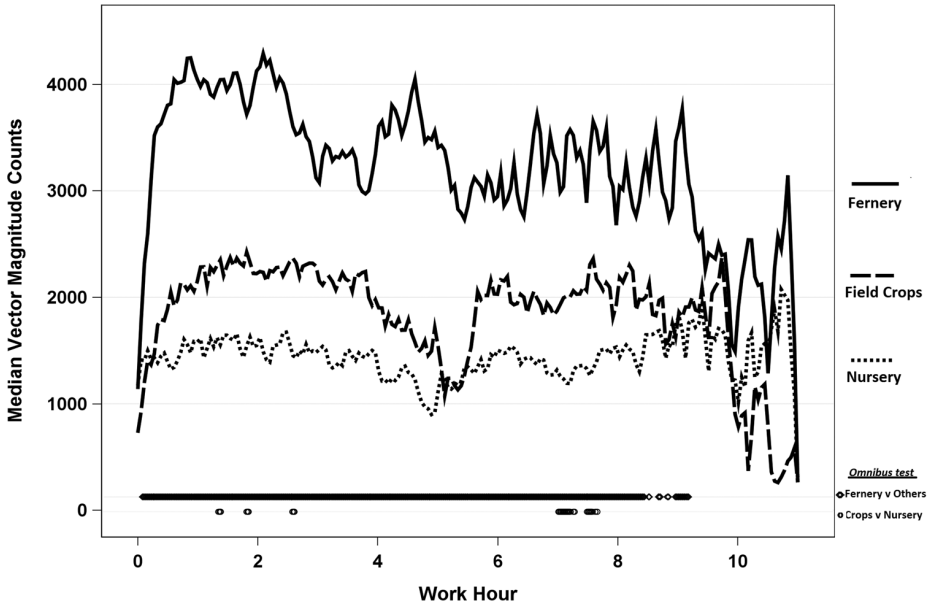


FIGURE 1 Pattern of work activity over the workday among Florida agricultural workers, by the agricultural sector (Girasoles Study, 2015-2017). Omnibus test results are significant at times points marked by a symbol (diamond for fernery vs other work types, circle for field crop vs nursery). Statistical comparisons beyond nine work hours are based on sparse data

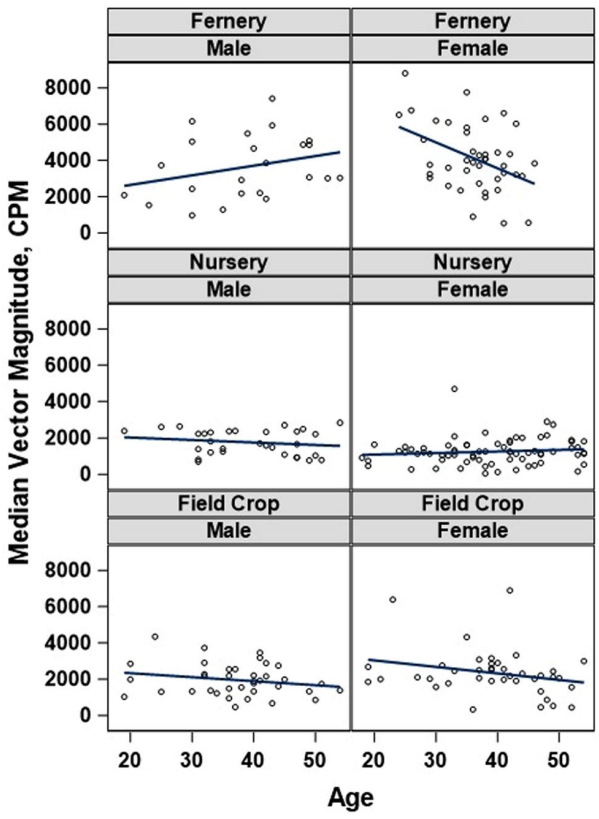


FIGURE 2 Vector magnitude counts per minute by age, sex, and agricultural sector, Girasoles Study, 2015-2017

frequently reported cleaning tasks (34% vs 23%, $P = .02$); in field-crop work, males more frequently engaged in lifting (42% vs 34%, $P = .03$) and squatting movements (17% vs 5%, $P = .01$).

4 | DISCUSSION

This study is the first to describe occupational physical activity among US agricultural workers using standardized, objective measurement. We found that Florida agricultural workers had a high overall volume of physical activity, with sustained bouts of moderate to vigorous activity during the workday. Within this high overall level of activity, there were substantial differences by the agricultural sector, reflecting the heterogeneity of crop-specific demands.

Crop workers reduced their typical physical activity in response to increasing environmental heat, but fernery and nursery workers did not. In a study using video monitoring of seven grape workers on multiple days, Ioannou et al[29] found that workers took more informal work breaks as the temperature climbed. The reasons why there was no evidence of heat impact among nonfield crop workers are speculative. Fernery workers had shorter hours and on average ended their workday around 1 PM, before the worst heat of the day, while nursery workers may have had more chance to enter air-conditioned buildings for a brief respite.

Within the different agricultural sectors, we found differences in the work tasks that may contribute to the observed difference in overall physical activity. Harvesting ferns involves intense physical including bending over, thrusting arms into masses of ferns, and cutting the fronds at their base. After the workers cut the fronds, they

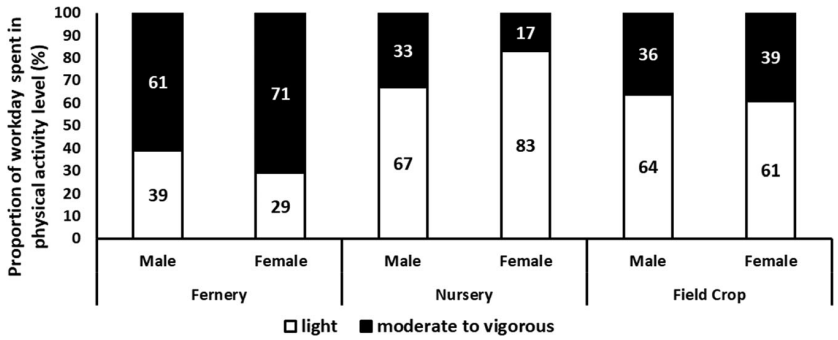


FIGURE 3 Proportion of workday spent in activity levels by the sex and agricultural sector in Florida agricultural workers, Girasoles Study, 2015-2017

secure them with a wire or plastic tie and then toss them aside until they have enough to carry by the armload to a loading area. Most often they are paid by the number of bunches they harvest. The intensity of the physical activity in fernery workers is validated with their sustained and substantially elevated activity levels. Perhaps reflecting their greater involvement in harvesting tasks, female fernery workers were more physically active than their male coworkers.

While we found that crop workers did have periods of moderate to vigorous physical activity, they were more likely to have periods of light or sedentary activity when compared to fernery workers. Participants worked with a wide variety of crops that necessitate different tasks using different physical movements and activity patterns. Vegetable harvesters bend over to pull or cut vegetables, placing the harvested crop in a bucket that they carry as they move along a row. They then carry the full bucket to deposit in a large bin or truck. Others, such as those harvesting sawtooth palmetto berries may walk long distances between trees. Additionally, it is likely that work tasks performed by field-crop workers vary more by season than in ferneries or nurseries.

Overall, the nursery workers were found to have less moderate to vigorous physical activity when compared to fernery or field-crop workers. Work tasks at nurseries are varied and include planting seeds and/or plants in pots, loading pots of plants onto trays and loading and carrying trays, boxes, or bags of soil. Other nursery workers are outside and maybe doing tasks such as loading and cutting plants.

Increasing our knowledge of the nature of agricultural work and the physical activity associated with that work can aid in designing interventions to protect workers during the hottest times of the workday, and to inform public policy regarding the work safety of agricultural workers. The finding that fernery workers have the highest volume of physical activity has important implications for occupational health policy. Guidelines from the Occupational Safety and Health Administration recommend the provision of water, rest, and shade to protect agricultural workers from occupational heat-related hazards.[2] Fernery workers are often paid by a piece-rate, which discourages workers from taking breaks for water or rest in lieu of economic considerations. A recent study showed that piece-rate pay is associated with a four-fold increased risk of HRI.[9] This information, as well as the information from the current study, highlights the need for workplace health and safety standards related to rest breaks to protect the health of these workers.

5 | LIMITATIONS AND STRENGTHS

There are some limitations to consider in interpreting the results of this study. Accelerometry measures objective physical activity but may underestimate upper-body movements. Agricultural tasks include frequent bending, stretching and reaching, hoisting loads

TABLE 3 The association between average daily physical activity and environmental heat, controlling for the agricultural sector, sex, age, body mass index, and work duration, Girasoles Study, 2015-2017

	Agricultural sector					
	Fernery		Nursery		Field crop	
	Estimate	95% CI	Estimate	95% CI	Estimate	95% CI
Intercept[a]	3543	2914, 4171	1746	1548, 1944	2009	1760, 2259
WBGT, °C	188	−24, 399	−21	−82, 41	**−162**	**−306, −19**
WBGT squared	–	–	–	–	−35	−80, 9
Sex (ref = male)	291	−387, 970	**−494**	**−724, −264**	186	−123, 494
Age, y	27	−35, 89	8	−4, 19	−9	−27, 9
Age × sex	**−131**	**−235, −26**	–	–	–	–
BMI	−72	−166, 22	−3	−27, 21	−10	−42, 22
Work duration, h	−94	−257, 70	0.4	−39, 40	−46	−119, 28

Note: The bolded items are significant at the 5% level. Abbreviations: BMI, body mass index; CI, confidence interval; WBGT, wet bulb globe temperature.
[a]Continuous variables were centered; thus the intercept represents the average daily CPM for a 38-year-old male having a BMI of 29 who works 8 hours on a day with an average WBGT of 28.3°C.

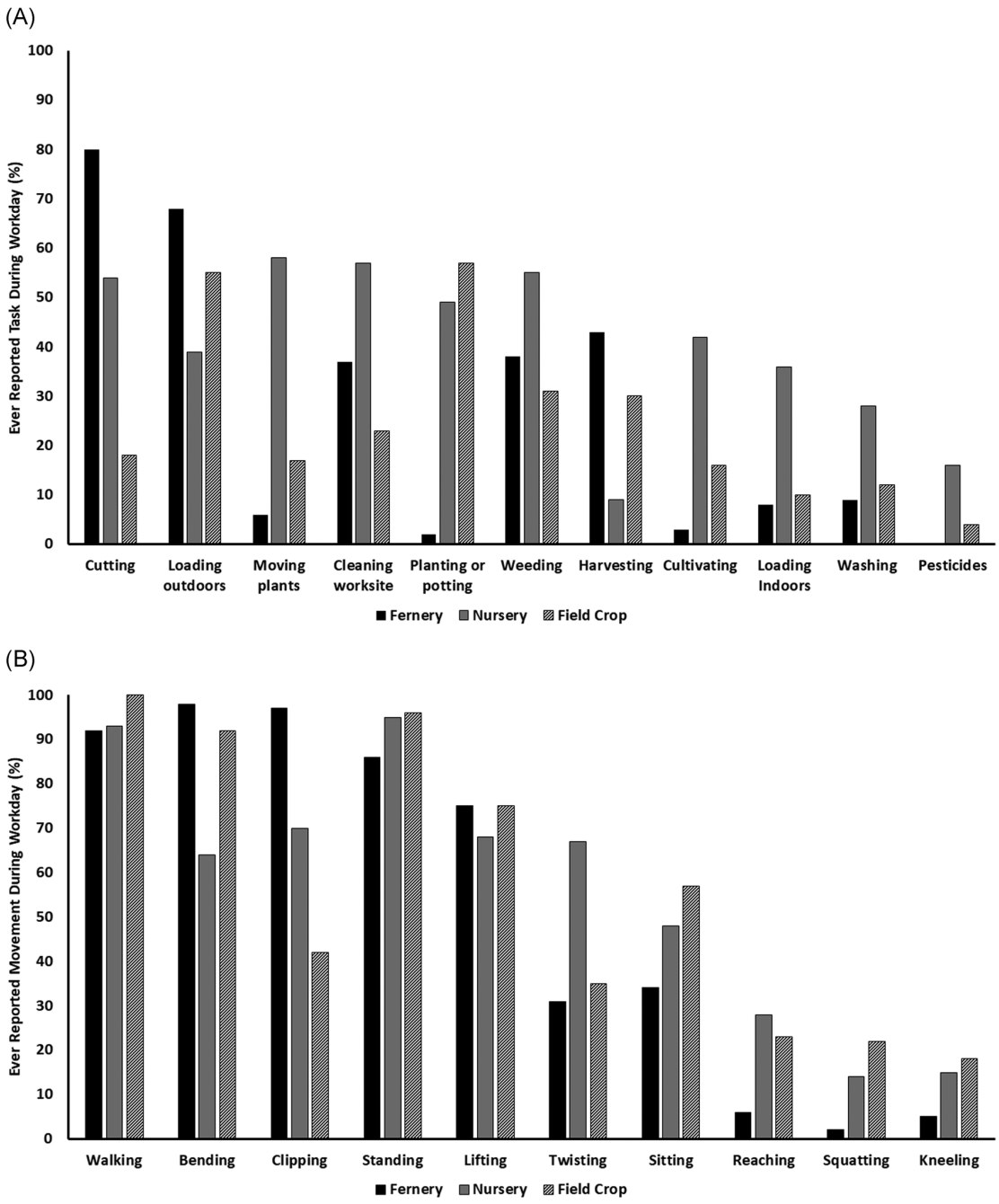


FIGURE 4 A, Work tasks performed by the agricultural sector in Florida agricultural workers, Girasoles Study, 2015-2017. B, Reported physical movements by the agricultural sector in Florida agricultural workers, Girasoles Study, 2015-2017

over the head, heavy lifting and carrying of sacks and buckets, and walking long distances from the field to a loading area. In this study, accelerometers were placed at the hip, which may not have fully captured work activities that involve movements such as lifting and twisting. These are common movements in agricultural work, such as when hauling crops in the field and loading large packages of produce into transport trucks. However, studies have reported moderate to high correlation between accelerometers placed at the hip and the wrist.[30,31] Additionally, the use of accelerometry to evaluate physical activity is more reliable than self-report measures, which are subject to recall error and misclassification.

Since we were unable to follow the worker to their worksite, we relied on self-reported start and stop times for the workday. As a result, it is possible that nonwork activity may have been misclassified as work activity, or vice versa. Another limitation is that we were not able to observe all workers for all three workdays. However, 91% participated for three workdays, and their daily median CPM were similar to those who participated in fewer

workdays. We found that overall WBGT did not impact the overall amount of physical activity performed during the day among fernery and nursery workers. However, the relation between daily summary values may not reflect the relationship between heat and activity on a minute-by-minute basis. Additionally, worker response at hotter temperatures than we observed may be different.

Our findings may not be generalizable to all Florida agricultural workers. We relied on convenience sampling to recruit workers, which may have resulted in healthier, more motivated workers participating in this study. Our study captures the experience of agricultural workers who primarily work for subcontractors and labor crews, who often do not provide training on workers' safety, including preventing HRI. Additionally, our results apply to activities performed in the hot and humid Florida summer season; agricultural tasks and activities occurring during other seasons are likely to be different.

6 | CONCLUSION

This study increases our knowledge of the physical activity performed by Florida agricultural workers. Both the quantity and patterns of physical activity varied by the agricultural sector, sex, and age, indicating that interventions that aim to reduce heat-related morbidity and mortality should be tailored to specific subpopulations. Some workers did not reduce overall physical activity under dangerously hot environmental conditions, which has implications for policies protecting worker health. Future research is needed to determine how physical activity and climatic conditions impact the development of heat-related disorders in this population.

ACKNOWLEDGMENT

This study was supported by the National Institute for Occupational Safety and Health (#R01OH010657).

CONFLICTS OF INTEREST

The authors declare that there are no conflicts of interest.

DISCLOSURE BY AJIM EDITOR OF RECORD

Rodney Ehrlich declares that he has no conflict of interest in the review and publication decision regarding this article.

AUTHOR CONTRIBUTION

Data management: JMM and LE. Study planning: VMT, JF, AJT-A, VSH, and LAMC. Study-site visits: JMM, LE, VMT, and LAMC. Recruitment: JE and AJT-A. Data collection: VMT, JE, AJT-A. Statistical analysis: JMM, LE, and VSH. Manuscript preparation: JMM, LE, JF, and LAMC. Manuscript review: VMT, JE, AJT-A, and LAMC.

ETHICS APPROVAL AND INFORMED CONSENT

This study was approved by the Emory University Institutional Review Board (#IRB00075192). All study participants provided informed consent.

ORCID

Jacqueline M. Mix http://orcid.org/0000-0001-6418-7706
Joan Flocks http://orcid.org/0000-0002-4317-8779
Vicki S. Hertzberg http://orcid.org/0000-0002-8834-4363

REFERENCES

1. Steeves JA, Tudor-Locke C, Murphy RA, King GA, Fitzhugh EC, Harris TB. Classification of occupational activity categories using accelerometry: NHANES 2003-2004. *Int J Behav Nutr Phys Act*. 2015;12(1):89. https://doi.org/10.1186/s12966-015-0235-z
2. National Institute for Occupational Safety and Health. NIOSH criteria for a recommended standard: occupational exposure to heat and hot environments. Cincinnati, OH: US Department of Health and Human Services, Center for Disease Control and Prevention, National Institute for Occupational Safety and Health; 2016.
3. Wexler RK. Evaluation and treatment of heat-related illnesses. *Am Fam Physician*. 2002;65(11):2307-2314.
4. Jackson LL, Rosenberg HR. Preventing heat-related illness among agricultural workers. *J Agromedicine*. 2010;15(3):200-215. https://doi.org/10.1080/1059924X.2010.487021
5. Gubernot DM, Anderson GB, Hunting KL. Characterizing occupational heat-related mortality in the United States, 2000-2010: an analysis using the Census of Fatal Occupational Injuries database. *Am J Ind Med*. 2015;58(2):203-211. https://doi.org/10.1002/ajim.22381
6. California Department of Industrial Relations. California code of regulations, title 8, section 3995: Heat illness prevention.http://www.dir.ca.gov/title8/3395.html. Accessed 21 September 2013.
7. Washington Department of Labor and Industries. WAC: General occupation health standards. http://apps.leg.wa.gov/WAC/default.aspx?cite=296-62&full=true#296-62-095 Accessed 21 September 2013.
8. Minnesota Department of Labor and Industry. *Heat stress*. St. Paul, MN: Occupational Safety and Health Division; 2009.
9. Moyce S, Mitchell D, Armitage T, Tancredi D, Joseph J, Schenker M. Heat strain, volume depletion and kidney function in California agricultural workers. *Occup Environ Med*. 2017;74(6):402-409. https://doi.org/10.1136/oemed-2016-103848
10. Flocks J, Tovar JA, Economos E, et al. Lessons learned from data collection as health screening in underserved farmworker communities. *Progress Community Health Partnersh: Res Educ Action*. 2018;12(1S):93-100. https://doi.org/10.1353/cpr.2018.0024
11. Vega-Arroyo AJ, Mitchell DC, Castro JR, et al. Impacts of weather, work rate, hydration, and clothing in heat-related illness in California farmworkers. *Am J Ind Med*. 2019;62:1038-1046. https://doi.org/10.1002/ajim.22973 [published online ahead of print April 09, 2019].
12. Poulianiti KP, Havenith G, Flouris AD. Metabolic energy cost of workers in agriculture, construction, manufacturing, tourism, and transportation industries. *Ind Health*. 2019;57:283-305. https://doi.org/10.2486/indhealth.2018-0075
13. Mac VVT, Tovar-Aguilar JA, Flocks J, Economos E, Hertzberg VS, McCauley LA. Heat exposure in central Florida fernery workers: results of a feasibility study. *J Agromedicine*. 2017;22(2):89-99. https://doi.org/10.1080/1059924X.2017.1282906

14. Fleischer NL, Tiesman HM, Sumitani J, et al. Public health impact of heat-related illness among migrant farmworkers. *Am J Prev Med*. 2013;44(3):199-206. https://doi.org/10.1016/j.amepre.2012.10.020
15. World Health Organization. Body mass index—BMI. http://www.euro.who.int/en/health-topics/disease-prevention/nutrition/a-healthy-lifestyle/body-mass-index-bmi. Accessed 7 August 2017.
16. Matthews CE, Hagströmer M, Pober DM, Bowles HR. Best practices for using physical activity monitors in population-based research. *Med Sci Sports Exercise*. 2012;44(1 suppl 1):S68-S76. https://doi.org/10.1249/MSS.0b013e3182399e5b
17. National Weather Service (NWS). Heat Index. http://www.nws.noaa.gov/om/heat/heat_index.shtmlAccessed 4 January 2019.
18. Bernard TE, Barrow CA. Empirical approach to outdoor WBGT from meteorological data and performance of two different instrument designs. *Ind Health*. 2013;51(1):79-85.
19. Troiano RP, Berrigan D, Dodd KW, Mâsse LC, Tilert T, McDowell M. Physical activity in the United States measured by accelerometer. *Med Sci Sports Exercise*. 2008;40(1):181-188. https://doi.org/10.1249/mss.0b013e31815a51b3
20. Masse LC, Fuemmeler BF, Anderson CB, et al. Accelerometer data reduction: a comparison of four reduction algorithms on select outcome variables. *Med Sci Sports Exercise*. 2005;37(11 suppl):S544-S554.
21. Sasaki JE, John D, Freedson PS. Validation and comparison of ActiGraph activity monitors. *J Sci Med Sport*. 2011;14(5):411-416. https://doi.org/10.1016/j.jsams.2011.04.003
22. Aguilar-Farías N, Brown WJ, Peeters GM. ActiGraph GT3X+ cut-points for identifying sedentary behaviour in older adults in free-living environments. *J Sci Med Sport*. 2014;17(3):293-299. https://doi.org/10.1016/j.jsams.2013.07.002
23. Ramsay JO, Silverman PE. *Functional Data Analysis*. 2nd ed. New York, NY: Springer; 2005.
24. Cleveland WS. Robust locally weighted regression and smoothing scatterplots. *J Am Stat Assoc*. 1979;74:829-36.
25. Hertzberg V, Mac V, Elon L, et al. Novel analytic methods needed for real-time continuous core body temperature data. *West J Nurs Res*. 2017;39(1):95-111.
26. Nichols TE, Holmes AP. Nonparametric permutation tests for functional neuroimaging: a primer with examples. *Human Brain Mapp*. 2002;15(1):1-25.
27. Aitchison J. *The Statistical Analysis of Compositional Data*. Caldwell, NJ: The Blackburn Press; 2003.
28. Neter JKM, Nachtsheim CJ, Wasserman W. Applied linear statistical models. 4th ed. Boston, MA: WCB/McGraw Hill; 1996.
29. Ioannou LG, Tsoutsoubi L, Samoutis G, et al. Time-motion analysis as a novel approach for evaluating the impact of environmental heat exposure on labor loss in agriculture workers. *Temperature (Austin)*. 2017;4(3):330-340. https://doi.org/10.1080/23328940.2017.1338210
30. Kamada M, Shiroma EJ, Harris TB, Lee IM. Comparison of physical activity assessed using hip- and wrist-worn accelerometers. *Gait Posture*. 2016;44:23-28. https://doi.org/10.1016/j.gaitpost.2015.11.005
31. Shiroma EJ, Schepps MA, Harezlak J, et al. Daily physical activity patterns from hip- and wrist-worn accelerometers. *Physiol Meas*. 2016;37(10):1852-1861. https://doi.org/10.1088/0967-3334/37/10/1852

SUPPORTING INFORMATION

Additional supporting information may be found online in the Supporting Information section.

How to cite this article: Mix JM, Elon L, Mac Thien V, et al. Physical activity and work activities in Florida agricultural workers. *Am J Ind Med*. 2019;62:1058-1067. https://doi.org/10.1002/ajim.23035

Farmworkers at Risk

The Growing Dangers of Pesticides and Heat

HIGHLIGHTS

The estimated 2.4 million farmworkers in the United States are vital to US food production. However, these workers are exploited, undervalued, and vulnerable to compounding climate change threats. The Union of Concerned Scientists (UCS) assessed how pesticide exposure and heat stress conditions combine to present significant risks to farmworkers' health and safety. We focused on California, Florida, and Washington—states that lead the nation in pesticide use, farmworkers, and production of labor-intensive fruits, nuts, and vegetables. We found that farmworkers in these states already experience substantial threats and that these are likely escalating. Policies to protect farmworkers' well-being from the dangerous consequences of extreme heat and pesticides are urgently needed.

Introduction

Farmworkers are vital to the agricultural system that brings food to dinner tables in the United States every day. Some 2.4 million workers perform two-thirds of all labor in US agriculture, producing and packing crop and livestock products (NASS 2019; Lacey et al. 2017). Despite this, they remain largely invisible to many. Distinct from farmers, farmworkers do not typically own or operate farm businesses, nor do they own or rent the land. They perform difficult and dangerous work for insufficient wages and with few legal protections (Guild and Figueroa 2018; Clemens 2013; Quandt et al. 2013a). At best, their labor is undervalued, and at worst, they are brutally exploited. And now, their work is becoming even more hazardous as a result of climate change.

Weather extremes associated with climate change are creating increasingly uncertain and life-threatening working conditions. Rising summer and winter temperatures and shifting rainfall patterns alter the timing and length of growing seasons (Lane et al. 2019; Doll, Petersen, and Bode 2017), extreme heat is becoming more common and deadly, and expanding pest activity may increase the likelihood of farmworkers' exposure to dangerous pesticides (USGCRP 2018). In this report, we examine US farmworkers' vulnerability to compounding climate change threats due to the nature of their work and their social and political standing.

Rightclv/iStock

Farmworkers harvest strawberries in California. Such work is often done under grueling conditions, elevating the likelihood of injury from pesticide exposure and heat stress, among other hazards.

We focus on two threats—pesticide exposure and heat stress conditions—and explore how these are affecting US farmworkers' health and safety as climate change takes hold. This report provides recommendations for action, at both the state and federal levels, to protect the most vulnerable workers now. It also urges bold policy measures to create resilient, regenerative farming systems that are less reliant on pesticides, along with swift action to reduce the nation's heat-trapping emissions in order to begin limiting and reversing climate change for the long term.

Farmworkers Are Undervalued and Highly Vulnerable

Farmworkers often conduct their work under grueling conditions, putting their health and safety at risk. While mechanization has reduced the role of farm labor for grain production (Dimitri, Effland, and Conklin 2005), other parts of the agricultural sector remain labor intensive. The food system heavily relies on farmworkers for the production of berries and other fruits, dairy products, tree crops, and vegetables, and to manage livestock (Zahniser et al. 2018).

AP Photo/Luis M. Alvarez

Farmworkers, like these shown harvesting tomatoes in Florida, may resort to rudimentary and inadequate personal protection against pesticides and other airborne hazards.

Multiple forms of disenfranchisement enable the food system's reliance on cheap, exploited labor. The US farm labor market heavily depends on immigrants and seasonal guest workers to fill jobs that domestic workers generally find undesirable (Bronars 2015).[1] In 2015–2016, only 24 percent of US farmworkers were born in the United States, and three-quarters were people of color (Hernandez and Gabbard 2018). Farmworkers leave their countries to do jobs that most US citizens will not do, to earn an average of $10.80 per hour (Hernandez and Gabbard 2018; O'Brien, Kruse, and Kruse 2014). The National Agriculture Workers Survey found that only 32 percent of farmworkers reported a personal annual income of $30,000 or more (Hernandez and Gabbard 2018).

> ***Farmworkers leave their countries to do jobs that most US citizens will not do, to earn an average of $10.80 per hour.***

Farmworkers are typically hired by farmers or, in many cases, by contractors who coordinate labor for farmers and act as intermediaries between farmers and farmworkers. The use of farm labor contractors can insulate farmers from charges of hiring undocumented workers and creates a situation ripe for abuse (Hernandez and Gabbard 2018; Perea 2010).

Economic hardship, immigration status, spoken language, national origin, race, socioeconomic status, and other issues all contribute to farmworkers being the targets of systematic exploitation and exclusion (Guild and Figueroa 2018; Hernandez and Gabbard 2018; Robinson et al. 2011; UFW 2011). Cultural differences, lack of transportation, language barriers, and physical isolation in work camps all combine to create many obstacles that keep farmworkers from accessing whatever scarce resources and services may be available.

More fundamentally, lack of legal protection and political and socioeconomic power limits farmworkers' ability to seek redress for abuses and violations of labor law. This absence of protection and power highlights the need for the expansion of basic rights and protections to these workers, who help build wealth for so many others, throughout the food system (Wadsworth, Courville, and Schenker 2018; Courville,

1 *The H2-A guest worker program gives agricultural employers permission to bring foreign workers to the United States temporarily, for seasonal labor. In recent years, use of the H2-A program has more than doubled in size, and the program has been the target of criticism from both farmworker advocates and farmers (USDL 2019; Wozniacka 2019).*

BOX 1.

Lack of Data Makes It Harder to Protect Farmworkers

Researchers face a lack of reliable and accessible public information about the lives and working conditions of farmworkers. There are multiple reasons for the scarcity of good data (UFW 2011). The informal, seasonal, and subcontracted nature of agricultural labor makes it difficult to count farmworkers. Some surveys on occupational injury omit small farms (with fewer than 11 employees) (Ruser 2008). Undocumented farmworkers and their employers may be reluctant to share information, and employers may refuse to allow access for researchers and surveyors. Workers with health concerns may not report their experiences due to lack of reporting systems, fear of retaliation, or failure to recognize symptoms.

Thus, information about farmworkers—including the number and rate of occupational injuries caused by pesticides and heat—is underreported (Prado et al. 2017; Jackson and Rosenberg 2010). Researchers have estimated that US government reports of occupational injuries in agriculture miss 79 percent of nonfatal injuries and 74 percent of deaths (Leigh, Du, and McCurdy 2014; Leigh, McCurdy, and Schenker 2001). The lack of accurate and complete data makes every aspect of research, education, and advocacy on farmworker issues more difficult.

Wadsworth, and Schenker 2016). Political and social marginalization of farmworkers make them especially vulnerable to abuse and neglect, in and out of the workplace (Wadsworth, Courville, and Schenker 2018; Summers et al. 2015).

Farmworkers were excluded from the rights and protections secured for most private sector workers in the United States by the 1930s New Deal legislation, which established child labor protections, collective bargaining, minimum wage, overtime pay, protection from hazards in the workplace, and unemployment insurance (Guild and Figueroa 2018). The exclusion of farm labor enabled the continued exploitation of Black sharecroppers in the Southern plantation system, created barriers to the accumulation of wealth by the descendants of slaves, and helped maintain white economic dominance in the United States (Perea 2010; Linder 1987). Some protections have since been extended to some farmworkers, but exceptions have been maintained. For example, at the federal level, the minimum wage has been extended to workers on large farms, but overtime pay has not. Small farms remain exempt from minimum wage requirements.

Farmworkers at Risk

Farmworkers undertake some of the most challenging work: cultivating, harvesting, maintaining, packing, and planting fruits and vegetables, and handling livestock. Often, they work under grueling conditions. While farmworkers face numerous threats to their health and safety, pesticides and heat stress conditions are among the most serious.

PESTICIDE DEPENDENCE PUTS FARMWORKER HEALTH AND SAFETY AT RISK

During the 20th century, through a combination of technological development, market forces, and policies, US agriculture became overwhelmingly dependent on synthetic pesticides (Aspelin 2003). The use of these toxic compounds to control fungi, insects, weeds, and other pests has become commonplace in intensive monoculture farming—a system in which single crop species are grown across vast areas of farmland, often year after year. The resulting diminished biodiversity creates ideal environments for insects and plant diseases to propagate, while exposed soils and extensive fertilizer use—also hallmarks of today's dominant agricultural system—create welcoming habitats for weeds.

However, heavy reliance on pesticides is not the only option for dealing with agricultural pests—the science and practice of agroecology incorporates many alternative approaches to crop protection (see Box 2, p. 4). Despite the existence of these alternatives, the area of farmland treated with pesticides increased 65 percent between 1997 and 2017 (NASS 2019). In 2017, farmers spent more than $17.5 billion on pesticides—$37 for every acre treated, up from $27 per acre in 1997 (NASS 2019).

While intensive pesticide use has been an integral part of the strategy to increase yields per acre, it has had disastrous consequences for many communities and the environment (Bourguet and Guillemaud 2016; Pimentel and Burgess 2014). Farmworkers and their families face both immediate and long-term harm from pesticides. Although data are limited, estimates suggest that thousands of workers suffer acute pesticide poisoning every year (EPA 2015).[2] Farmworker

2 *Assessing pesticide poisoning is difficult, as federal agencies that track instances have released data only until 2011. These data do not capture potential changes due to improvements in the Agricultural Worker Protection Standard for pesticides in 2015. Furthermore, interpretation of these data is limited by known underreporting issues as well as differences in reporting practices across states (Prado et al. 2017).*

pesticide poisonings are likely to be more severe than pesticide poisonings that occur in other occupations: considering all exposure cases, farmworkers are twice as likely to suffer severe injury or death (Calvert et al. 2016).

Farmworkers face risks of injury and death whether or not they are directly involved with handling pesticides, and field-workers who are *not* working directly with pesticides account for the majority of reported poisonings (CDC 2019; CDPR 2019). Many employers do not post adequate notices that fields have been sprayed with pesticides, fail to enforce "no entry" periods after spraying, fail to provide required protective gear and training on how to use it, or discourage the use of protective gear (EPA 2019; Calvert et al. 2008, 2004; Arcury et al. 2001). The 2015–2016 National Agriculture Workers Survey indicated that only 57 percent of farmworkers had received any pesticide safety training in the previous 12 months.

Chronic health effects from long-term exposure to pesticides are also an issue. Farmworkers repeatedly endure exposure to pesticides through contact with airborne drift or through residues on equipment, soil, plants, or clothing. Farmworkers' families also are exposed to pesticide residues when these are brought home on workers' bodies, clothes, and shoes (Hyland and Laribi 2017). Chronic pesticide exposure has been associated with devastating health issues, including cancer, depression, diabetes, neurodegenerative diseases, and reproductive issues (Kim, Kabir, and Jahan 2017; Muñoz-Quezada et al. 2016; Beard et al. 2014; Starling et al. 2014; Bassil et al. 2007; Frazier 2007). Some of these conditions are associated even with very low levels of exposure over long periods (Alleva et al. 2018; García et al. 2017; Sánchez-Santed, Colomina, and Herrero Hernández 2016; Son et al. 2010).

BOX 2.

Agroecology Can Help Protect Farmworkers and Fight Climate Change

The science and practice of agroecology can help address many of the problems identified in this report. Agroecology applies ecological principles to farms and is premised on working with nature rather than against it (Gliessman and Tittonell 2015). For example, practices such as crop rotation, multi-cropping, and use of cover crops can discourage weeds and insect pests, thereby reducing the need for pesticides. In addition, diversified farms can be designed to improve occupational safety for both farmers and farmworkers. For example, cropping systems that provide tree shade or shift some labor to cooler seasons may prevent farmworker exposure to dangerous conditions. Finally, some farming practices can directly mitigate climate change by reducing heat-trapping gas emissions and sequestering carbon in the soil (Harden et al. 2018; Feliciano et al. 2017).

Farmworkers die of heat-related causes at roughly 20 times the rate of workers in all other civilian occupations.

HEAT STRESS CONDITIONS ALSO THREATEN FARMWORKER HEALTH AND SAFETY

Over the past 30 years, exposure to extreme heat was, on average, the top cause of weather-related deaths in the United States (NWS 2019). Between 1992 and 2017, heat was estimated to be responsible for an average 2,700 serious injuries and 30 deaths per year among all US workers (Tanglis and Devine 2018). Farmworkers die of heat-related causes at roughly 20 times the rate of workers in all other civilian occupations (CDC 2008).

Farmworkers' high risk of heat stress is related to the nature of their labor: they do hard work under the sun and often through the hottest parts of the year. Direct sunlight can increase the heat index (which combines temperature and humidity to give a "feels like" temperature) by up to 15°F (NWS n.d.). Further, to protect against chemicals (including pesticides), insects, and sun, farmworkers typically wear long sleeves and often wear multiple layers. Such clothing can add up to 12°F to the "feels like" temperature (WSL 2018). Nonbreathable coveralls—used to protect pesticide handlers against the most toxic pesticides—can increase the "feels like" temperature even more, by up to 27°F (CHEMM 2019). Another factor that exacerbates heat injury is the way many farmworkers are paid. When employers pay farmworkers based on "piece rate," the workers earn according to how much they harvest (Guild and Figueroa 2018), and this disincentivizes taking breaks to rest, seek shade, or drink water (Lam et al. 2013).

The federal Occupational Safety and Health Administration (OSHA) endorses a set of clear heat stress prevention

Bob Nichols/USDA

In full sun and wearing multiple layers of clothing, these workers harvesting lettuce in California are at risk of heat stress.

measures and remedies. These include allowing new workers time to acclimatize to hot conditions; providing additional hydration, rest, and shade as heat increases; and training workers and supervisors to recognize and respond to signs of heat stress (Jackson and Rosenberg 2010). However, many employers fail to offer such remedies (Arbury, Lindsley, and Hodgson 2016). In the absence of training, many farmworkers are not aware of the critical importance of hydration and acclimatization (Stoecklin-Marois et al. 2013).

The confusion and impaired coordination that accompany heat stress can put workers at additional risk for other kinds of traumatic injury (Varghese et al. 2018; Spector et al. 2016). Moreover, farmworkers can face additional heat stress risks even outside of the work environment. Employer-provided housing often lacks air-conditioning or fans, eliminating important overnight recovery time and, in some cases, meaning that farmworkers start their day already experiencing heat stress (Quandt et al. 2013b). All of this is further compounded by the fact that the majority of farmworkers do not have access to health insurance coverage or workers' compensation, and are unlikely to receive care for heat-related (or other) injuries (Arcury and Quandt 2011, 2007).

Combined Pesticide and Heat Effects Are Worse Than the Sum of Their Parts

While pesticide exposure and heat stress conditions each already represent a threat to farmworkers' health, climate change promises to compound these threats. For example, climate change is likely to increase pesticide use due to expanding ranges and impacts of pests and pathogens, increasing vigor of weeds compared with crops, and decreasing efficacy of pesticides under increasing temperatures (Taylor et al. 2018; Ziska 2016; Delcour, Spanoghe, and Uyttendaele 2015; Bebber, Holmes, and Gurr 2014). Higher temperatures also increase pesticide volatilization rates, meaning more of the pesticides applied will be lost as vapor, potentially leading to even higher application rates to achieve the same effect (Delcour, Spanoghe,

TABLE 1. Agriculture, Pesticide Use, and Heat Stress Conditions in Key Agricultural States

		CA	WA	FL
Farmworkers[a]	Statewide	377,593	228,588	96,247
	10 Top Counties[b]	210,083	182,376	56,983
Value of Crop Sales	Statewide	$33.4 billion	$7.0 billion	$5.7 billion
	10 Top Counties	$22.4 billion	$5.6 billion	$3.8 billion
Acres Harvested	Statewide	7.9 million	4.5 million	2.1 million
	10 Top Counties	4.7 million	2.8 million	0.9 million
Pesticide Application Rate[c]	Statewide	8.1 kg/acre	7.6 kg/acre	11.7 kg/acre
	10 Top Counties	9.3 kg/acre	11.1 kg/acre	15.4 kg/acre
	Statewide Mandatory Pesticide Use Reporting	Yes	No	No
Days with Heat Index[d] over 80°F, April–October	Statewide	102 days	31 days	193 days
	10 Top Counties	115 days	42 days	202 days
	Statewide Worker Heat Protection Regulations	Yes	Yes	No

California, Washington, and Florida are the top three states with the greatest sales of labor-intensive fruits, nuts, and vegetables. They also lead the nation in numbers of farmworkers and average pesticide application rates (see Table A1 in Technical Appendix II). Farmworkers in these states are at risk due to both pesticide exposure and heat stress conditions, compounding threats likely to worsen as climate change continues.

Notes: a. "Farmworkers" refers to hired farm labor as estimated by the 2017 Census of Agriculture. Hired labor is distinct from the labor of farmers and their families, who are generally categorized as self-employed and unpaid labor, respectively. b. Top 10 counties are determined by crop sales. For list of counties and detailed results, see Table A2 in Technical Appendix II. c. "Pesticide application rate" is the total agricultural pesticides applied for all crops and counties divided by total harvested cropland acres. d. "Heat index" is calculated as the average from 1971 to 2000 (see Technical Appendix I for more details).

SOURCES: NASS 2019; USGS 2018.

and Uyttendaele 2015). Increasing volatilization also raises airborne concentrations and leads to a higher risk of pesticide exposure and injury for farmworkers as well as nearby communities (Houbraken et al. 2016).

As the potential for exposure to pesticides increases, farmworkers may also become more vulnerable to them: a growing body of research shows that heat stress increases the human body's susceptibility to pesticides and other toxicants, magnifying the potential for both acute and long-term health effects (Johnson, Wesseling, and Newman 2019; Wang et al. 2018; Fortes et al. 2016; Gordon and Leon 2011). In the case of widely used organophosphate pesticides, warmer temperatures have been shown to increase the rate of chemical transformation into more toxic compounds (Mackay, Giesy, and Solomon 2014; Armstrong et al. 2013).[3] Finally, the increasing use and toxicity of pesticides amplify the need for protective clothing, which can, as noted earlier, dramatically increase the risk of heat-related injury (Bernard et al. 2007).

Risks for Farmworkers: A Closer Look in Three States

We aimed to assess how farmworkers experience compounding threats from pesticide use and heat stress conditions. While dangerous heat is an issue for farmworkers in every kind of agriculture, pesticide use is more concentrated in crop

> ***Climate change will not only cause increased severity and frequency of dangerous heat, but will likely lead to increased pesticide use as well.***

3 *Studies showed that warmer temperatures increased the rate of transformation of organophosphorus pesticides into oxon metabolites, which can be 5 to 100 times as toxic as the parent pesticide.*

production than in animal agriculture. We therefore focused our attention on crop agriculture.

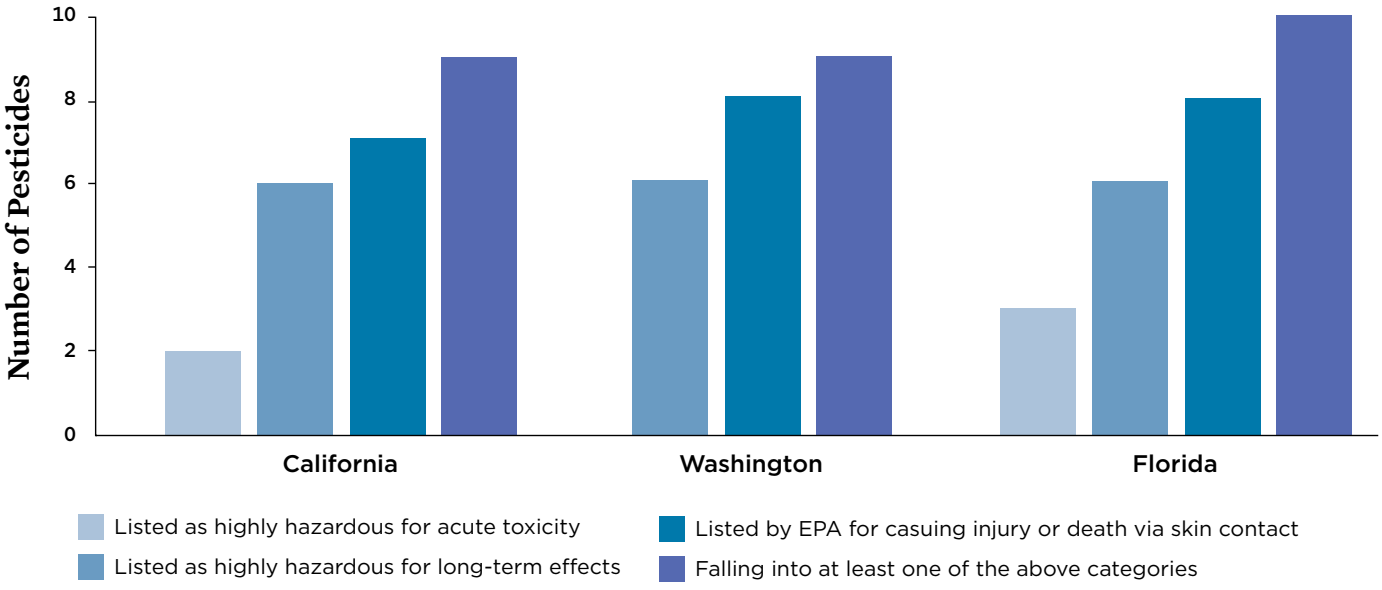
Heat and pesticide use vary from state to state. We assessed three key states in depth: California, Florida, and Washington (see Table 1). We chose these states based on their high rates of pesticide use and the importance of agriculture, especially labor-intensive fruit, nut, and vegetable crops, to their economies. These states also have among the highest numbers of farmworkers.

For each state, we examined the intersection between risks of pesticide use and heat stress conditions, situating our analysis in the context of the state's agricultural economy and regulatory environment. Since agriculture and climate conditions are highly variable within any given state, we also identified the top 10 agricultural counties in each state and conducted a similar analysis focusing on just those counties (see Technical Appendices I and II).

We calculated the average rate of pesticide use (kilogram per harvested cropland acre) at state and county levels, using estimates of agricultural applications in 2016 from the US Geological Survey Pesticide National Synthesis Project (USGS 2018) and acres of crops harvested from the 2017 Census of Agriculture (NASS 2019). To better understand the nature of acute and long-term health threats faced by farmworkers, we also identified the top 10 pesticides used in labor-intensive agriculture in each state and assessed the risks associated with them (see Figure 1, and Table 2, p. 8); see Technical Appendix I for methods; see Table A3 in Technical Appendix II for detailed results).

Finally, we used heat data from recent historical conditions (1971–2000) based on the Union of Concerned Scientists report, *Killer Heat in the United States*, focusing on the 214 days between April 1 through October 31 (Dahl et al. 2019b). As in that work, we used the heat index used by the National Weather Service—also known as the "feels like" temperature—which accounts for both temperature and relative humidity (NWS, n.d.). While susceptibility to heat risks is highly individual and depends on many factors, National Weather Service guidance and other research suggests that at a heat index above 90°F, people exerting themselves or working outdoors become increasingly susceptible to heat illness or injury (NWS, n.d.).

FIGURE 1. Health Hazards of Top Pesticides Used on Labor-Intensive Crops in California, Washington, and Florida



The top 10 pesticides applied (by weight) in California, Florida, and Washington include several that are highly dangerous to human health, according to three key indicators.

Note: Pesticides listed for acute toxicity can cause a broad range of symptoms, depending on the compound and the level of exposure (see Table 2, p. 8). Pesticides listed for long-term health effects are known potential carcinogens and endocrine disruptors. See methods for identifying and characterizing the pesticides in Technical Appendix I, and see Table A3 of Technical Appendix II for detailed results of the analysis.

SOURCES: PANI 2019; SEE PESTICIDE SOURCE DOCUMENTS IN TECHNICAL APPENDIX 1.

TABLE 2. Acute Health Hazards of Top Pesticides Used on Labor-Intensive Crops in California, Washington, and Florida

Pesticide	Selected Label Text
Sulfur	"Harmful if swallowed, inhaled or absorbed through skin."
Dichloropropene	"May be fatal if absorbed through the skin."
Petroleum Oil	"Harmful if swallowed or absorbed through skin or inhaled."
Metam Potassium	"POISON. Fatal if absorbed through skin. Corrosive. Causes skin burns and irreversible eye damage."
Chloropicrin	"Poisonous liquid and vapor. Inhalation may be fatal. . . . Liquid will cause chemical burns to skin or eyes."
Glyphosate	"Causes moderate eye irritation."
Kaolin Clay	"Causes moderate eye irritation."
Metam	"Corrosive. Causes skin damage. May be fatal if absorbed through the skin."
Copper Hydroxide	"May be fatal if swallowed. . . . Harmful if inhaled."
Petroleum Distillate	"Harmful if absorbed through skin."
Calcium Polysulfide	"Corrosive. Causes irreversible eye damage. Causes skin burns. Harmful if swallowed or absorbed through skin."
Mancozeb	"Harmful if absorbed through skin."
Chlorothalonil	"Corrosive. Causes irreversible eye damage. May be fatal if inhaled."
Sulfuric Acid	"Corrosive. Causes irreversible eye damage and severe skin burns. May be fatal if swallowed or absorbed through skin or inhaled."
Allyl Isothiocyanate	"Corrosive. Causes irreversible eye damage and skin burns. May be fatal if swallowed, absorbed through skin, or inhaled."

The Environmental Protection Agency (EPA) mandates specific text that must appear in the safety warnings on product labels for pesticides in the United States. These selections from the mandated safety text for the top pesticides applied (by weight, in descending order) in California, Florida, and Washington illustrate some of the dangers faced by farmworkers working with labor-intensive crops. These warnings do not reflect long-term health hazards associated with these pesticides.

Note: See methods for identifying and characterizing the pesticides in Technical Appendix I and detailed results of analysis in Table A3 of Technical Appendix II.

SOURCES: SEE PESTICIDE SOURCE DOCUMENTS IN TECHNICAL APPENDIX 1.

For farmworkers, however, heat does not have to be extreme to be dangerous. The heat index used by the National Weather Service is calibrated for a healthy, hydrated, and unmedicated person who is five-foot-seven and 147 pounds, wears short sleeves, and does light work in the shade with a slight breeze (Rothfusz 1990). With farm work, however, heat becomes dangerous at lower temperatures, including temperatures that probably feel quite comfortable for those of us who match the descriptions listed above: doing light work in comfortable clothes in a shady, breezy area.

A recent study identified a heat index of just 80°F as a critical threshold for outdoor workers, defining the lower end of the range in which 99 percent of injuries and 100 percent of deaths occur (Morris et al. 2019). Therefore, in this report, we used an 80°F heat index threshold. This threshold makes it clear that the season of risk for farmworkers extends far beyond the very hottest part of the year.

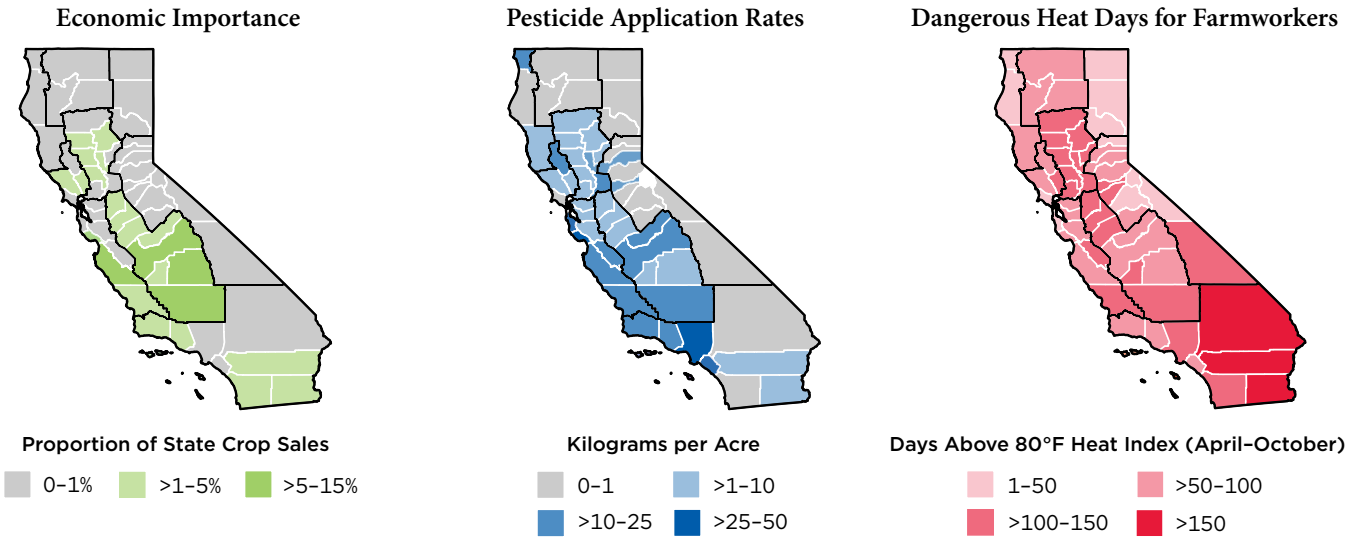
CALIFORNIA

California leads the nation in total value of agricultural products sold, as well as in labor-intensive commodities such as fruits, nursery products, tree nuts, and vegetables (NASS 2019; see Table 1, p. 6). Fruit, tree nut, and vegetable production make up 84 percent of California's crop sales, more than any other state. Further, the state's crop production uses nearly 8 million acres (NASS 2019). The 2017 Census of Agriculture estimated California's farmworker population to be 377,593, but as with other farmworker data, this may reflect significant underreporting (NASS 2019). A recent analysis of California employment records estimates there are more than twice that number: 829,000 (Martin et al. 2016).

California's average rate of pesticide use on harvested croplands, 8.1 kg per acre, is more than 4.5 times the national average (1.7 kg per acre). Despite recent declines in statewide pesticide use and pesticide injury, acute pesticide poisoning remains a regular occurrence, with an average of 88 cases per year between 2010 and 2015 (CDPR 2019; USGS 2018). Nine of the top 10 pesticides used on California's labor-intensive crops have dire implications for farmworker health. The Pesticide Action Network (PAN) associates six with long-term health effects and two with acute toxicity. The Environmental Protection Agency (EPA) lists seven as causing injury or death through contact with the skin.

California farmworkers' risk of pesticide injury is compounded by the risk of heat stress conditions. From 1971 to 2000, the average number of days per year over the heat risk threshold of 80°F stood at 102. Extreme heat, driven by climate change, is a mounting public health concern in California for much of the population and especially those,

FIGURE 2. Agricultural Economy, Pesticides, and Heat Stress Conditions in California



In California's top agricultural regions, farmworkers face even greater threats from both pesticide exposure and heat stress conditions than across the state as a whole.

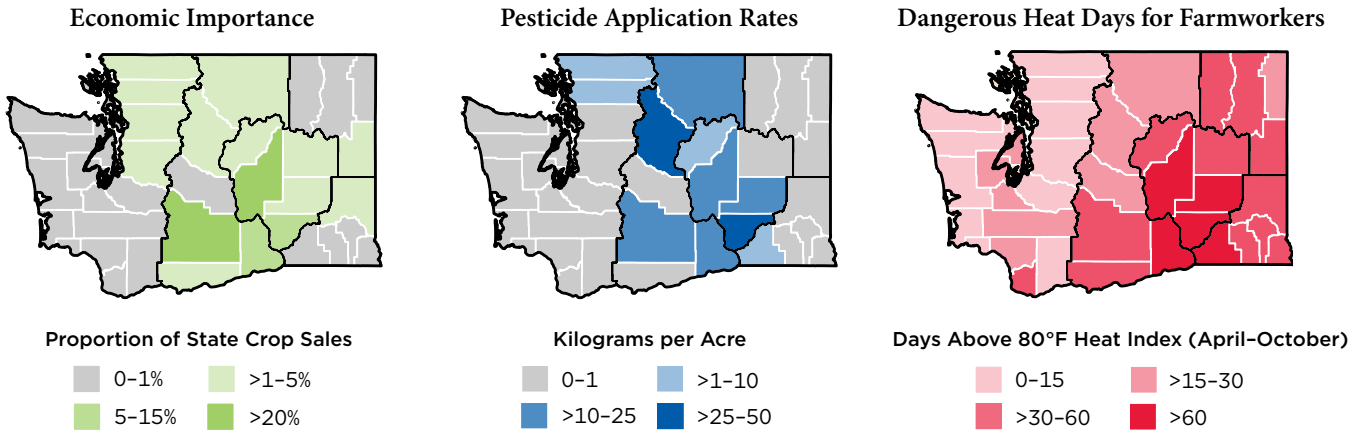
Notes: Light lines represent county boundaries and dark lines represent agricultural district boundaries. Figures show (left) county crop sales as a proportion of total state crop sales, (center) pesticide application rates per acre of harvested cropland, and (right) average days per year with a heat index above 80°F from April to October, 1971–2000 (see Technical Appendix I for methods). Areas in white on pesticide map indicate counties for which application rates could not be calculated due to lack of available census data on acres of crops harvested.

SOURCES: NASS 2019; USGS 2018.

NNehring/iStock

Workers spot-spraying artichokes with herbicide in California illustrate gear used by pesticide handlers. While protective clothing reduces exposure to chemicals, it can also increase the risk of heat stress.

FIGURE 3. Agricultural Economy, Pesticides, and Heat Stress Conditions in Washington



Washington's top agricultural regions are also areas where farmworkers face significant threats from both pesticide exposure and heat stress conditions. Although the state is much cooler than California and Florida, it still experiences a large number of dangerous days, especially in the counties with the greatest crop sales.

Note: Light lines represent county boundaries and dark lines represent agricultural district boundaries. Figures show (left) county crop sales as a proportion of total state crop sales, (center) pesticide application rates per acre of harvested cropland, and (right) days with a heat index above 80°F from April to October, 1971–2000 (see Technical Appendix I for methods).

SOURCES: NASS 2019; USGS 2018.

like farmworkers, who must exert themselves outdoors (Dahl et al. 2019b, Mera et al. 2015).

The situation in the state's leading agricultural counties is even more severe (see Figure 2, p. 9). The top 10 agricultural counties—which account for 67 percent of all crop sales and 60 percent of all harvested acres—have higher pesticide use rates than the state average, as well as more days with risk of heat injury (an average of 115 days per year between April and October from 1971 to 2000). In addition, cities such as Fresno, located in the agriculture-rich Central Valley region, have already seen an increase in the number of days with a high heat index since the 1970s (CC 2016).

WASHINGTON

Washington is a major producer of labor-intensive crops, ranking second in the nation for total crop sales for fruits, tree nuts, and vegetables (see Table 1, p. 6 and Table A1 in Technical Appendix II). In terms of production, it ranks second in the nation for fruits and tree nuts, third for vegetables, and fifth for Christmas trees and short rotation woody crops (NASS 2019). The Washington agricultural industry relies on 228,588 farmworkers for its agriculture

> ***Washington's average pesticide application rate is 4.5 times the national average.***

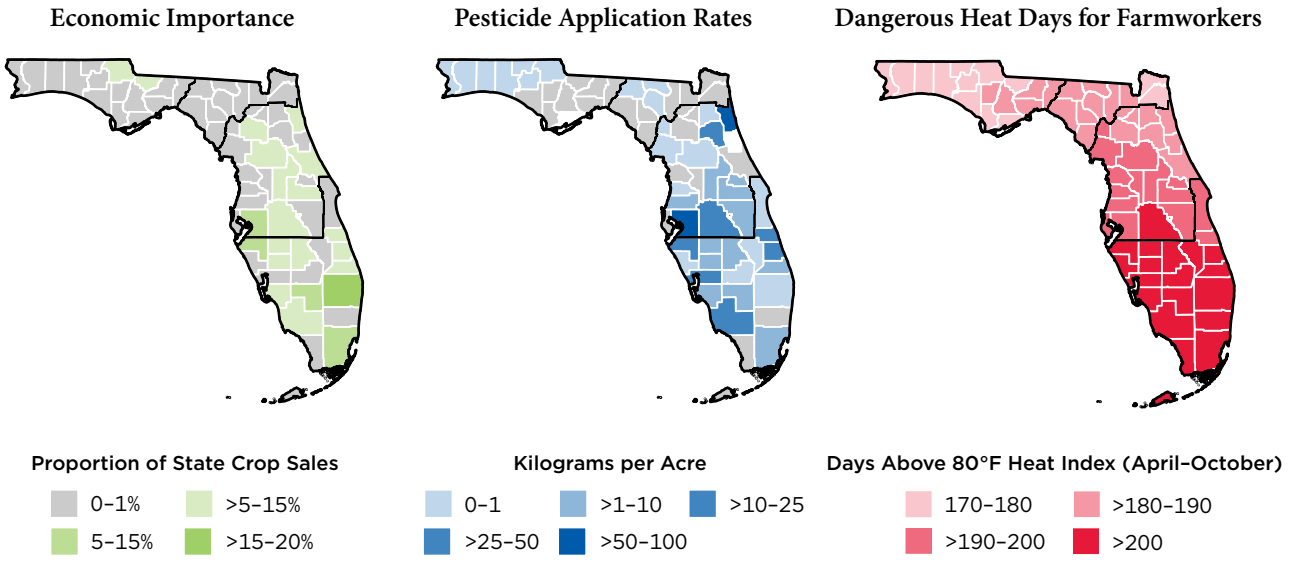
(NASS 2019). Overall, Washington has the second highest number of farmworkers in the nation after California.

Washington's average pesticide application rate of 7.6 kg per harvested crop acre is 4.5 times the national average. Nine of the 10 most common pesticides applied to fruit, orchard crops, and vegetables have dire implications for farmworker health: PAN associates six with long-term health effects, and the EPA lists eight as causing injury or death through contact with the skin.

Farther north and cooler than California and Florida, Washington has historically averaged only 31 days with risk of heat-related injuries (i.e., days with a heat index above 80°F) between April and October.[4] However, conditions have been worsening. The Pacific Northwest today is, on average, more

4 *Note that Washington's own Outdoor Heat Exposure Safety Standards for Agriculture mandate an action threshold of 77°F for workers wearing the double-layer long-sleeve clothing that is very common among farmworkers.*

FIGURE 4. Agricultural Economy, Pesticides, and Heat Stress Conditions in Florida



Florida's agricultural value is spread throughout the state, and many areas of the state have high pesticide use rates. While heat stress conditions are most severe in the southernmost areas, the majority of the state already faces dangerous heat during most of the period from April to October.

Note: Light lines represent county boundaries and dark lines represent agricultural district boundaries. Figures show (left) county crop sales as a proportion of total state crop sales, (center) pesticide application rates per acre of harvested cropland, and (right) days with a heat index above 80°F from April to October, 1971–2000 (see Technical Appendix I for methods). Areas in white on pesticide map indicate counties for which application rates could not be calculated due to lack of available census data on acres of crops harvested.

SOURCES: NASS 2019; USGS 2018.

than 1.5°F warmer than it was during the first half of the 20th century (USGCRP 2017). Average summer temperatures in Washington have increased by about 0.6°F since 1970, though the increase has been as much as 1°F for many Washington locations in that time frame (OWSC 2019).

In Washington's top 10 agricultural counties, pesticide use rates are higher than the statewide average, with a rate of 11.1 kg per acre, or 6.5 times the national average (Figure 3). The number of days with a high risk of heat-related injuries has also been higher in these counties, averaging 42 days per year between 1971 and 2000.

FLORIDA

Florida ranks third in the nation for total sales of fruits, tree nuts, and vegetables—behind California and Washington—and is first in the nation in production of oranges (NASS 2019, see Table 1, p. 6, and Table 1A in Technical Appendix II). The 2017 Census of Agriculture estimated that Florida's farmworker population is 94,247 (NASS 2019), but a recent state-level analysis of labor and employment data for Florida produced a higher estimate: 110,000 (SCHS 2019).

Florida's dependence on agricultural pesticides puts the state's farmworkers at risk. Despite nearly 20 years of gradual decline in Florida's average pesticide application rates, the rates remain the highest in the nation, at almost seven times the national average. Further, every one of the 10 most common pesticides applied to fruit, orchard crops, and vegetables in Florida have dire implications for farmworker health, more than in either California or Washington. PAN associates six with long-term health effects and three with acute toxicity, and the EPA lists eight as causing injury or death through contact with the skin.

Dangerous levels of heat compound the risk of pesticides for Florida's farmworkers. Historically, these workers have

> ***Florida workers have experienced an average of 193 days between April and October with a heat index over 80°F.***

experienced an average of 193 days between April and October with a heat index over 80°F. Further, current heat conditions already pose a serious threat to Florida's population—from 2001 to 2010, Florida had the greatest increase of hospitalizations for heat illness out of 20 states in the Centers for Disease Control and Prevention's National Environmental Public Health Tracking Program (Choudhary 2014). Farmworkers are no exception, with 84 percent of those surveyed in 2015–2016 reporting at least one symptom of heat illness and 40 percent reporting three or more symptoms (Mutic et al. 2018).

In this state, where so much of the April–October interval climate is already over a heat index of 80°F, our threshold does not reveal the full story of increasing heat risk, because both the frequency *and* the severity of heat risk conditions are expected to rise (Dahl et al. 2019b).

As in the cases of California and Washington, farmworkers in Florida's top agricultural counties face relatively greater threats than those in other areas across the state (Figure 4, p. 11). In these counties, the pesticide application rate reaches an average 15.4 kg per acre, and farmworkers have historically faced 202 days with a heat index above 80°F from April to October.

Protections for Farmworkers Are Uneven and Inadequate

While some progress has been made since the 1930s, farmworkers continue to suffer from inconsistent and insufficient worker protection standards.

Federal pesticide regulation is the responsibility of the EPA. Currently, the agency assumes that workers handling pesticides will be trained, equipped, and able to follow the full specified safety requirements. Evidence suggests that, on the contrary, farmworkers have often received no training in pesticide handling and may not even know the names of the chemicals with which they are working (Hernandez and Gabbard 2018, Arcury et al. 2001). As noted earlier, employers frequently fail to provide the full set of specified protective gear (Calvert et al. 2008). While the EPA has made strides in restricting the use of some of the most toxic pesticides, the agency's overall approach fails to consider the potential for heat stress associated with protective gear (Regulations.gov 2019; Aspelin 2003).

Farmworkers who are not fully aware of the risks associated with the pesticides in use may choose not to wear protective equipment to avoid the increased risk of heat illness (Arbury, Lindsley, and Hodgson 2016). Even farmworkers who are fully aware of the risks are put in the dangerous position of having to choose between risking harm from pesticides or heat.

California is the only state with a comprehensive heat illness protection program for outdoor workers.

There is no federal standard that specifically protects workers from dangerous heat. Although OSHA provides suggested guidelines for heat safety, the only legal requirement is OSHA's general duty clause, which obligates employers to provide workplaces that do not expose workers to recognized hazards that could cause death or serious physical harm. The lack of any specific heat standards makes enforcement of the general duty clause very difficult (Tanglis and Devine 2018).[5] State-level regulations for outdoor workers exist only in California and Washington.

California is the only state with a comprehensive heat illness protection program for outdoor workers. California adopted the country's first heat protection standard on an emergency basis in 2005 and permanently in 2006 (DIRSC n.d.). It requires employers to provide water and shade and, as the temperature rises, to enforce a work-rest schedule that dictates mandatory breaks. It also requires training for supervisors and employees on prevention, recognition, and treatment of heat illness.

Washington followed California in adopting heat illness prevention regulations on an emergency basis in 2006 and 2007. Washington then adopted permanent regulations in 2008, which require employers to provide drinking water but do not specify the provision of shade (WSL 2018). They do, however, require that employers supply the means to cool off or have written plans for preventing and dealing with symptoms of heat stress. Unlike those for California, Washington's regulations apply only from May to September, and then only when the temperature exceeds one of several thresholds: 89°F regardless of clothing, 77°F if workers are wearing double-layer clothing (typical farmworker attire), and 52°F if workers are wearing nonbreathable coveralls,

5 *Review of OSHA enforcement cases has shown that 58 percent of employers failed to have any kind of heat illness prevention program, and even fewer follow the full guidelines for preventing heat illness (Arbury, Lindsley, and Hodgson 2016). For more information on the General Duty Clause, see* https://www.osha.gov/laws-regs/oshact/section5-duties.

Alexandria Jonas/National Farm Worker Ministry/Creative Commons (Flickr)

Farmworkers rally for justice in Bellingham, Washington in 2018. Fear of deportation marginalizes migrant farmworkers and makes them less likely to report dangerous working conditions.

such as those worn to protect against particularly toxic pesticides.

California and Washington may be the two states doing the most to protect farmworkers. In addition to protecting against heat, they are also two of the states with the most stringent regulation of pesticides. Both states have maintained public health programs that have monitored pesticide injury since the early 1970s, and both states have processes to report pesticide injury through state workers' compensation systems (Calvert et al. 2008; Calvert et al. 2004).[6] Unfortunately, numerous barriers—including fear of firing or deportation, lack of access to health care, language barriers, and lack of familiarity with pesticide injuries among clinicians—continue to limit adequate reporting of pesticide illness among farmworkers (Prado et al. 2017).

Numerous barriers—including fear of firing or deportation—continue to limit adequate reporting of pesticide illness among farmworkers.

6 *In California, doctors are required to report all pesticide-related injuries and illnesses, whether known or suspected. For further information, see* https://oehha.ca.gov/pesticides/pesticide-illness-surveillance-pesticide-illness-reporting.

Policy Recommendations

Over the long term, addressing the threats to farmworkers posed by climate change requires rapid action to reduce heat-trapping emissions. However, given that farmworkers are already subject to injury and death from pesticide exposure and heat stress conditions—and that these threats are likely to increase, even with rapid and aggressive emissions reductions—additional measures are needed to protect farmworkers now (Dahl et al. 2019b).

Additionally, farmworker communities are already especially vulnerable to climate impacts, so it is critical that measures to address climate change do not come at the further expense of farmworker wellbeing. The science and practice of agroecology encompasses a diverse set of strategies for addressing medium- and long-term objectives at the same time—with the potential to reduce reliance on pesticides, build climate resilience through soil health and diversification, reduce heat-trapping emissions, and sequester carbon in the soil (see Box 2, p. 4).

> ***It is critical that measures to reduce climate change do not come at the further expense of farmworker health and safety.***

To directly and rapidly protect farmworkers who face unsafe and deteriorating working conditions, the Union of Concerned Scientists recommends the following:

- **Congress should direct OSHA to set and enforce standards that protect farmworkers from heat-related injuries.** Safety protocols for these workers should be consistently implemented when the heat index reaches 80°F, to protect against 99 percent of injuries and 100 percent of deaths (Morris et al. 2019). Further,

AP Photo/Marcio Jose Sanchez

Relatives of farmworker Maria Isavel Vasquez Jimenez—who died of heat-related injuries in California—seek justice outside a courtroom in 2011. Expanded protections are needed as heat and pesticide dangers increase.

farmworkers should be guaranteed the right to sufficient rest, shade, and water, the need for which will increase as extreme heat becomes more common. These rules should apply to all farms, including those with fewer than 11 employees.

- **Congress should end the exclusion of farmworkers from legal protections afforded to other workers, including minimum wage, overtime pay, the right to organize, and robust child labor standards.** Protections such as the Fair Labor Standards Act and the National Labor Relations Act should be extended to include farmworkers. In addition, as mandated rest breaks grow more frequent with increasing extreme heat (as per the aforementioned worker heat protection standards), Congress must protect farmworkers' right to be paid for all hours worked.
- **The EPA must make rigorous and timely assessments of risk when considering whether to allow, ban, or restrict the use of pesticides.** Given the evidence of noncompliance with existing safety standards, the EPA should assess risk based on realistic rather than idealized use scenarios. Further, use scenarios and risk assessments should account for the amplified risk of heat stress associated with the use of personal protective equipment.
- **The US Department of Agriculture (USDA) should fund and develop programs that protect farmworkers** by ensuring that all vulnerable communities have equitable access to disaster preparedness and disaster relief in the wake of extreme weather events, including extreme heat. Examples include the USDA's Disaster Assistance Program.
- **The USDA should work with other federal agencies to develop and improve a warning system that alerts farmers and farmworkers of current and forecasted dangerous conditions.** This effort may involve close coordination with numerous federal agencies, especially the National Weather Service. Research investments would be needed to improve this system over time and to enable more effective and targeted interventions.

To improve working conditions and decrease risks for farmers, farmworkers, and society at large in the long-term, the following actions should be taken:

- **Congress and the USDA should identify ways to help farmers develop, implement, and share knowledge about farming systems that reduce reliance on and exposure to pesticides, ameliorate extreme heat, and help with climate change mitigation and adaptation.** This effort should include increasing the availability of technical assistance through university-based cooperative extension services, including county extension offices, and ensuring that the USDA is actively providing growers with all relevant information on federal farm programs that support such practices. Resources should be targeted to prioritize improving conditions for the most farmworkers, while supporting young, beginning, socially disadvantaged, and other limited-resource farmers whenever possible.

Protections such as the Fair Labor Standards Act and the National Labor Relations Act should be extended to include farmworkers.

- **Congress and the USDA should increase investments in public agricultural and agroecological research programs, particularly those that reduce exposure to extreme heat, heat-trapping emissions, and reliance on pesticides.** For example, participatory research and farmer-to-farmer learning could be facilitated to identify farming systems that are more resilient to pests, have safer planting and harvest seasons or conditions, incorporate more shade (e.g., through agroforestry), and contribute to climate change mitigation through reduced emissions or increased carbon sequestration. Public research programs—including the USDA's Agriculture and Food Research Initiative, Sustainable Agriculture Research and Education Program, and Organic Agriculture Research and Extension Initiative—need to be continually improved and expanded to address evolving challenges. Social science research is also needed to center farmers in learning how improved practices can be effectively adopted and scaled up to benefit farmers, rural communities, and, especially, farmworkers.
- **Federal and state policymakers should take aggressive actions to fight climate change and prevent drastic increases in dangerous heat conditions.** These include implementing and strengthening the Paris Agreement and achieving deep cuts to US heat-trapping

emissions while protecting and increasing the levels of carbon stored in plants and soils. Such policies must be designed and implemented to explicitly consider and center the most vulnerable groups.

Conclusion

More than 2.4 million farmworkers in the United States make fundamental contributions to our health, social well-being, and the economy by producing the food we eat every day, and they deserve to work in safety and dignity. However, the systematic exploitation of farmworkers and their exclusion from legal protections leave them especially vulnerable to hazardous workplace conditions. Our analysis reveals how farmworkers' health and safety are already at risk. In a rapidly warming world, climate change threatens to amplify the harms farmworkers already face from exposure to pesticides and heat-related injury.

Threats to farmworkers are a threat to the nation—to our economy, food security, health, and rural communities. Farmworkers deserve the respect, rights, and safeguards available to other workers, and recognition of their essential role
in building a more resilient food and agriculture system.

Rafter Ferguson *is a scientist in the UCS Food and Environment Program.* ***Kristina Dahl*** *is a senior climate scientist in the UCS Climate and Energy Program.* ***Marcia DeLonge*** *is senior scientist in the UCS Food and Environment Program.*

ACKNOWLEDGMENTS

This policy brief was made possible in part through the generous support of the Grantham Foundation for the Protection of the Environment, The Lumpkin Family Foundation, The Martin Foundation, The New York Community Trust, the W.K. Kellogg Foundation, and UCS members. The authors would like to thank Thomas A. Arcury, PhD, Wake Forest School of Medicine; Jeannie Economos, Farmworker Association of Florida; Sally Moyce, RN, PhD, Montana State University, Margaret Reeves, PhD, Pesticide Action Network; and Virginia Ruiz, JD, Farmworker Justice; for their reviews. The time they spent reviewing and contributing to the brief was considerable, and their comments and suggestions greatly improved it.

At UCS, the authors thank Betty Ahrens, Cynthia DeRocco, Erik Kamrath, Mike Lavender, Lisa Nurnberger, Kathleen Rest, Ricardo Salvador, Erika Spanger-Siegfried, Karen Perry Stillerman, Ruth Tyson, Bryan Wadsworth, and Ja-Rei Wang for their help in developing and refining this report. Finally, we'd like to thank Cynthia Williams and David Gerratt for their editing and design work, respectively.

Organizational affiliations are listed for identification purposes only. The opinions expressed herein do not necessarily reflect those of the organizations that funded the work or the individuals who reviewed it. The Union of Concerned Scientists bears sole responsibility for the report's contents.

REFERENCES

All links accessed August 16, 2019.

Abatzoglou, John T., and Timothy J. Brown. 2012. "A Comparison of Statistical Downscaling Methods Suited for Wildfire Applications." *International Journal of Climatology* 32 (5): 772–80. *https://doi.org/10.1002/joc.2312.*

Alleva, Renata, Nicola Manzella, Simona Gaetani, Tiziana Bacchetti, Massimo Bracci, Veronica Ciarapica, Federica Monaco, Battista Borghi, Monica Amati, Gianna Ferretti, and Marco Tomasetti. 2018. "Mechanism Underlying the Effect of Long-Term Exposure to Low Dose of Pesticides on DNA Integrity." *Environmental Toxicology* 33 (4): 476–87. *https://doi.org/10.1002/tox.22534.*

Anderson, G. Brooke, and Michelle L. Bell. 2011. "Heat Waves in the United States: Mortality Risk during Heat Waves and Effect Modification by Heat Wave Characteristics in 43 U.S. Communities." *Environmental Health Perspectives* 119 (2): 210–18. *https://doi.org/10.1289/ehp.1002313.*

Arbury, Sheila, Matthew Lindsley, and Michael Hodgson. 2016. "A Critical Review of OSHA Heat Enforcement Cases: Lessons Learned." *Journal of Occupational and Environmental Medicine* 58 (4): 359. *https://doi.org/10.1097/JOM.0000000000000640.*

Arcury, Thomas A., and Sara A. Quandt. 2007. "Delivery of Health Services to Migrant and Seasonal Farmworkers." *Annual Review of Public Health* 28 (1): 345–63. *https://doi.org/10.1146/annurev.publhealth.27.021405.102106.*

Arcury, Thomas A., and Sara A. Quandt.. 2011. "Living and Working Safely: Challenges for Migrant and Seasonal Farmworkers." *North Carolina Medical Journal* 72 (6): 466–70.

Arcury, Thomas A., and Sara A. Quandt, Altha J. Cravey, Rebecca C. Elmore, and Gregory B. Russell. 2001. "Farmworker Reports of Pesticide Safety and Sanitation in the Work Environment." *American Journal of Industrial Medicine* 39 (5): 487–98.

Arcury, Thomas A., Phillip Summers, Jennifer W. Talton, Haiying Chen, Joanne C. Sandberg, Chaya R. Spears Johnson, and Sara A. Quandt. 2015. "Heat Illness among North Carolina Latino Farmworkers." *Journal of Occupational and Environmental Medicine* 57 (12): 1299–1304. *https://doi.org/10.1097/JOM.0000000000000552.*

Armstrong, Jenna L., Richard A. Fenske, Michael G. Yost, Kit Galvin, Maria Tchong-French, and Jianbo Yu. 2013. "Presence of Organophosphorus Pesticide Oxygen Analogs in Air Samples." *Atmospheric Environment* 66:145–50. *https://doi.org/10.1016/j.atmosenv.2012.06.087.*

Aspelin, Arnold L. 2003. "Pesticide Usage in the United States: Trends during the 20th Century." *CIPM Technical Bulletin* 105:1–213.

Baker, Nancy T., and Wesley Stone. 2015. *Estimated Annual Agricultural Pesticide Use for Counties of the Conterminous United States, 2008–12*. USGS numbered series 907. Data series. Reston, VA: US Geological Survey. *http://pubs.er.usgs.gov/publication/ds907.*

Basara, Jeffrey B., Heather G. Basara, Bradley G. Illston, and Kenneth C. Crawford. 2010. "The Impact of the Urban Heat Island during an Intense Heat Wave in Oklahoma City." *Advances in Meteorology.* Article ID 230365. *https://doi.org/10.1155/2010/230365.*

Bassil, K.L., C. Vakil, M. Sanborn, D.C. Cole, J.S. Kaur, and K.J. Kerr. 2007. "Cancer Health Effects of Pesticides: Systematic Review." *Canadian Family Physician* 53 (10): 1704–11.

Beard, John D., David M. Umbach, Jane A. Hoppin, Marie Richards, Michael C. R. Alavanja, Aaron Blair, Dale P. Sandler, and Freya Kamel. 2014. "Pesticide Exposure and Depression among Male Private Pesticide Applicators in the Agricultural Health Study." *Environmental Health Perspectives* 122 (9): 984–91. *https://doi.org/10.1289/ehp.1307450.*

Bebber, Daniel P., Timothy Holmes, and Sarah J. Gurr. 2014. "The Global Spread of Crop Pests and Pathogens." *Global Ecology and Biogeography* 23 (12): 1398–1407. *https://doi.org/10.1111/geb.12214*.

Bedsworth, Louise, Dan Cayan, Guido Franco, Leah Fisher, and Sonja Ziaja. 2018. *Statewide Summary Report: California's Fourth Climate Change Assessment*. Publication number: SUMCCCA4-2018-01. Sacramento: California Governor's Office of Planning and Research; La Jolla, CA: Scripps Institution of Oceanography; Sacramento: California Energy Commission; San Francisco: California Public Utilities Commission. *www.energy.ca.gov/sites/default/files/2019-07/Statewide%20Reports-%20SUM-CCCA4-2018-013%20Statewide%20Summary%20Report.pdf*

Bernard, Thomas E., Victor Caravello, Skai W. Schwartz, and Candi D. Ashley. 2007. "WBGT Clothing Adjustment Factors for Four Clothing Ensembles and the Effects of Metabolic Demands." *Journal of Occupational and Environmental Hygiene* 5 (1): 1–5. *https://doi.org/10.1080/15459620701732355*.

Bonauto, David, Edmund Rauser, and Louis Lim. 2010. *Occupational Heat Illness in Washington State, 2000–2009.* Technical report 59-2–2010. Olympia: Washington State Department of Labor and Industries. *www.lni.wa.gov/Safety/Research/Files/OccHeatRelatedIllnessWa20002009.pdf.*

Bourguet, Denis, and Thomas Guillemaud. 2016. "The Hidden and External Costs of Pesticide Use." *Sustainable Agriculture Reviews* 19:35–120. *https://doi.org/10.1007/978-3-319-26777-7_2*.

Bronars, Stephen. 2015. *A Vanishing Breed: How the Decline in US Farm Laborers over the Last Decade Has Hurt the US Economy and Slowed Production on American Farms.* New York: Partnership for a New American Economy.

California Department of Pesticide Regulation (CDPR). 2019. "California Pesticide Illness Query (CalPIQ)." *https://apps.cdpr.ca.gov/calpiq*.

Calvert, Geoffrey M., John Beckman, Joanne Bonnar Prado, Heidi Bojes, Abby Schwartz, Prakash Mulay, Kathy Leinenkugel, Sheila Higgins, Michelle Lackovic, Justin Waltz, Derry Stover, and Stephanie Moraga-McHaley. 2016. "Acute Occupational Pesticide-Related Illness and Injury—United States, 2007–2011." *Morbidity and Mortality Weekly Report* 63 (55): 11–16. *https://doi.org/10.15585/mmwr.mm6355a3.*

Calvert, Geoffrey M., Jennifer Karnik, Louise Mehler, John Beckman, Barbara Morrissey, Jennifer Sievert, Rosanna Barrett, Michelle Lackovic, Laura Mabee, Abby Schwartz, Yvette Mitchell, and Stephanie Moraga–McHaley. 2008. "Acute Pesticide Poisoning among Agricultural Workers in the United States, 1998–2005." *American Journal of Industrial Medicine* 51 (12): 883–98. *https://doi.org/10.1002/ajim.20623.*

Calvert, Geoffrey M., David K. Plate, Rupali Das, Rachel Rosales, Omar Shafey, Catherine Thomsen, Dorilee Male, John Beckman, Ernest Arvizu, and Michelle Lackovic. 2004. "Acute Occupational Pesticide-Related Illness in the US, 1998-1999: Surveillance Findings from the SENSOR-Pesticides Program." *American Journal of Industrial Medicine* 45 (1): 14–23. *https://doi.org/10.1002/ajim.10309.*

Centers for Disease Control and Prevention (CDC). 2008. "Heat-Related Deaths among Crop Workers—United States, 1992–2006." *Morbidity and Mortality Weekly Report* 57:1–5.

Centers for Disease Control and Prevention (CDC). 2019. "Acute Pesticide-Related Illnesses Charts." *wwwn.cdc.gov/Niosh-whc/chart/sensor-pe.*

Chemical Hazards Emergency Medical Management (CHEMM). 2019. "Personal Protective Equipment (PPE)." *www.chemm.nlm.nih.gov/ppe.htm.*

Choudhary, Ekta. 2014. "Heat Stress Illness Hospitalizations—Environmental Public Health Tracking Program, 20 States, 2001–2010." *Morbidity and Mortality Weekly Report* 63 (SS13): 1–10. *www.cdc.gov/mmwr/preview/mmwrhtml/ss6313a1.htm*.

Clemens, Michael A. 2013. *International Harvest: A Case Study of How Foreign Workers Help American Farms Grow Crops, and the Economy: A Report by the Partnership for a New American Economy and the Center for Global Development.* New York: Partnership for a New American Economy; Washington, DC: Center for Global Development.

Climate Central (CC). 2016. "U.S. Faces Dramatic Rise in Extreme Heat, Humidity." *www.climatecentral.org/news/sizzling-summers-20515#daysabove*.

Courville, Michael, Gail Wadsworth, and Marc Schenker. 2016. "'We Just Have to Continue Working': Farmworker Self-Care and Heat-Related Illness." *Journal of Agriculture, Food Systems, and Community Development 6 (2): 143–64. https://doi.org/10.5304/jafscd.2016.062.014*.

Dahl, Kristina, Rachel Licker, John T. Abatzoglou, and Juan Declet-Barreto. 2019a. "Increased Frequency of and Population Exposure to Extreme Heat Index Days in the United States during the 21st Century." *Environmental Research Communications* 1 (7): 075002. *https://doi.org/10.1088/2515-7620/ab27cf.*

Dahl, Kristina, Erika Spanger-Siegfried, Rachel Licker, Astrid Caldas, John T. Abatzoglou, Nicholas Mailloux, Rachel Cleetus, Juan Declet-Barreto, Shana Udvardy, and Pamela Worth. 2019b. *Killer Heat in the United States: Climate Choices and the Future of Dangerously Hot Days.* Cambridge, MA: Union of Concerned Scientists.

Delcour, Ilse, Pieter Spanoghe, and Mieke Uyttendaele. 2015. "Literature Review: Impact of Climate Change on Pesticide Use." *Food Research International* 68:7–15. *https://doi.org/10.1016/j.foodres.2014.09.030.*

Department of Industrial Relations, State of California (DIRSC). n.d. "California Code of Regulations, Title 8, Section 3395: Heat Illness Prevention." *www.dir.ca.gov/title8/3395.html.*

Dimitri, Carolyn, Anne B.W. Effland, and Neilson C. Conklin. 2005. *The 20th Century Transformation of US Agriculture and Farm Policy.* Economic information bulletin number 3. Washington, DC: US Department of Agriculture, Economic Research Service. *http://ageconsearch.umn.edu/bitstream/59390/2/eib3.pdf.*

Doll, Julie E., Brian Petersen, and Claire Bode. 2017. "Skeptical but Adapting: What Midwestern Farmers Say about Climate Change." *Weather, Climate, and Society* 9 (4): 739–51. *https://doi.org/10.1175/WCAS-D-16-0110.1.*

Environmental Protection Agency (EPA). 2015. "Pesticides; Agricultural Worker Protection Standard Revisions." *Federal Register 80 (221): 67496–574.*

Environmental Protection Agency (EPA).2019. "Analyze Trends: Pesticide Dashboard." *https://echo.epa.gov/trends/comparative-maps-dashboards/state-pest-dashboard?state=National.*

Feliciano, Diana, Dali R. Nayak, Sylvia H. Vetter, and Jon Hillier. 2017. "CCAFS-MOT—A Tool for Farmers, Extension Services and Policy-Advisors to Identify Mitigation Options for Agriculture." *Agricultural Systems* 154:100–111. *https://doi.org/10.1016/j.agsy.2017.03.006.*

Fortes, Cristina, Simona Mastroeni, Marjorie Segatto, Clarissa Hohmann, Lucia Miligi, Lucio Bakos, and Renan Bonamigo. 2016. "Occupational Exposure to Pesticides with Occupational Sun Exposure Increases the Risk for Cutaneous Melanoma." *Journal of Occupational and Environmental Medicine* 58 (4): 370. *https://doi.org/10.1097/JOM.0000000000000665*.

Frazier, Linda M. 2007. "Reproductive Disorders Associated with Pesticide Exposure." *Journal of Agromedicine* 12 (1): 27–37. *https://doi.org/10.1300/J096v12n01_04*.

García, Jessica, Maria I. Ventura, Mar Requena, Antonio F. Hernández, Tesifon Parrón, and Raquel Alarcón. 2017. "Association of Reproductive Disorders and Male Congenital Anomalies with Environmental Exposure to Endocrine Active Pesticides." *Reproductive Toxicology* 71:95–100. *https://doi.org/10.1016/j.reprotox.2017.04.011*.

Gliessman, Steve, and Pablo Tittonell. 2015. "Agroecology for Food Security and Nutrition." *Agroecology and Sustainable Food Systems* 39 (2): 131–33. *https://doi.org/10.1080/21683565.2014.972001*.

Gordon, Christopher J., and Lisa R. Leon. 2011. "Thermal Stress and the Physiological Response to Environmental Toxicants." *Reviews on Environmental Health* 20 (4): 235–64. *https://doi.org/10.1515/REVEH.2005.20.4.235*.

Guild, Alexis, and Iris Figueroa. 2018. "The Neighbors Who Feed Us: Farmworkers and Government Policy—Challenges and Solutions." *Harvard Law & Policy Review* 13:157.

Guirguis, Kristen, Alexander Gershunov, Alexander Tardy, and Rupa Basu. 2013. "The Impact of Recent Heat Waves on Human Health in California." *Journal of Applied Meteorology and Climatology* 53 (1): 3–19. *https://doi.org/10.1175/JAMC-D-13-0130.1*.

Harden, Jennifer W., Gustaf Hugelius, Anders Ahlström, Joseph C. Blankinship, Ben Bond–Lamberty, Corey R. Lawrence, Julie Loisel, Avni Malhotra, Robert B. Jackson, Stephen Ogle, Claire Phillips, Rebecca Ryals, Katherine Todd–Brown, Rodrigo Vargas, Sintana E. Vergara, M. Francesca Cotrufo, Marco Keiluweit, Katherine A. Heckman, Susan E. Crow, Whendee L. Silver, Marcia DeLonge and Lucas E. Nave. 2018. "Networking Our Science to Characterize the State, Vulnerabilities, and Management Opportunities of Soil Organic Matter." *Global Change Biology* 24 (2): e705–18. *https://doi.org/10.1111/gcb.13896*.

Hernandez, Trish, and Susan Gabbard. 2018. *Findings from the National Agricultural Workers Survey (NAWS) 2015–2016: A Demographic and Employment Profile of United States Farmworkers.* Research report 13. Rockville, MD: JBS International for US Department of Labor, Employment and Training Administration, Office of Policy Development and Research. *www.doleta.gov/naws/research/docs/NAWS_Research_Report_13.pdf*.

Houbraken, Michael, Frederik van den Berg, Clare M. Butler Ellis, Donald Dekeyser, David Nuyttens, Mieke De Schampheleire, and Pieter Spanoghe. 2016. "Volatilisation of Pesticides under Field Conditions: Inverse Modelling and Pesticide Fate Models." *Pest Management Science* 72 (7): 1309–21. *https://doi.org/10.1002/ps.4149*.

Hyland, Carly, and Ouahiba Laribi. 2017. "Review of Take-Home Pesticide Exposure Pathway in Children Living in Agricultural Areas." *Environmental Research* 156 (July): 559–70. *https://doi.org/10.1016/j.envres.2017.04.017*.

Jackson, Larry L., and Howard R. Rosenberg. 2010. "Preventing Heat-Related Illness among Agricultural Workers." *Journal of Agromedicine* 15 (3): 200–215. *https://doi.org/10.1080/1059924X.2010.487021*.

Johnson, Richard J., Catharina Wesseling, and Lee S. Newman. 2019. "Chronic Kidney Disease of Unknown Cause in Agricultural Communities." *New England Journal of Medicine* 380 (19): 1843–52. *https://doi.org/10.1056/NEJMra1813869*.

Karl, Thomas R., and Richard W. Knight. 1997. "The 1995 Chicago Heat Wave: How Likely Is a Recurrence?" *Bulletin of the American Meteorological Society* 78 (6): 1107–20. *https://doi.org/10.1175/1520-0477*

Kim, Ki-Hyun, Ehsanul Kabir, and Shamin Ara Jahan. 2017. "Exposure to Pesticides and the Associated Human Health Effects." *Science of the Total Environment* 575:525–35. *https://doi.org/10.1016/j.scitotenv.2016.09.009*.

Lacey, T. Alan, Mitra Toossi, Kevin Dubina, and Andrea Gensler. 2017. "Projections Overview and Highlights, 2016–26." *Monthly Labor Review* (October). *https://doi.org/10.21916/mlr.2017.29*.

Lam, Michelle, Jennifer Krenz, Pablo Palmández, Maria Negrete, Martha Perla, Helen Murphy-Robinson, and June T. Spector. 2013. "Identification of Barriers to the Prevention and Treatment of Heat-Related Illness in Latino Farmworkers Using Activity-Oriented, Participatory Rural Appraisal Focus Group Methods." *BMC Public Health* 13 (1). *https://doi.org/10.1186/1471-2458-13-1004*.

Lambar, Elizabeth Freeman, and Gayle Thomas. 2019. "The health and Well-Being of North Carolina's Farmworkers: The Importance of Inclusion, Accessible Services and Personal Connection." *North Carolina Medical Journal* 80 (2): 107–12. *https://doi.org/10.18043/ncm.80.2.107*.

Lane, David, Evan Murdock, Ken Genskow, Carolyn Rumery Betz, and Allison Chatrchyan. 2019. "Climate Change and Dairy in New York and Wisconsin: Risk Perceptions, Vulnerability, and Adaptation among Farmers and Advisors." *Sustainability* 11 (13): 3599. *https://doi.org/10.3390/su11133599*.

Leigh, J. Paul, Juan Du, and Stephen A. McCurdy. 2014. "An Estimate of the U.S. Government's Undercount of Nonfatal Occupational Injuries and Illnesses in Agriculture." *Annals of Epidemiology* 24 (4): 254–59. *https://doi.org/10.1016/j.annepidem.2014.01.006*.

Leigh, J. Paul, Stephen A. McCurdy, and Marc B. Schenker. 2001. "Costs of Occupational Injuries in Agriculture." *Public Health Reports* 116 (3): 235–48. *https://doi.org/10.1093/phr/116.3.235*.

Linder, Marc. 1987. "Farm Workers and the Fair Labor Standards Act: Racial Discrimination in the New Deal." *Texas Law Review* 65:60.

Mackay, Don, John P. Giesy, and Keith R. Solomon. 2014. "Fate in the Environment and Long-Range Atmospheric Transport of the Organophosphorus Insecticide, Chlorpyrifos and Its Oxon." *Ecological Risk Assessment for Chlorpyrifos in Terrestrial and Aquatic Systems in the United States*, 35–76. *https://doi.org/10.1007/978-3-319-03865-0_3*.

Martin, Philip, Brandon Hooker, Muhammad Akhtar, and Marc Stockton. 2016. "How Many Workers Are Employed in California Agriculture?" *California Agriculture* 71 (1): 30–34.

Meehl, Gerald A., and Claudia Tebaldi. 2004. "More Intense, More Frequent, and Longer Lasting Heat Waves in the 21st Century." *Science* 305 (5686): 994–97. *https://doi.org/10.1126/science.1098704*.

Mera, Roberto, Neil Massey, David E. Rupp, Philip Mote, Myles Allen, and Peter C. Frumhoff. 2015. "Climate Change, Climate Justice and the Application of Probabilistic Event Attribution to Summer Heat Extremes in the California Central Valley." *Climatic Change* 133 (3): 427–38. *https://doi.org/10.1007/s10584-015-1474-3*.

Mix, Jacqueline, Lisa Elon, Valerie Vi Thien Mac, Joan Flocks, Eugenia Economos, Antonion J. Tovar-Aguilar, Vicki Stover Hertzberg, and Linda A. McCauley. 2018. "Hydration Status, Kidney Function, and Kidney Injury in Florida Agricultural Workers." *Journal of Occupational and Environmental Medicine* 60 (5): e253–60. *https://doi.org/10.1097/JOM.0000000000001261*.

Morris, Courtney E., Richard G. Gonzales, Michael J. Hodgson, and Aaron W. Tustin. 2019. "Actual and Simulated Weather Data to Evaluate Wet Bulb Globe Temperature and Heat Index as Alerts for Occupational Heat-Related Illness." *Journal of Occupational and Environmental Hygiene* 16 (1): 54–65. *https://doi.org/10.1080/15459624.2018.1532574*.

Muñoz-Quezada, Maria T., Boris Andrés Lucero, Veronica Paz Iglesias, Maria P. Muñoz, Claudia A. Cornejo, Eduardo Achu, Brittany Baumert, Arianna Hanchey, Carlos Concha, Ana M. Brito, and Marcos Villalobos. 2016. "Chronic Exposure to Organophosphate (OP) Pesticides and Neuropsychological Functioning in Farm Workers: A Review." *International Journal of Occupational and Environmental Health* 22 (1): 68–79. *https://doi.org/10.1080/10773525.2015.1123848*.

Mutic, Abby D., Jacqueline M. Mix, Lisa Elon, Nathan J. Mutic, Jeannie Economos, Joan Flocks, Antonio J. Tovar-Aguilar, and Linda A. McCauley. 2018. "Classification of Heat-Related Illness Symptoms among Florida Farmworkers." *Journal of Nursing Scholarship* 50 (1): 74–82. *https://doi.org/10.1111/jnu.12355*.

National Agricultural Statistics Service (NASS). 2019. "Quick Stats." *https://quickstats.nass.usda.gov*.

National Weather Service (NWS). 2019. "79-Year List of Severe Weather Fatalities: Natural Hazard Statistics." *www.nws.noaa.gov/om/hazstats/resources/79years.pdf*.

National Weather Service (NWS). n.d. "Heat Index." *www.weather.gov/safety/heat-index*.

O'Brien, Patrick, John Kruse, and Darlene Kruse. 2014. *Gauging the Farm Sector's Sensitivity to Immigration Reform via Changes in Labor Costs and Availability*. Washington, DC: American Farm Bureau Federation.

Oleson, K.W., A. Monaghan, O. Wilhelmi, M. Barlage, N. Brunsell, J. Feddema, L. Hu, and D. F. Steinhoff. 2015. "Interactions between Urbanization, Heat Stress, and Climate Change." *Climatic Change* 129 (3–4): 525–41. *https://doi.org/10.1007/s10584-013-0936-8*.

Office of the Washington State Climatologist (OWSC). 2019. "PNW Temperature, Precipitation, and SWE Trend Analysis Tool." *https://climate.washington.edu/climate-data/trendanalysisapp*.

Pal, Jeremy S., and Elfatih A.B. Eltahir. 2016. "Future Temperature in Southwest Asia Projected to Exceed a Threshold for Human Adaptability." *Nature Climate Change* 6 (2): 197–200. *https://doi.org/10.1038/nclimate2833*.

Perea, Juan F. 2010. "The Echoes of Slavery: Recognizing the Racist Origins of the Agricultural and Domestic Worker Exclusion from the National Labor Relations Act." *SSRN Electronic Journal* (July 19). *https://doi.org/10.2139/ssrn.1646496*.

Pesticide Action Network International (PANI). 2019. *PAN International List of Highly Hazardous Pesticides*. Hamburg, Germany. *http://pan-international.org/wp-content/uploads/PAN_HHP_List.pdf*.

Pimentel, David, and Michael Burgess. 2014. "Environmental and Economic Costs of the Application of Pesticides Primarily in the United States." In *Integrated Pest Management: Pesticide Problems*, edited by David Pimentel and Rajinder Peshin, 47–71. Vol. 3. Dordrecht: Springer Netherlands. *https://doi.org/10.1007/978-94-007-7796-5_2*.

Prado, Joanne B., Prakash R. Mulay, Edward J. Kasner, Heidi K. Bojes, and Geoffrey M. Calvert. 2017. "Acute Pesticide-Related Illness among Farmworkers: Barriers to Reporting to Public Health Authorities." *Journal of Agromedicine* 22 (4): 395–405. *https://doi.org/10.1080/1059924X.2017.1353936*.

Quandt, Sara A., Kristen L. Kucera, Courtney Haynes, Bradley G. Klein, Ricky Langley, Michael Agnew, Jeffrey L. Levin, Timothy Howard, and Maury A. Nussbaum. 2013a. "Occupational Health Outcomes for Workers in the Agriculture, Forestry and Fishing Sector: Implications for Immigrant Workers in the Southeastern US: Immigrant Worker Occupational Health Outcomes." *American Journal of Industrial Medicine* 56 (8): 940–59. *https://doi.org/10.1002/ajim.22170*.

Quandt, Sara A., Melinda F. Wiggins, Haiying Chen, Werner E. Bischoff, and Thomas A. Arcury. 2013b. "Heat Index in Migrant Farmworker Housing: Implications for Rest and Recovery from Work-Related Heat Stress." *American Journal of Public Health* 103 (8): e24–26. *https://doi.org/10.2105/AJPH.2012.301135*.

Regulations.gov. 2019. "Comments Submitted by Carrie Apfel, Earthjustice et al." *https://beta.regulations.gov/document/EPA-HQ-OPP-2013-0266-1252*.

Robinson, Erin, Ha T. Nguyen, Scott Isom, Sara A. Quandt, Joseph G. Grzywacz, Haiying Chen, and Thomas A. Arcury. 2011. "Wages, Wage Violations, and Pesticide Safety Experienced by Migrant Farmworkers in North Carolina." *New Solutions: A Journal of Environmental and Occupational Health Policy* 21 (2): 251–68. *https://doi.org/10.2190/NS.21.2.h*.

Rothfusz, Lans P. 1990. *The Heat Index Equation*. National Weather Service technical attachment SR 90–23. Bohemia, NY.

Ruser, John W. 2008. "Examining Evidence on Whether BLS Undercounts Workplace Injuries and Illnesses." *Monthly Labor Review* 131:20-32. *www.bls.gov/opub/mlr/2008/08/art2full.pdf*

Sánchez-Santed, Fernando, Maria T. Colomina, and Elena Herrero Hernández. 2016. "Organophosphate Pesticide Exposure and Neurodegeneration." *Cortex* 74:417–26. *https://doi.org/10.1016/j.cortex.2015.10.003*.

Shaw, Anugrah, and Courtney Harned. 2013. "Analysis of Personal Protective Equipment Requirements on Labels of Pesticides for Agricultural Use." *Journal of Pesticide Safety Education* 15:17–29.

Shimberg Center for Housing Studies (SCHS). 2019. *2019 Rental Market Study Housing Needs of Farmworkers and Commercial Fishing Workers*. Tallahassee: Florida Housing Finance Corporation. *www.floridahousing.org/docs/default-source/programs/competitive/2019/2019-108/2019-rms-farmworker-commercial-fishing-worker-analysis-only.pdf?sfvrsn=7878147b_2*.

Son, H.-K., S.-A. Kim, J.-H. Kang, Y.-S. Chang, S.-K. Park, S.-K. Lee, D.R. Jacobs, and D.-H. Lee. 2010. "Strong Associations between Low-Dose Organochlorine Pesticides and Type 2 Diabetes in Korea." *Environment International* 36 (5): 410–14. *https://doi.org/10.1016/j.envint.2010.02.012*.

Spector, June T., David K. Bonauto, Lianne Sheppard, Tania Busch-Isaksen, Miriam Calkins, Darrin Adams, Max Lieblich, and Richard A. Fenske. 2016. "A Case-Crossover Study of Heat Exposure and Injury Risk in Outdoor Agricultural Workers." *Plos One* 11 (10): e0164498. *https://doi.org/10.1371/journal.pone.0164498*.

Starling, Anne P., David M. Umbach, Freya Kamel, Stuart Long, Dale P. Sandler, and Jane A. Hoppin. 2014. "Pesticide Use and Incident Diabetes among Wives of Farmers in the Agricultural Health Study." *Occupational and Environmental Medicine* 71 (9): 629–35. *https://doi.org/10.1136/oemed-2013-101659.*

Steadman, R.G. 1979. "The Assessment of Sultriness Part I: A Temperature-Humidity Index Based on Human Physiology and Clothing Science." *Journal of Applied Meteorology* 18 (7): 861–73. *https://doi.org/10.1175/1520-0450(1979)018<0861:TAOSPI>2.0.CO;2.*

Stoecklin-Marois, Maria, Tamara Hennessy-Burt, Diane Mitchell, and Marc Schenker. 2013. "Heat-Related Illness Knowledge and Practices among California Hired Farm Workers in the MICASA Study." *Industrial Health* 51 (1): 47–55. *https://doi.org/10.2486/indhealth.2012-0128.*

Stone, Wesley. 2013. *Estimated Annual Agricultural Pesticide Use for Counties of the Conterminous United States, 1992–2009.* USGS numbered series 752. Data series. Reston, VA: US Geological Survey. *http://pubs.er.usgs.gov/publication/ds752.*

Summers, Phillip, Sara A. Quandt, Jennifer W. Talton, Leonardo Galván, and Thomas A. Arcury. 2015. "Hidden Farmworker Labor Camps in North Carolina: An Indicator of Structural Vulner-ability." *American Journal of Public Health* 105 (12): 2570–75. *https://doi.org/10.2105/AJPH.2015.302797.*

Tanglis, Michael, and Shana Devine. 2018. *Extreme Heat and Unprotected Workers: Public Citizen Petitions OSHA to Protect the Millions of Workers Who Labor in Dangerous Temperatures.* Washington, DC: Public Citizen. *www.citizen.org/wp-content/uploads/migration/extreme_heat_and_unprotected_workers.pdf.*

Taylor, R. A. J., Daniel A. Herms, John Cardina, and Richard H. Moore. 2018. "Climate Change and Pest Management: Unanticipated Consequences of Trophic Dislocation." *Agronomy* 8 (1): 7. *https://doi.org/10.3390/agronomy8010007.*

United Farm Workers (UFW). 2011. *Inventory of Farmworker Issues and Protections in the United States.* Palo Alto, CA: Bon Appétit Management Company Foundation; Keene, CA: United Farm Workers. *www.panna.org/sites/default/files/farmworkerinventory_0428_2011_1.pdf.*

US Department of Labor (USDL). 2019. "Foreign Labor Certification H-2A Temporary Agricultural Program." *www.foreignlaborcert.doleta.gov/h-2a.cfm.*

US Energy Information Administration (USEIA). 2018. "One in Three U.S. Households Faces a Challenge in Meeting Energy Needs." *www.eia.gov/todayinenergy/detail.php?id=37072.*

US Geological Survey (USGS). 2018. "National Pesticide Synthesis Project." *https://water.usgs.gov/nawqa/pnsp/usage/maps/county-level.*

US Global Change Research Program (USGCRP). 2017. Climate *Science Special Report: Fourth National Climate Assessment*, edited by Donald J. Wuebbles, David W. Fahey, Kathy A. Hibbard, David J. Dokken, Brooke C. Stewart, and Thomas K. Maycock. Vol. 1. Washington, DC. *http://doi.org/10.7930/J0J964J6.*

US Global Change Research Program (USGCRP). 2018. *Impacts, Risks, and Adaptation in the United States: Fourth National Climate Assessment*, edited by David Reidmiller, Christopher W. Avery, David R. Easterling, Kenneth E. Kunkel, Kristin L. M. Lewis, Thomas K. Maycock, and Brooke C. Stewart. Vol. 2. Washington, DC: USGCRP. *https://nca2018.globalchange.gov.*

Vaidyanathan, Ambarish, Shubhayu Saha, Ana M. Vicedo-Cabrera, Antonio Gasparrini, Nabill Abdurehman, Richard Jordan, Michelle Hawkins, Jeremy Hess, and Anne Elixhauser. 2019. "Assessment of Extreme Heat and Hospitalizations to Inform Early Warning Systems." *Proceedings of the National Academy of Sciences* 116 (12): 5420–27. *https://doi.org/10.1073/pnas.1806393116.*

Varghese, Blesson M., Alana Hansen, Peng Bi, and Dino Pisaniello. 2018. "Are Workers at Risk of Occupational Injuries due to Heat Exposure? A Comprehensive Literature Review." *Safety Science* 110:380–92. *https://doi.org/10.1016/j.ssci.2018.04.027.*

Wadsworth, Gail, Michael Courville, and Marc Schenker. 2018. "Pay, Power, and Health: HRI and the Agricultural Conundrum." *Labor Studies Journal* 44 (3): 214–35. *https://doi.org/10.1177/0160449X18767749.*

Wang, Junhui, Honglin Wang, Guijie Luan, and Dongfeng Zhang. 2018. "Ambient Temperature and Pesticide Poisoning: A Time-Series Analysis." *International Journal of Environmental Health Research. https://doi.org/10.1080/09603123.2018.1558185.*

Washington State Legislature (WSL). 2018. *Chapter 296–307 WAC: Safety Standards for Agriculture.* Olympia. *www.lni.wa.gov/safety/rules/chapter/307/WAC296-307.pdf.*

Wozniacka, Gosnia. 2019. "The H-2A Guest Worker Program Has Ballooned in Size, but Both Farmers and Workers Want It Fixed." *Civil Eats.* July 16, 2019. *https://civileats.com/2019/07/16/the-h-2a-guest-worker-program-has-ballooned-in-size-but-both-farmers-and-workers-want-it-fixed.*

Zahniser, Stephen, J. Edward Taylor, Thomas Hertz, and Diane Charlton. 2018. *Farm Labor Markets in the United States and Mexico Pose Challenges for US Agriculture.* Economic information bulletin number 201. Washington, DC: USDA Economic Research Service.

Ziska, Lewis H. 2016. "The Role of Climate Change and Increasing Atmospheric Carbon Dioxide on Weed Management: Herbicide Efficacy." *Agriculture, Ecosystems & Environment* 231:304–9. *https://doi.org/10.1016/j.agee.2016.07.014.*

Union of Concerned Scientists

FIND THIS DOCUMENT ONLINE: www.ucsusa.org/farmworkers-at-risk

The Union of Concerned Scientists puts rigorous, independent science to work to solve our planet's most pressing problems. Joining with citizens across the country, we combine technical analysis and effective advocacy to create innovative, practical solutions for a healthy, safe, and sustainable future.

NATIONAL HEADQUARTERS
Two Brattle Square
Cambridge, MA 02138-3780
Phone: (617) 547-5552
Fax: (617) 864-9405

WASHINGTON, DC, OFFICE
1825 K St. NW, Suite 800
Washington, DC 20006-1232
Phone: (202) 223-6133
Fax: (202) 223-6162

WEST COAST OFFICE
500 12th St., Suite 340
Oakland, CA 94607-4087
Phone: (510) 843-1872
Fax: (510) 843-3785

MIDWEST OFFICE
One N. LaSalle St., Suite 1904
Chicago, IL 60602-4064
Phone: (312) 578-1750
Fax: (312) 578-1751

WEB: www.ucsusa.org

PRINTED ON RECYCLED PAPER USING VEGETABLE-BASED INKS

CIVIL EATS

Burning Sugarcane in Florida is Making People Sick. Could ‘Green Harvesting’ Change the Game?

A class action lawsuit blames sugar companies for health risks in low-income communities of color as a result of burning sugarcane fields, and urges more environmental and economical harvesting methods.

BY NANO RILEY JULY 15, 2019

They call it “black snow” when the ash from the burning sugar cane rains down on the small communities dotting the south shore of Florida’s Lake Okeechobee. From October to April, ash and soot fall from the sky and settle on everything, blackening yards and blowing in open windows. Asthma, chronic bronchitis, and sinus problems plague area residents during the burning season, and local doctors usually ask patients how close they live to the cane fields.

Fred Brockman remembers the day in 2008, when 14 students at Rosenwald Elementary School in South Bay were treated for respiratory problems after exposure to smoke; five with asthma were hospitalized. Brockman spent six years working at Rosenwald, surrounded on three sides by cane fields pressing right up to the fence and said the school was "smoked," often.

"We had smoke every time the wind blew our way during a burn," Brockman said. "It would get dark and smoky…lots of the kids had breathing problems."

Compounding the residents' health woes is a widespread belief that Florida's sugar companies only burn around lower-income communities of color. At the same time, advocates believe that the companies practice "green harvest"—a method that both protects air quality and residents' health—around wealthier, whiter communities and near commercial districts. This process creates additional economic benefits by repurposing field waste that would otherwise get burned.

In early June, a high-profile group of plaintiffs and lawyers filed a federal class action lawsuit on behalf of more than 40,000 residents living by the sugar cane fields near Lake Okeechobee. The suit names a dozen sugar growers as defendants and blames them for health risks and lowered property values as a result of burning sugar cane fields. Residents say the decades-old practice of pre-harvest burning by sugar companies has caused unprecedented levels of respiratory illnesses and other problems from toxic smoke exposure.

Sugar industry representatives did not respond to requests for comment, but according to Tim O'Connor, a state health department spokesman, air pollutants do spike during the actual burning, but it dissipates and the sugar cane burning doesn't violate federal air quality standards,.

A Tale of Two Cities

The small, lakeside towns of Belle Glade, Pahokee, and South Bay, referred to as the Tri-Cities, are designated by the State of Florida as a Rural Area of Critical Economic Concern. Belle Glade's motto is "Her Soil is Her Fortune." But the fortune doesn't trickle down: The working-class residents, many of whom are agricultural workers, have an average income of about $37,000. Many are Haitians and Jamaicans who came to the U.S. to cut the cane before the big sugar companies moved to mechanical harvesters.

There's a saying in Belle Glade that the lakeside town has two exports: sugar cane and wide


Welcome to
BELLE
GLADE
HER SOIL IS
HER FORTUNE
CITY OF BELLE GLADE
CHAMBER OF COMMERCE

Photo courtesy of Nano Riley.

receivers. Football is leading many of these low-income families out of their limited lives, because if a local player gets into the NFL, they bring a lot of people with them.

“Muck City,” as sportscasters call Belle Glade and Pahokee, has contributed nearly 60 players to the NFL over the years. In fact, there’s a tale that local football players hone their skills by chasing rabbits escaping from the burning fields.

One of the lawsuit’s plaintiffs is Fred Taylor, who was a star at Glades Central High School before an 11-year NFL career. Taylor said he and many of the people he grew up with experienced respiratory challenges and related health problems.

“If nothing more, [the sugar companies] need to promote awareness and get down to the bottom of these health issues because the community is dying,” Taylor said at the press conference announcing the suit. He wants the sugar companies to take responsibility for the problems he believes are caused by burning. “The black snow that comes from the sky, people are breathing that stuff in. They’re getting sicker and sicker every day,” he said.

Taylor and others in Belle Glade anti-burn advocacy groups want the sugar industry to stop burning the fields and switch to green harvest to spare local residents. They point to the burn restrictions in place if prevailing winds would blow smoke toward Wellington, an upscale development 30 miles east of Belle Glade on the way to Palm Beach. Filled with multi-million dollar estates for the affluent and famous, Bill Gates has a home in Wellington, as do Bruce Springsteen and other luminaries.

Communities like Wellington are seldom subjected to smoke from sugarcane burning. The Florida Forestry Service began issuing permits for cane growers to burn in the 1990s, when they received complaints about smoke and haze drifting east toward Wellington and Palm Beach. Now they cannot burn if winds blow in that direction. Tri-Cities residents want those same protections.

‘Green Harvest,’ an Alternative to Burning

The lawsuit aims to require Florida sugar companies to harvest sugarcane without burning it—a technique called "green harvest," which is practiced in sugar-growing regions around the world. Thailand wants to phase out cane burning over the next three years, and Brazil, the world's largest producer of sugar, mandated an end to burning in 2017.

"[Sugar companies] burn the cane to remove the outer leaves before harvest," said Patrick Ferguson, an organizer at environmental group Sierra Club. "But companies around the world use green harvest technology, and in many countries burning is banned." While Sierra Club is not part of the class-action lawsuit, the group has been conducting a "Stop the Burn" campaign in Florida since 2015.

After the sugarcane leaves or "trash" is burned off, the cane is milled to extract the sweet syrup. The remaining fiber is called bagasse. With a green harvest, machines with cutting blades remove the outer foliage, which can then be collected to make biochar, mulch, and ethanol.

Green harvest is often employed to reduce smog in cities, but advocates say it brings a number of economic and health benefits as well. Brazil has built a thriving industry using sugarcane trash to produce electricity, fuel pellets, ethanol and jet fuels, commercial mulch, and tree-free paper products, along with bagasse.

Ferguson recently returned from a trip to Brazil to study industry practices there, and calls the country the "most advanced cane-growing nation."

"In Brazil, they utilize the whole plant with green harvest," he explained, adding that the the sugar trash gets used as mulch, can is also mixed with bagasse to generate electricity and ethanol at sugar mills.

In Australia, the Rocky Point Company started green harvesting sugarcane in 1993, baling the leaf for cattle feed and garden mulch instead of burning it. Rocky Point's Sugar Cane Mulch sells millions of bags every year by refining raw products from nearby farms.

A mechanical sugar cane harvester in Queensland, Australia. (Photo by Michele Jackson / iStock)

Closer to home, U.S., paper products company Emerald Brand processes agricultural trash into tree-free paper, cardboard, and bio-plastics. They note that “burning and wasting this valuable material takes time and energy away from farmers when processed trash can be made into paper, cardboard, and bio-plastics.”

Advocates say that green harvest is not only cleaner and healthier, it also creates jobs, and in the Glades communities that would be an asset. And yet Glades sugar farmers claim advocates are trying to eliminate jobs by going to green harvest.

“This attack is simply another of their efforts to put the sugar industry out of business,” said Judy Sanchez, a spokesperson for U.S. Sugar Corp, adding stopping the burning “would significantly impact our business and take jobs away.”
But the Florida sugar industry is already working to benefit from bagasse. In March 2018, Tellus—a company jointly owned by the Sugar Cane Growers Cooperative of Florida and Florida Crystals Corporation—opened a $75 million, state-of-the art manufacturing facility in Belle Glade offering biodegradable products such as plates and take-out containers made from

bagasse. The facility is located by the sugar mill, powered by solar and renewable biomass from the mill, and according to Tellus officials, employed 50 people at launch, with a goal of hiring a total of 100 employees, 90 percent of whom will be local.

The Tellus facility is a rare exception for businesses seeking to locate in Belle Glade, residents say, because who wants to have to wash soot off cars every day? Some residents say this has caused a job shortage. One compared the practice of burning to hazardous dirty coal jobs, and said the cane industry needs something similar to programs that have trained coal workers for clean-energy jobs that pay better and support families.

What's Next?

With the hot summer slowing everything down, everyone in this community is waiting to see what happens next with the lawsuit. In the meantime, burning season won't start again until October.

Kina Phillips is a lifelong resident of Belle Glades, and seven generations of her family have grown up here. Most of her family members have suffered from respiratory ailments, and attended Rosenwald Elementary in nearby South Bay.

"My grandson is five and he has to use a breathing machine sometimes, especially during burning season," said Phillips, 44, who runs the front office for a heart specialist in Belle Glade and says she sees people suffering from the effects of the cane smoke all the time. Phillips says she wants to fight the cane burning so her kids won't have to, so she decided to speak out to join the Stop the Burn campaign. She has not yet joined the suit, but she's "looking into it."

"This is my battle, and they can't stop me," she said. "They could go to green harvest and stop burning," she said. "Our lives are worth that."

(This article was updated to reflect the fact that Brazil is not currently making biochar from sugar trash and bagasse.)

Nano Riley is a journalist, environmental historian, and an adjunct professor at the University of South Florida, St. Petersburg. She is the author, most recently, of *Florida's Farmworkers in the Twenty-First Century*. Read more >

LAKE APOPKA FARMWORKERS ENVIRONMENTAL HEALTH PROJECT

Report on Community Health Survey

May 2006

With deep gratitude for and acknowledgement of their tremendous contribution to Florida's vegetable crop production, the Farmworker Association of Florida would like to dedicate the Lake Apopka Farmworkers Environmental Health Project's *Report on Community Health Survey* to the former Lake Apopka farmworkers. This report is a compilation of the data analysis of 148 environmental health surveys conducted with the former Lake Apopka farmworker community from January – December 2005. We would like to thank all of the survey participants, community members who were trained as interviewers, Farmworker Association staff, and volunteers who contributed to this project.

The survey design, implementation, analysis, and report were made possible through funding from the *Presbyterian Committee on the Self-Development of People* and the *United States Environmental Protection Agency*.

Ron Habin, Ph.D.
Principal Investigator

Geraldean Matthew
Project Coordinator
Farmworker Association of Florida

"Farm worker families bear many burdens to make a living in agriculture. Past and present pesticide exposure leaves a toxic legacy that denies them a safe and healthy environment. This survey is another bleak reminder of the failure to meet even their most basic health needs."
- Marion Moses, Ph.D., author of Designer Poisons

The Farmworker Association of Florida
La Asociación Campesina
Asosiyasyon Travayè Latè

815 S. Park Ave ● Apopka, FL 32703 ● 407-886-5151

Table of Contents

Summary of Community Health Survey……3-7

Report on Community Health Survey……8-27

Recommendations……..……...…28-29

Appendix A……..…….30-34
"Background on Lake Apopka and the Farmworker Community"

Appendix B – The Survey Instrument
Informed Consent Form……35

Participant Consent and Signature Form……..……36

Community Health Survey…….……37-51

Appendix C …….....52
"List of Charts"

LAKE APOPKA FARMWORKERS ENVIRONMENTAL HEALTH PROJECT

Summary of Community Health Survey

May 2006

The ***Lake Apopka Farmworkers Environmental Health Project*** was developed in response to the health concerns expressed by the community of former Lake Apopka farmworkers in the aftermath of the closing of the vegetable farms on the north shore of the lake in 1998. Their concerns emanated from two sources:
1) The high rates of illness, disease, and recurring health problems experienced first–hand by individuals and/or observed by the community in their friends, family, and former co-workers who were and continue to be suffering from a variety of ailments; and 2) The unprecedented bird mortality on Lake Apopka in the winter of 1998-1999, which eventually linked the tragic bird deaths to organochlorine pesticides found on the farm fields – the same chemicals to which the former farmworkers themselves had been exposed during the length of their working careers.

Lake Apopka, as Florida's most polluted large lake, rose to international attention in the 1990's because of wildlife studies on the lake's alligator population that discovered drastically reduced reproductive rates, along with genetic deformities, among the lake's alligators. Fifty years of farming on the north shore of Lake Apopka resulted in pesticide and fertilizer run-off that were blamed for the lake's distinctive pea green color. Yet, the more insidious problem would remain invisible. A spill of DDT, in 1980 into a percolation pond at what is now the Tower Chemical Superfund site at Gourd Neck Springs in the south quadrant of the lake, is likely responsible for the breakdown components, DDD and DDE, that were discovered in tissue samples from the studied alligators. Other pesticides that were once commonly used on the farms of Lake Apopka, such as toxaphene, have since been banned, yet, residues and breakdown products remain, and their cumulative and synergistic properties – either on wildlife or on people - have never been seriously studied.

Efforts over the years to encourage local, state and federal agencies to undertake a health assessment and/or study of the Lake Apopka farmworker community met with no response or action, yet, the community continued to recount stories of debilitating illnesses and even death among their members. While research into the impacts on wildlife on Lake Apopka were on-going, human health problems, especially that of former Lake Apopka farmworkers, were summarily ignored. Hence, in 2005, the staff of the Farmworker Association of Florida (FWAF), under the direction of local community leaders and Dr. Ron Habin, an independent anthropologist, designed and implemented a health survey in which 148 former Lake Apopka farmworkers were interviewed to assess their health problems, and their exposure to pesticides and other environmental contaminants. Through the work of this project and the release of this report, it is hoped that some of the people's concerns may at last be heard and addressed. Ideally, this project will generate increased interest in the community's concerns leading to constructive actions that will improve the health of individuals and the community as a whole.

Survey participants.

GENDER		AGE							RACE/ETHNICITY						
M	F	0-19	20-29	30-39	40-49	50-59	60-69	70+	African Amer.	Mex-ican	Mex.-Amer.	Puerto Rican	Other Hisp.	Haitian	Cau-casian
32%	68%	0%	2%	15%	27%	19%	20%	17%	78%	13%	1%	3%	2%	2%	1%

Respondents' length of time worked on farms.

0-5 yrs.	6-10 yrs.	11-15 yrs.	16-20 yrs.	21-25 yrs.	26+ yrs.
37%	19%	11%	14%	8%	11%

Farm work. The farmworkers surveyed worked primarily in the vegetable crop industry. The major crops grown on Lake Apopka farmlands were: carrots, radishes, corn, cabbage, different types of lettuce, parsley, cilantro, collards, potatoes, beans, bell peppers, cauliflower, celery, broccoli, cucumbers, peas, tomatoes, and beets. The workers performed various jobs on the Lake Apopka farms, including: plowing, hoeing, planting, harvesting, loading, box-making, washing, grading, sorting, branding/bagging, canning, transporting, and applying pesticides and fertilizer.

Pesticide exposure. Ninety-two percent (92%) of the participants surveyed indicated that they were exposed to pesticides in the workplace through such routes as: spray from an airplane, pesticide drift, touching plants with pesticide residues, and inhaling pesticides, among others.

Methods of pesticide exposure.

Touched plants wet from pesticides/dew/rain	87%	**Unpacking plants or cuttings**	68%
Sprayed by airplane/drift from spray	80%	**Washing/cleaning plants/trees/crops**	66%
Through hands, skin lacerations	76%	**By not washing hands**	64%
Entered a sprayed area without notification	74%	**When planting, potting, or replanting**	60%
Smelling, breathing in, poor ventilation	68%	**Pesticide drift into homes, neighborhoods**	36%

In addition to prior pesticide exposure on the farms, some community members continue to be exposed to environmental toxins through their consumption of different types of potentially contaminated fish/wildlife in and around Lake Apopka.

Respondents' consumption of fish/wildlife.

	Fish	**Wild Vegetables**	**Turtles**	**Rabbits**	**Raccoons**	**Alligators**
Current Consumption (May 1998 to present)	47%	25%	22%	20%	11%	9%
Previous Consumption (prior to May 1998)	68%	47%	33%	29%	16%	12%

Other exposures. Not only were the respondents exposed in the past to agricultural chemicals in their workplaces, but they continue to be at high risk of exposure to a variety of contaminants through various exposure routes due to the multiple neighboring polluting industries and hazardous sites located in the surrounding community. These sources of continuing exposure to pervasive toxins in their environment include: potential pesticide drift from several nurseries located adjacent to residential areas; volatile organic compounds from nearby fiberglass and plastics manufacturing companies and other industries located within the community; two local industrial landfills; two Superfund sites on Lake Apopka; two city sewage treatment plants; and a Stericycle medical waste incinerator.

State of health. When asked to characterize the current state of their health, **83% of respondents stated that they were in either "fair" or "poor" health**. Eighty-five percent (85%) feel their exposure to pesticides has affected their health, and 79% feel their exposure to pesticides is directly related to their current health problems. The following table illustrates the health problems identified by 30% or more of the respondents.

Health problems of Lake Apopka farmworkers.

Arthritis	70%	**Nervousness**	42%
Frequent sinus problems	60%	**A lot of coughing**	40%
Throat problems	58%	**Earaches/ear infections**	39%
Allergies	53%	**Asthma**	38%
Rheumatism	49%	**Sadness a lot**	38%
Urinary urgency at night	49%	**Uncontrollable anger**	37%
Diabetes	47%	**Loss of memory**	36%
Skin problems/recurrent rashes	46%	**Acid reflux**	33%
Overweight	46%	**Urinary tract/bladder infections**	31%
Bladder urgency	45%	**Constipation**	30%

In addition, there have been concerns about the apparently high number of community members diagnosed with Lupus, a serious auto-immune disease. The results of the survey indicated that 11% of the respondents live in homes where one or more persons have Lupus.

The former Lake Apopka farmworkers surveyed have multiple barriers that hinder them from proper treatment of health problems, such as limited financial resources, lack of adequate transportation, cultural inhibitions, and/or language difficulties. The survey revealed a clear discrepancy between the percentage of people reporting an illness or disease, and those actually treating their health problem with some form of prescription medication, as illustrated in the following table.

Health problems treated with prescription medications.

Symptom/illness	Respondents suffering from this ailment	Respondents taking prescription for ailment
Arthritis	70%	54%
Throat problems	58%	for chronic cough
Coughing	40%	28%
Allergies	53%	34%
Rheumatism	49%	37%
Diabetes	47%	32%
Skin problems/rashes	46%	30%
Thyroid	18%	14%
Lupus	11%	>1%

In addition, more than 56% of respondents reported that they *regularly* take some form of over-the-counter cough medicines (syrup or cough drops), and more than 49% of respondents reported that they *regularly* use over-the-counter creams to treat skin rashes.

Reproductive health. Of those surveyed, 13% indicated that they had a child born with a birth defect, 21% had one or more problem pregnancies, 14% had complicated pregnancies, 16% had miscarriages, and 8% had reproductive problems.

Multigenerational health problems. A great concern to the farmworker community is whether their exposure to workplace chemicals has produced multi-generational health effects, in particular effects on the cognitive abilities of their children. Of those respondents who have children, 26% have a child/children with a learning disability. Of those who have grandchildren, 37% have a grandchild/grandchildren with a learning disability. Organochlorine pesticides, such as those implicated in the bird deaths on Lake Apopka, are generally considered to be endocrine-disrupting chemicals, similar to those that have had impacts on the offspring of wildlife that have been exposed to these contaminants in the wild and/or in research studies.

Deaths. One area of information missing from this project is the number of former Lake Apopka farmworkers who have died, prior to, during, or after the closing of the farms, their ages at the time of death, and the cause of death on record. This is significant information that warrants further investigation. Any future health study of former Lake Apopka farmworkers should include analysis of the records of the deceased.

Conclusion. The results of this community health survey raise many questions: How many community members may be suffering from diseases that have gone undiagnosed? Which illnesses can be linked to pesticide exposures or immune system suppression due to exposures over long periods of time? What part do organochlorine pesticides play in the health problems of this community? Have endocrine-disrupting chemicals had an impact on the second or third generations of farmworker families? What cumulative and synergistic impacts have exposure to the various agricultural chemicals had on the community's overall health? What health hazards have these farmworkers endured to enable us to have an affordable and reliable food supply?

These are just some of the questions raised by this report. One conclusion that we can draw is that more study needs to be done. Fifty years of providing food for the people of this country should be

repaid by focusing attention on the health needs of this hard-working group of people. We recognize that there is no easy solution to the complex health problems experienced by the former Lake Apopka farmworkers. However, our collective hope is that, through the release of this document, enough effort and resolve will be generated to undertake significant and positive next steps to assist the community in their quest for answers regarding their health. With that in mind, we submit the following recommendations.

PROPOSED ACTIONS NEEDED TO ADDRESS THE IDENTIFIED PROBLEMS IN THE LAKE APOPKA FARMWORKER COMMUNITY

Though the causes and sources of people's illnesses are of significant importance in the long term, the most pressing and immediate issue of concern for the former Lake Apopka farmworker community is their current state of health. In the eight years since the closing of the farms on Lake Apopka and the devastating bird death incident that followed, there have been no actions, interventions, or other efforts on the part of state and/or local government to address in any comprehensive way the community's actual and/or perceived health problems. Aside from a recommendation in 1999 that individuals refrain from eating large quantities of Brown Bull-head Catfish from Lake Apopka, there has been no outreach to this population to even determine the nature and extent of illness and disease that they are experiencing. The following is a list of actions and/or steps, arising out of the results of this work, that are herein proposed to be undertaken by appropriate agencies in order to remedy the years of neglect that this community has experienced.

Actions to Address the Health Needs of the Lake Apopka Farmworker Community

- Improve the accessibility of the community to local health care clinics and local health department facilities including:
    - shorter waiting times for appointments
    - financial assistance for those unable to pay even minimum fees
    - increased availability of specialists to address people's specific health needs, such as, dermatologists, rheumatologists, endocrinologists, and auto-immune specialists
    - reliable and consistent sources and resources for obtaining critical prescription medications (blood pressure and diabetes medications, for example)
    - improved diagnosis of diseases, including requiring a questionnaire about work history within the medical history requirements
    - access to timely testing to improve disease diagnoses and health care treatment
    - availability of transportation alternatives for those with serious mobility issues

Develop and conduct a comprehensive community health study of the former Lake Apopka farmworkers to look at both the health of adults and the incidence of health problems in their offspring, and to test participants for body burden levels of toxicity. Any such study should include input from the community and have two clear objectives

- to determine the extent and nature of chronic and acute illness and disease present within and among this community,
- to explore the relationship between exposure to environmental toxins and the community's health, both individually and intergenerationally.

- Conduct more targeted testing and monitoring of soil, well water, groundwater, and air pollutants in South Apopka, and in the surrounding communities, especially those adjacent to Lake Apopka. Report these results to the community. Clean up areas of contamination.

- Develop an educational and outreach campaign specifically designed for this community to:
    - meet as frequently as necessary with concerned community members to respond to their questions and health concerns, and work together to resolve problems
    - to inform them of their health care options
    - to discuss preventative and treatment measures, and to open frank and honest dialogue between health care providers and community residents

- improve communication at all levels with the goal of improving health care outcomes

PROPOSED CHANGES NEEDED TO ADDRESS THE GENERAL HEALTH OF FARMWORKERS

Based on the survey data collected, anecdotal stories of health problems, and more than 20 years of experience working with various farmworker communities, we make the following recommendations to improve overall farmworker health:

Health Education/Training

- Ensure better training for health care providers in agricultural areas on the detection, treatment, and reporting of pesticide exposure and pesticide-related illnesses.
- Allocate more government dollars to grants to community-based organizations to conduct health outreach and pesticide trainings with farmworkers.
- Improve employer-provided training, in appropriate languages, about pesticide safety for farmworkers and pesticide applicators. Trainings should be conducted by independent persons or groups where possible, to prevent conflict of interest.

Health and Agricultural Practices Research

- Fund more scientific health studies of farmworker populations, focusing on the cumulative and synergistic effects of pesticide exposure, as well as the physical and cognitive multigenerational effects of chronic pesticide exposure.
- Strengthen farmworker housing regulations, and implement more stringent requirements when housing is on the site of or neighboring farms/fields.
- Increase research into sustainable agriculture practices.

Increased Enforcement of Farmworker Protections

- Increase enforcement of the laws protecting farmworkers, through the hiring of a sufficient number of state agricultural inspectors, in order to adequately monitor facilities throughout the state, and to impose greater penalties for violations of those protections when they occur.
- Allocate more government dollars for enforcement of farmworker health and safety protections.
- Conduct farm inspections without giving prior notice to farm operators.
- Impose greater restrictions on the water, air, and soil pollution caused by farming.
- Enforce implementation of the WPS provision that information about workplace chemicals be provided to farmworkers, in the appropriate language and in a format that they can take to their health care provider.
- Improve re-entry interval signage appropriate for illiterate workers.

Other

- Conduct independent evaluation of pesticides' effects on the environment and human health, prior to their authorized use.
- Implement a tax on agricultural pesticide manufacturers and consumers to be used for training, research, and enforcement to protect farmworkers.
- Revise zoning laws so that residential areas are not so close to polluting industries and environmentally-contaminated sites.

LAKE APOPKA FARMWORKERS ENVIRONMENTAL HEALTH PROJECT

Report on Community Health Survey

May 2006

Background. In 1998, the state of Florida closed approximately 15,000 acres of farmland on Lake Apopka that it had purchased for restoration purposes, since decades of chemical runoff had made Lake Apopka the *most contaminated large lake* in Florida. In 1996, when the Lake Apopka Restoration Act was passed, the Farmworker Association of Florida (FWAF) began working with Lake Apopka farmworkers and local agencies to anticipate the needs of the community regarding the impending layoffs of more than 2,500 workers. Initially after the closing of the farms, FWAF's work with this population focused mainly on retraining, re-employment, and relocation assistance. However, in the winter of 1998-1999, approximately 1,000 fish-eating birds were found dead on Lake Apopka, following unseasonal flooding of the farms. After intensive investigation, in June 2001, the U.S. Fish and Wildlife Service issued a report that concluded that elevated levels of *organochlorine pesticides* were responsible for the bird deaths. These are the *same chemicals* that farmworkers were exposed to for more than 50 years while working on the vegetable farms. More than $100 million government dollars were spent buying out the farms, with additional taxpayer money spent on investigating the bird deaths. However, none has been spent on researching the effects of organochlorine and other pesticides on the health of the Lake Apopka farmworkers. Numerous studies have also documented reproductive abnormalities and immune suppression in Lake Apopka alligators, fish, and turtles. Though extensive research has been done on Lake Apopka wildlife, nothing has been done to assess the health of thousands of farmworkers who lived and worked on and/or around the fields for decades. The ***Lake Apopka Farmworkers Environmental Health Project*** was created to address workers' growing and on-going health concerns.

**For a more detailed background on the Lake Apopka farm buyout, cleanup efforts, the South Apopka community, and the health of farmworkers and wildlife in the area, please see Appendix A.

About the survey. The survey instrument that was used to document the community health problems (see Appendix B) was created with the input of community leaders (former Lake Apopka farmworkers), staff of the Farmworker Association of Florida, and an independent anthropologist, Dr. Ron Habin, who served as the Principal Investigator for the project. The survey was pilot-tested and subsequently, during multiple community meetings, project leadership made recommendations for revising some of the questions and vocabulary, and adding

other items to the survey. Project staff also conducted two oral readings with community leaders, who made suggestions for making the questions more understandable and culturally appropriate. In addition, the survey was reviewed by a special education reading teacher, who recommended specific vocabulary changes to accommodate appropriate reading and comprehension levels. The survey was also reviewed by two physicians (one English-speaking and one bilingual, Spanish/English) to assure proper wording of questions and grouping of symptoms. In total, the survey went through eight full revisions to incorporate the comments and suggestions that were made, and to format the survey.

The actual survey design was finalized in early February 2005. Between January and March, a total of five training sessions were held, during which eight community leaders were trained on interviewing techniques and on how to conduct the survey. The total number of surveys completed by the end of the project was 148. Survey participants were each given a $10 gift card in exchange for their participation. The process of interviewing participants took at least one hour per survey. Two persons conducted the interview together – one person completed the actual interview, asking the questions and writing down the responses, while the other person operated a tape recorder to ensure proper documentation of the participant's responses. The survey materials were assigned a number and no participants' names were put on the surveys. The Principal Investigator worked with the interviewers on several occasions to emphasize the importance of thorough completion of the surveys, consistency in the presentation of survey questions, and proper recording of responses.

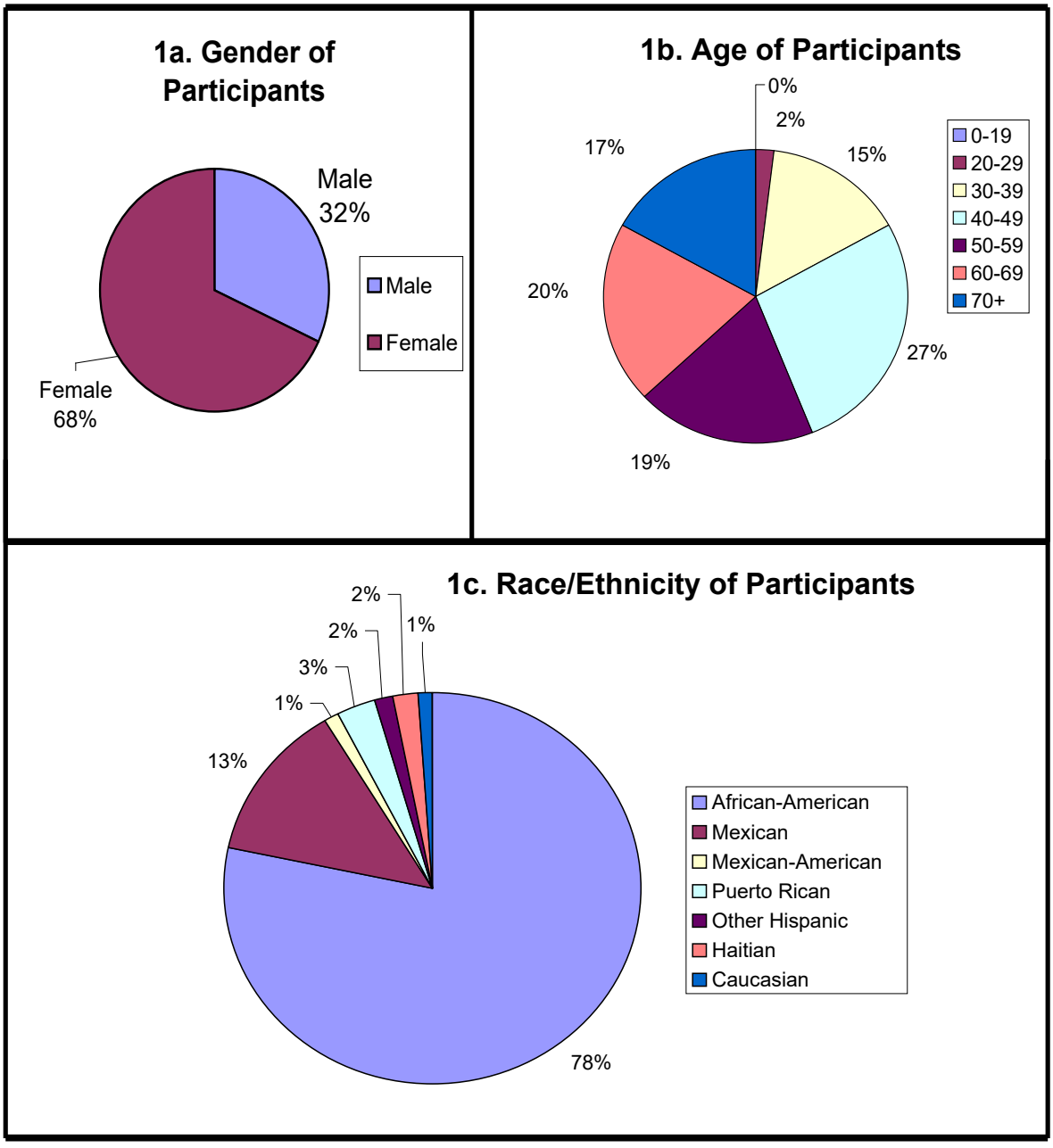
Survey participants. The survey was designed to document the health problems of African-American, Hispanic, and Haitian former Lake Apopka farmworkers, many of whom are experiencing significant and life-threatening health problems which they believe to be connected to their exposure to multiple sources of environmental contamination—direct pesticide spray in the fields; pesticide drift into the fields where they were working, as well as labor camps, and residential areas; utilization of agricultural pesticide containers in the home for various purposes; consumption of contaminated fish and other wildlife; toxic waste from nearby chemical manufacturers; potential groundwater contamination; an industrial landfill; a Stericycle medical waste incinerator; and two Superfund sites on Lake Apopka.

The participants were selected by the following methods: identifying former co-workers of the project leaders and interviewers; consulting a list of displaced Lake Apopka farmworkers provided by the Department of Labor during FWAF's project with Central Florida Jobs and Education Partnership (1998—1999); referral of other former Lake Apopka farmworkers by survey participants; and word-of-mouth. The African-American participants were, for the most part, long-time residents of South Apopka. They were more likely to have a longer employment period working on the muck farms around Lake Apopka (as much as 30-40 years in some cases), and to be part of multigenerational farmworker families. The African-American farmworkers were more likely to have been exposed to very high levels of

organochlorine pesticides in the decades before these chemicals were banned in the United States.

The survey was translated into Spanish and Creole for those participants with limited English proficiency, and who preferred to respond to the survey in their native language. The Hispanic and Haitian survey participants arrived in the Apopka area more recently (generally since 1978), and worked on the Lake Apopka farms for a shorter period of time (generally 1-5 years). At the same time, in more recent years, these communities were more likely to have lived in labor camps neighboring the farms. All of the farmworkers interviewed live at or below the poverty level and have little formal education. Most do not have health insurance. Included in the group of survey participants were several undocumented immigrants who spoke little English.

Chart 1. Demographics of Survey Participants



Analysis, strengths, and limitations of the survey. Both quantitative and qualitative analysis of the survey data was conducted by a team of four FWAF staff members, the Project Coordinator and the Principal Investigator. The survey analysis is focused on workplace exposure to chemicals. The survey documented multiple health problems within the community, including doctor-diagnosed conditions, as well as self-assessment. Also, the survey results are based on farmworker households, not solely on individuals' health problems.

One of the significant strengths of the survey was training community leaders to be interviewers. Since the interviewers were familiar with most of the respondents, they were able to elicit and document personal information about people's health problems. This, also, put participants more at ease when talking about their personal and sensitive health issues. It is important to note however, that there were at least ten survey participants who ultimately decided that they did not want to participate in the survey because the questions were too personal. There were even occasions when participants' insisted that their survey be torn up because they did not want their personal health information to be included in the survey findings. Also, there were several occasions where participants did not want to answer the questions about reproductive health problems and problem pregnancies.

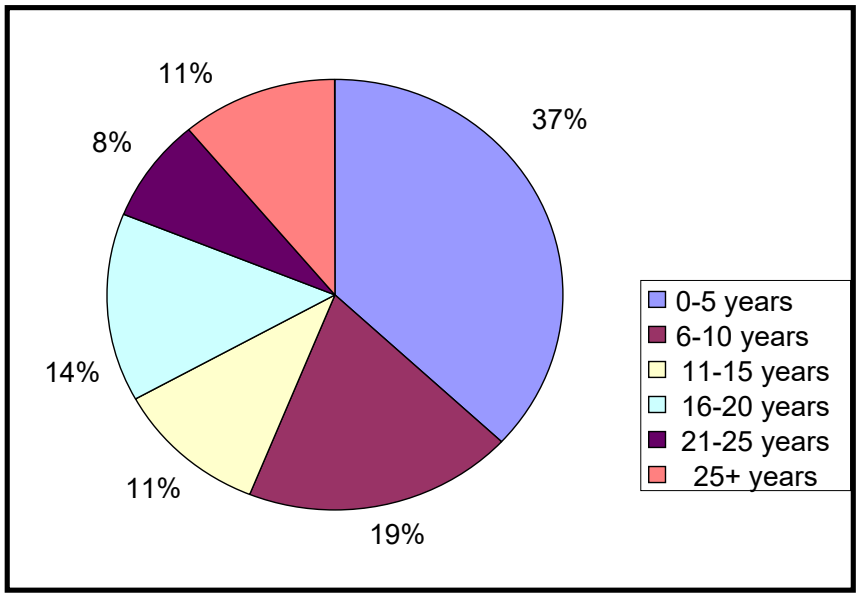
The survey participants were mostly African-American. There are several reasons for this. Most of the African-American community members that worked on the Lake Apopka farms are settled in the Apopka area, and most were easily identified and located. The Hispanic and Haitian communities were less likely to have put down permanent roots in the Apopka area. Most Hispanic former Lake Apopka farmworkers have relocated to other areas. Most Haitian former Lake Apopka farmworkers either relocated, or began working in other industries (such as hospitality) before the farms closed. Many Haitians were reluctant to participate because of a long-time misunderstanding that, following the closing of the farms, they were entitled to monies from the state that they never received.

FWAF staff and the Principal Investigator have interpreted the survey results based on data collected and their expertise, particularly that of the Project Coordinator, Geraldean Matthew. Ms. Matthew has been an employee of FWAF for 14 years, and has been a community organizer for 20 years. She is part of a multigenerational farmworker family, and as a child, would play in the fields while her mother worked. At the age of 16, Ms. Matthew got her first job as a farmworker, although she had been helping her mother in the fields since age six. She worked on the Lake Apopka farms for 34 years. Ms. Matthew has diabetes, and was just recently diagnosed with Lupus. She has two daughters with Lupus, a son with a thyroid problem, and a brother with a serious birth defect. Also, one of her daughters had a stroke at age three, and later was diagnosed with a brain tumor. Ms. Matthew not only served as the Project Coordinator, but also provided invaluable insight into the customs and realities of the Lake Apopka farmworker community, from exposure to chemicals, to common health practices and problems, to the subsistence consumption of wildlife from in and around Lake Apopka.

Based on Ms. Matthew's knowledge of the community's traditions and practices, there are some findings that appear to be underreported, as noted later in the report. In addition, some figures may be underreported due to respondents providing an answer they felt was appropriate or acceptable, rather than factual. Lastly, it is important to note that, at times and in various instances, it either was or seemed to be difficult for some respondents to speak freely about their health problems due to the sensitive and personal nature of the questions.

Farm work. The farmworkers surveyed worked primarily in the vegetable crop industry. The major crops grown on Lake Apopka farmlands were: carrots, radishes, corn, cabbage, different types of lettuce, parsley, cilantro, collards, potatoes, beans, bell peppers, cauliflower, celery, broccoli, cucumbers, peas, tomatoes, and beets. They performed various jobs on the Lake Apopka farms, such as: plowing, hoeing, planting, harvesting, loading, box-making, washing, grading, sorting, branding/bagging, canning, transporting, and applying pesticides and fertilizer.

Chart 2. Length of Survey Participants' Employment in Farm Work



Exposure to pesticides. Survey participants were exposed to workplace chemicals in numerous ways. Not only were they exposed at the worksite, but they also, in many cases, unknowingly brought these chemicals home on their clothes and shoes, which, in turn, exposed their children and others in the home to the pesticides. Common practices, such as washing work clothes with the family laundry and bringing home pesticide containers for domestic use, further exposed their families and/or housemates. Twenty-six percent (26%) of respondents indicated that they brought home pesticide containers for such uses as: holding drinking water or laundry detergent; storing things, such as food, clean clothing, diapers, and/or dirty laundry; or for use as a trashcan or mop bucket. This 26% is likely to be an underreported figure, since washing out pesticide containers to use for other purposes was a common practice in both the African-American and Hispanic communities.

Principal Investigator's comment:
After conferring with our community organizers and survey administrators, we believe that the aforementioned results (26%) may be underreported. Potential reasons that some survey participants may not have responded fully to this question include: not making the cognitive connection between bringing home large jug containers and their previous pesticide content; feeling ashamed or frightened of their previous use of pesticide containers for domestic purposes; not wanting to admit to something that could be construed as stealing; answering the question the way they thought the survey interviewer wanted to hear; and simply forgetting some of the particulars of daily existence many years ago.

Ninety-two percent (92%) of the participants surveyed indicated that they were exposed to pesticides in the workplace. The routes of exposure are detailed in Chart 3. It is important to note that there were few or no regulations that were being implemented to protect farmworkers' health and safety before the passage of Field Sanitation laws in 1987, and the federal Worker Protection Standards (WPS) in 1992. WPS regulations were not implemented until 1995. Prior to these dates, the use of pesticides and the provision of proper field sanitation facilities were widely unregulated. Later, even with the passage of strengthened health and safety protections, it was still years before toilets were common in the fields. Also, it was years before farmers commonly began practicing proper and effective posting of the re-entry intervals to notify workers of when they could safely enter pesticide application areas.

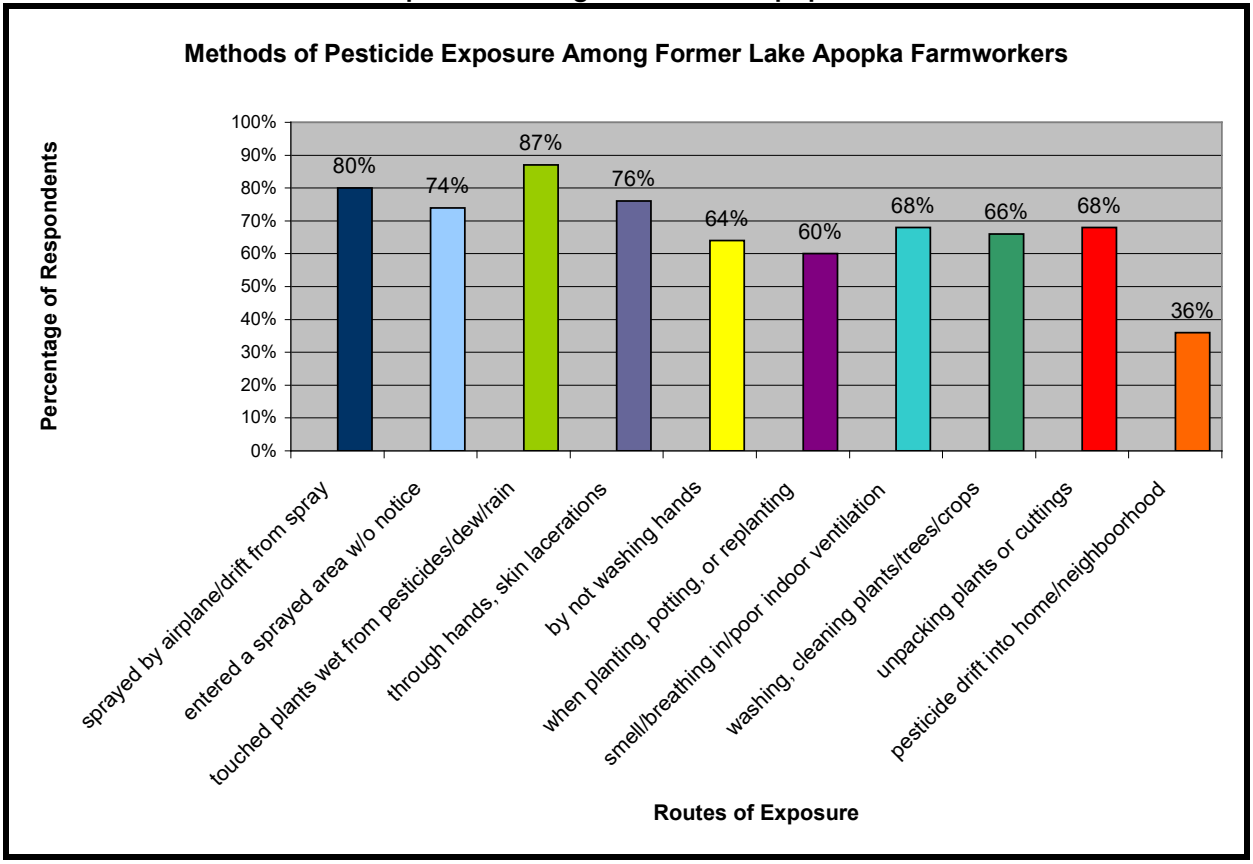
In 1999, four years after the implementation of the WPS, the Farmworker Association of Florida and the Farmworker Health and Safety Institute (FHSI) conducted 248 workplace assessment surveys and analyzed the data collected. The purpose of the surveys was to document violations of WPS and Field Sanitation laws. FHSI's report ***FARMWORKERS AT RISK: The Worker Protection Standard Four Years Later. Is It Really Protecting Our Nation's Farmworkers?*** highlights the following findings:

- only 54.5% of the farms surveyed conducted pesticide safety trainings for farmworkers.
- only 24.6% of the farms surveyed provided written information on pesticides.
- more than 60% of the farm operations surveyed did not inform farmworkers about the re-entry time after an area had been sprayed.
- farmworkers from 42.7% of the farms reported that they had been sprayed with pesticides (directly or indirectly).
- farmworkers from 51.4% of the farms reported that they had worked in an area still wet with pesticides.
- 22% of the farms improperly stored pesticides or other toxic chemicals on the site.
- farmworkers from 76% of the farms had access to a toilet at the worksite, but only 48.7% had access to a sink for washing their hands.

The Farmworker Association continues to identify innumerable employer violations of farmworker health and safety protections. However, at present, there are only 20 pesticide safety inspectors in Florida, under the Florida Department of Agriculture and Consumer Services, responsible for monitoring the practices of

more than 40,000 growing operations, plus golf courses. In 2005, only 600 farms (less than 2% of the total) were inspected for compliance with worker health and safety protections.

Chart 3. Methods of Pesticide Exposure Among Former Lake Apopka Farmworkers



Respondents' comments (excerpted from taped interviews):

We were in the fields when they were spraying.

Due to the fact of them spraying us, it got into our system.

No one ever told the workers what kind of pesticides and the dangers we were exposed to.

No, they didn't let us know. They'd just come over and begin spraying while we were working …. When we were working, they were spraying those fields.

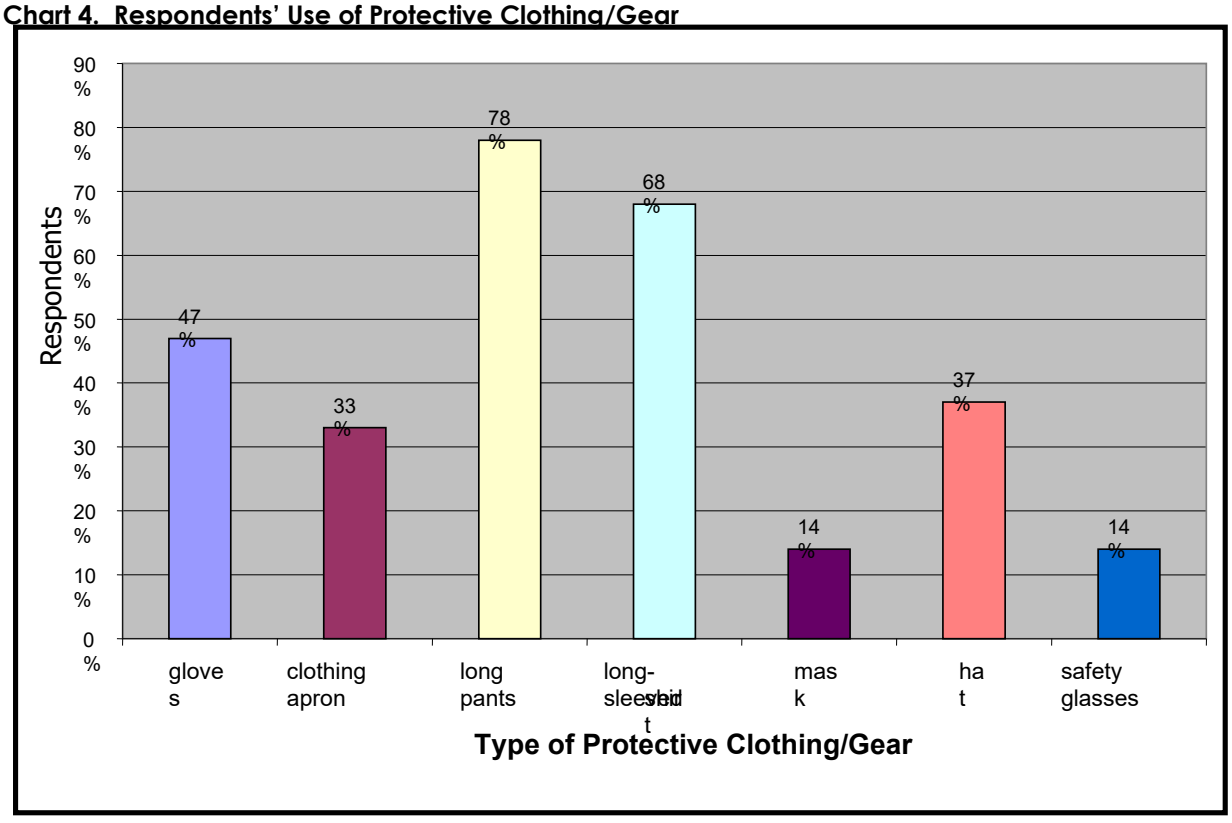
We used to live across from the packing building. When planes spread the pesticides, they were wet, but no one told us to seek shelter.

I told the news lady from channel 2 who came out to talk to me that I do believe some of my sickness is from the chemicals that were on the farm …. I was working in the carrot house and I stayed sick all the time. I had to keep going to the doctor because I just couldn't work out there. I would switch out of the carrot house and go to the field. I just couldn't deal with the wetness, the doctor told me that I had to stay out of the wetness.

When I was working in the muck, I got sick over the thing. I didn't know what was wrong, why they were spraying over me like that …. I know I was poisoned breathing that stuff (pesticides).

Although the importance of wearing protective gear is currently taught in pesticide trainings, prior to the implementation of the WPS in 1995, there was little education about precautionary measures passed on to farmworkers. The Lake Apopka workers customarily wore long pants and long-sleeved shirts as a way to protect themselves from pesticides and the elements. Gloves were not worn frequently by those picking most crops in the fields because it slowed down their pace of work and they were paid by piece rate which generally netted them very low wages, often below the hourly minimum wage. On the other hand, gloves were commonly worn by workers in the carrot packinghouse and those picking corn. Aprons wore worn (mostly by women) to have a place to collect their tickets indicating how much they'd picked that day. Chart 4 indicates survey participants' responses regarding protective gear that was worn consistently on the job.

Chart 4. Respondents' Use of Protective Clothing/Gear



Exposure to other environmental contaminants. Not only were the respondents exposed in the past to agricultural chemicals in their workplaces, but they continue to be exposed to a variety of contaminants through various exposure routes due to the multiple neighboring polluting industries and hazardous sites located in the community. These sources of continuing potential exposure to pervasive toxins in their environment include: consumption of contaminated fish and wildlife from in and around Lake Apopka; potential pesticide drift from several

nurseries located adjacent to residential areas; volatile organic compounds from nearby fiberglass and plastics manufacturing companies and other industries located within the community; two local industrial landfills; two Superfund sites on Lake Apopka; two city sewage treatment plants; and a Stericycle medical waste incinerator.

The following chart (Chart 5) indicates community members' reported consumption of different types of fish and wildlife in and around Lake Apopka, and the frequency with which they consume(d) that fish and wildlife. Previous consumption denotes prior to the closing of the Lake Apopka farms, and current consumption indicates after the farms' closure. Despite community education about pesticides, water and soil contamination, fish advisories, and the bird deaths, a high percentage of community members continue to eat the wildlife for two primary reasons: 1) they are low-income, and the wildlife is an easily-available supplement to their diets; and 2) the custom is a tradition throughout many generations in the African-American communities, and even in the Hispanic community.

Chart 5. Respondents' Consumption of Fish and Wildlife In/Around Lake Apopka

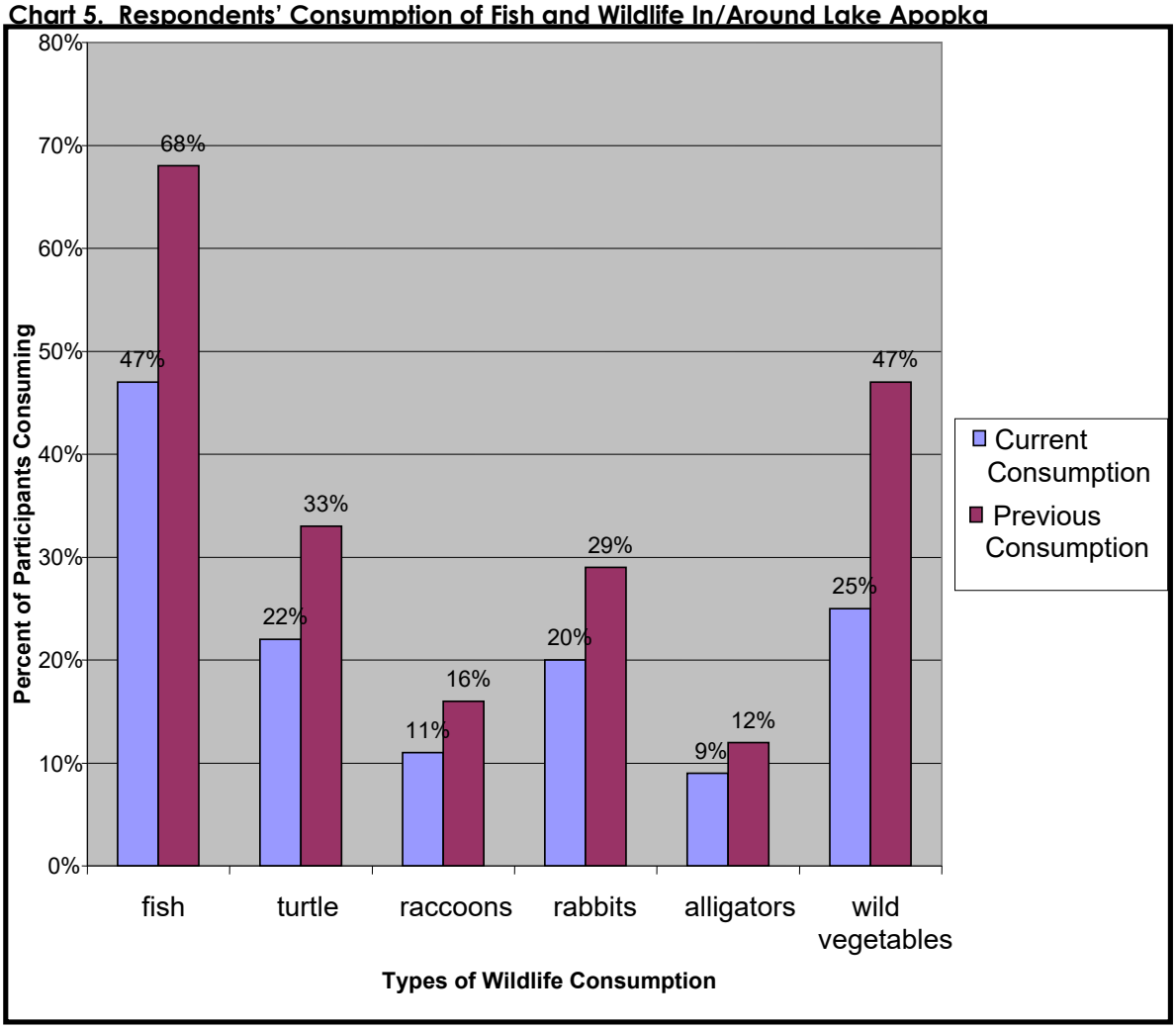
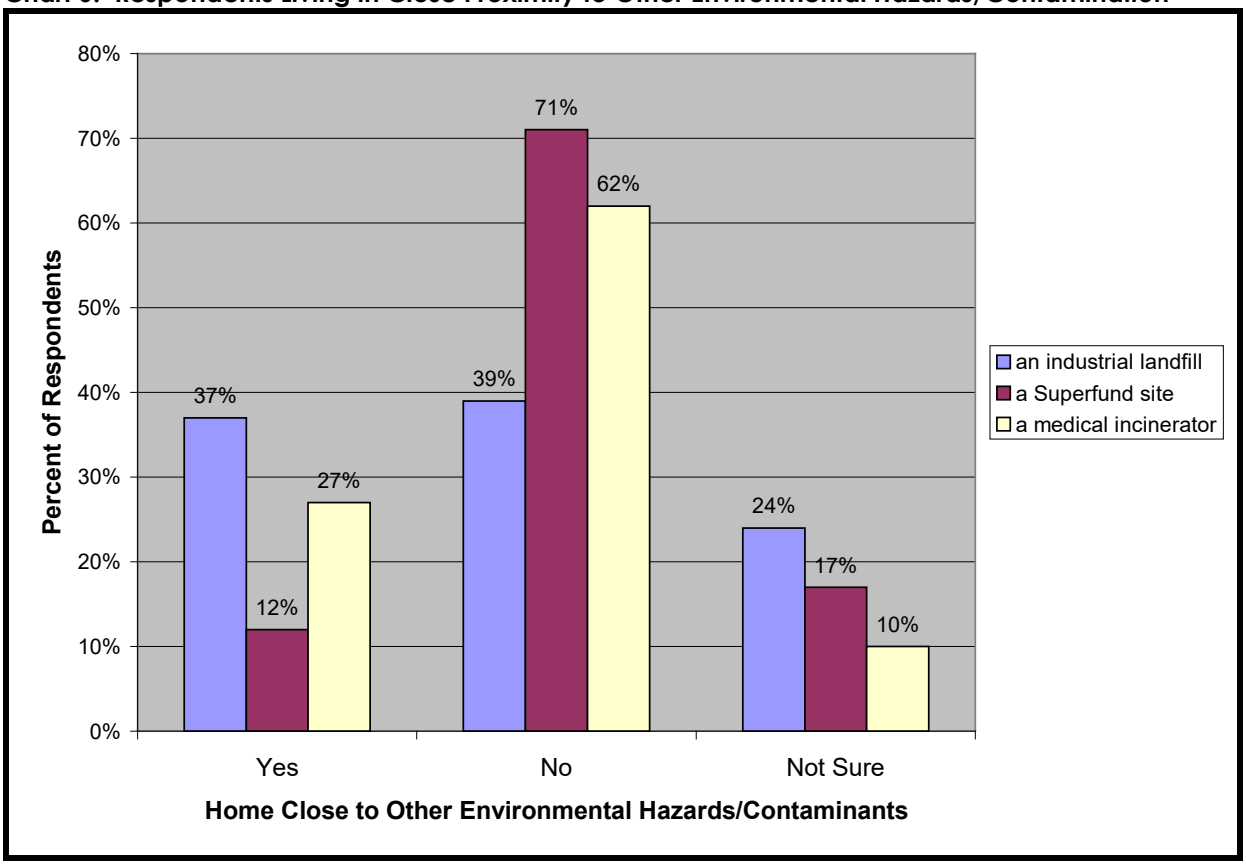


Chart 6 shows the percentage of respondents living near the landfill, the incinerator, or a Superfund Site. Positive responses may be underreported, because many participants were unsure of their proximity to these contaminated sites.

Chart 6. Respondents Living in Close Proximity to Other Environmental Hazards/Contamination



State of health. When asked to characterize the current state of their health, 83% of respondents stated that they were in either "fair" or "poor" health, as noted in Chart 7. Although 6% believe themselves to be in excellent health, when questioned further the survey revealed that nearly all nine of these respondents indicated multiple health problems. Thus, Charts 7 and 8 indicate the community's perception about their state of health, and about whether they believe that exposure to pesticides has adversely impacted their health.

Principal Investigator's comment:
The most powerful means of anthropological data collection is simply listening, without bias. Because people's perceptions of their lives are sacrosanct, some of the most important questions on the community health survey are those about how respondents feel about the current state of their health. Profoundly, over 80% of participants answered that they were either in fair or poor health. People's perceptions of their lives are the personal construct of their life experience within a particular cultural milieu; therefore, it is vitally informative that a large majority of the studied community believes themselves not to be physically well.

Chart 7. Self-Identified State of Health

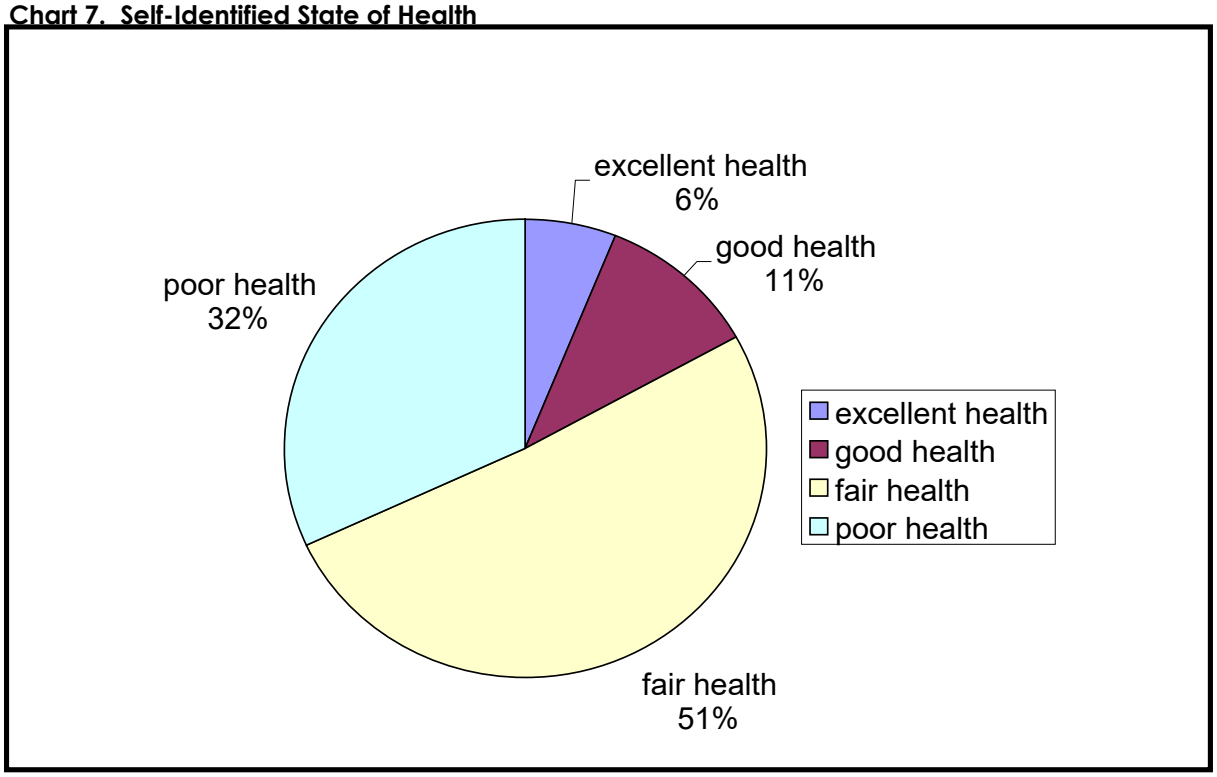
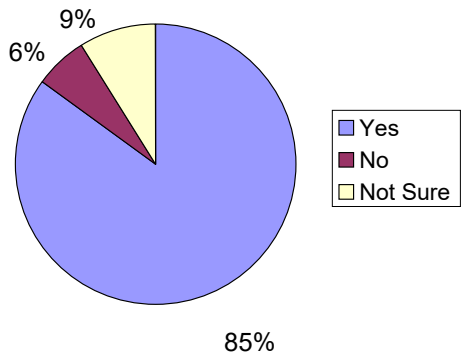
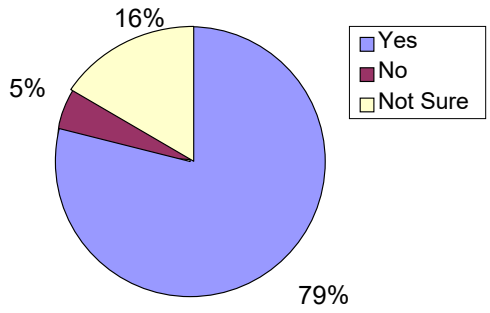


Chart 8. Community's Perception of Connection Between Pesticide Exposure & Health Problems

8a. Respondents Who Feel Their Exposure to Pesticides Has Affected Their Health



8b. Respondents Who Feel Their Exposure to Pesticides Is Directly Related to Their Current Health



Unfortunately, current scientific studies have fallen short of establishing conclusive correlations between exposure to specific pesticides over long periods of time and particular human health outcomes. The data collected from this survey suggests that cumulative exposure to pesticides over a period of time can potentially be implicated in long-term human health effects. However, due to the lack of corroborated scientific support, doctors are hesitant to make definitive links between pesticide exposure and health problems of farmworkers. Often, health care providers in the Apopka area do not even ask questions about occupational history or consider occupational exposure to chemicals when treating a patient, as documented in the Together for Agricultural Safety Project's ***Health Care Provider Interview Summary 2000***. In fact, most physicians, and other health care personnel, reported that they did not know about Florida's required reporting procedures for cases of suspected or confirmed pesticide poisoning. There is a lack of training on the diagnosis, treatment, and reporting of pesticide exposure for health care professionals in agricultural areas.

Respondents' comments (excerpted from taped interviews):

Before working there (Lake Apopka farms) I was healthy.

No, I did not go to a doctor. I did not know that I was working in something so deadly. I did not know that I would have all these aches and pains.

My husband and I have been seriously affected by our exposure to pesticides, working on the farms at Lake Apopka.

It was hard work and everybody in my family seemed to be sick one way or the other.

I was a healthy man. I am sure pesticides hurt my feet.

I can't tell if I have fair health or poor health. The only thing I know is that I'm hurting all the time and it did not come until I worked on the Lake Apopka farm.

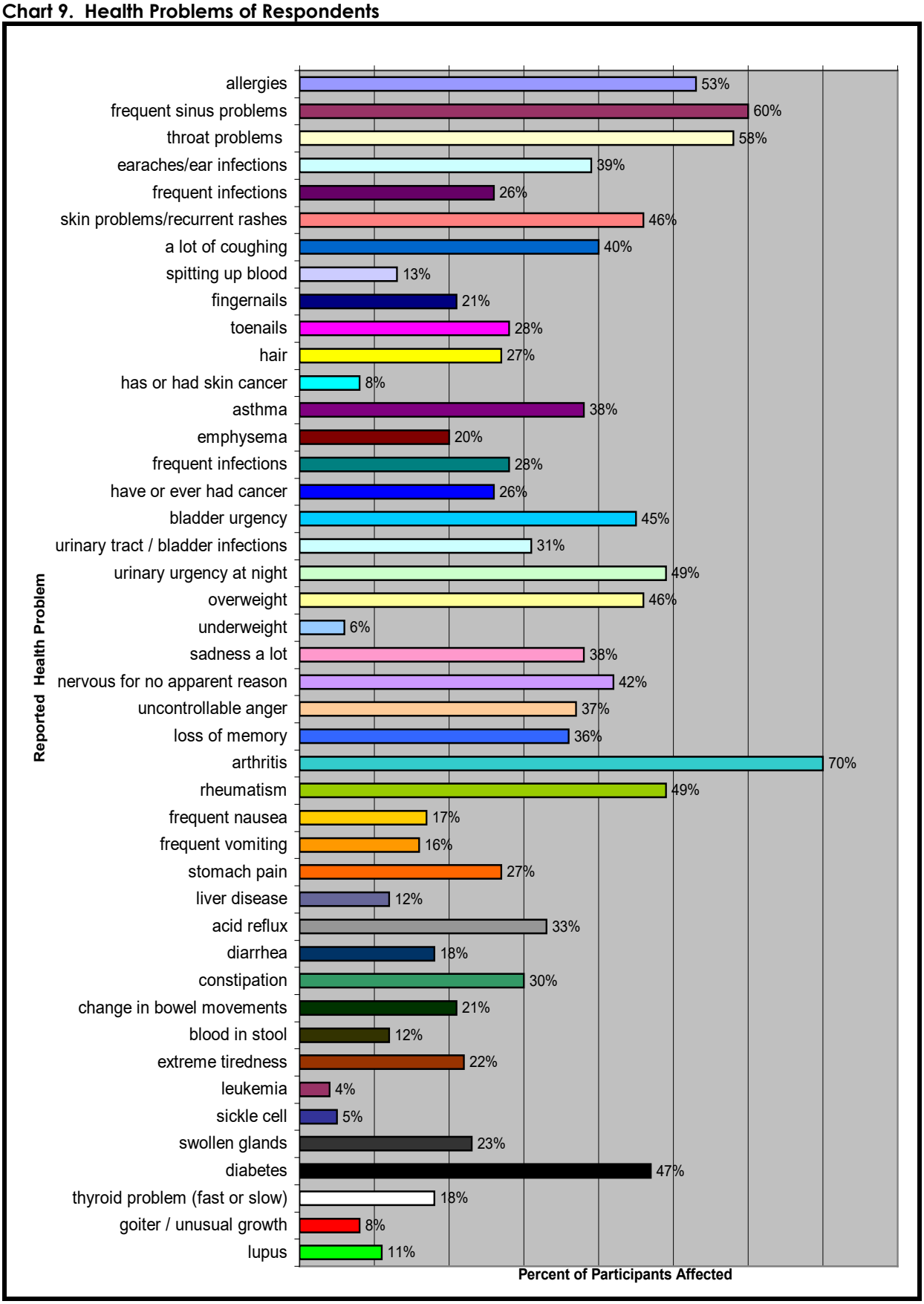
My health started to fail when I worked on the (Lake Apopka) farm.

My Daddy died on that muck, he was ate up with cancer.

I do believe that my children have the effects of the chemicals in their systems.

General health problems. The responses related to health problems detailed in the following chart (Chart 9) reflect the respondent's household, rather than solely the individual worker. For example, a respondent may have indicated that his/her son has asthma. Because the community has identified multiple health problems among farmworker children and grandchildren, the survey focused on farmworker families/households, not just individuals.

Chart 9. Health Problems of Respondents



Lupus. The African-American former Lake Apopka farmworker community has expressed concern that the rate of Lupus in the area may be higher than average. Although Chart 9 indicates 11 % of respondents live in homes where one or more persons have Lupus, the actual number of family members/housemates with Lupus reported in the survey was 22 out of 148 households, which is 14.8%.

Lupus is an auto-immune disease that can be very debilitating for its victims. In 1998, the Greater Florida Chapter of the Lupus Foundation of America established a local office in Apopka because more and more people in the area were being diagnosed with the disease. Though a blood test can determine the presence of the disease, it is difficult to make an initial diagnosis, because many of the symptoms of Lupus mimic those associated with other diseases. Lupus is sometimes referred to as "the disease with 1000 faces." Precursor symptoms to those of Lupus are headaches, severe fatigue, weight gain or loss, hair loss, high blood pressure, and changes in color of the fingers in the cold. Skin rashes are a common symptom of Lupus, as is joint pain, which is often misdiagnosed as arthritis or rheumatism. Extreme fatigue, chest pain, swelling of the feet and legs, and weight gain are, also, symptoms of the disease.

People that have Lupus often go years, at great expense of their time and money, suffering from a variety of ailments, before they are tested for and given a conclusive diagnosis of Lupus. Farmworkers that may be suffering from these common symptoms, do not have health insurance to pay for the necessary doctor's visits and testing to determine the cause or nature of their illnesses. Additionally, specialists that can diagnose and treat Lupus are not readily available at the local health clinics that the community customarily accesses.

Medication. Most of the respondents experience multiple barriers, such as financial, transportation, and/or language difficulties, that further contribute to their health care disparities. The fact of the community's pervasive exposure to toxic agricultural chemicals and other contaminants in their environment must be considered along with the other circumstances of their living situation, including the general lack of: health insurance; access to quality, affordable health care and trained medical specialists; and the financial means and/or resources to purchase necessary medications. Chart 10 indicates the percentage of respondents taking prescription medications for particular illnesses.

Chart 10. Respondents Taking Doctors' Prescriptions

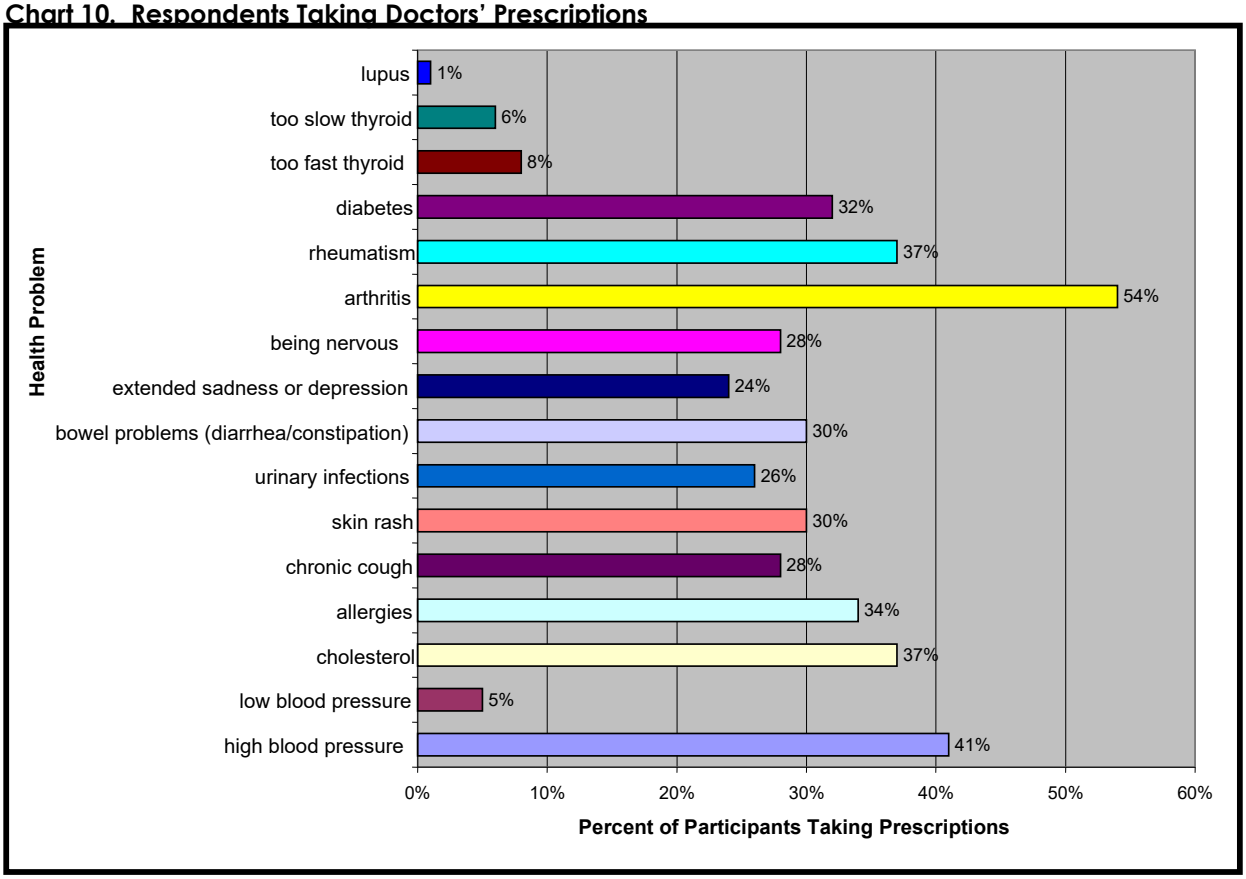


Chart 10, showing prescription medication use, compared to Chart 9, indicating reported health problems, demonstrates that many people are not taking prescription medications to treat the illnesses from which they are suffering. For example, 18% of respondents have one or more persons in their home with a thyroid problem, but only a combined 14% of respondents reported taking prescription medication for the problem. Also, 11% of the households have one or more persons in the home with Lupus, yet only 1% of the respondents reported access to appropriate prescription medications to treat the disease. The high rate of usage of prescription medicines for such health problems as high blood pressure, cholesterol, allergies, arthritis, rheumatism, and diabetes is indicative of the community's poor health overall.

Health Problem	Respondents suffering from this ailment	Respondents taking prescription for ailment
Arthritis	70%	54%
Throat problems	58%	for chronic cough 28%
Coughing	40%	
Allergies	53%	34%
Rheumatism	49%	37%
Diabetes	47%	32%
Skin problems/rashes	46%	30%
Thyroid	18%	14%
Lupus	11%	>1%

In addition to the disparities between those suffering from throat problems (58%) and coughing (40%) and those taking prescription medicine for chronic coughing (28%), more than 56% of respondents reported that they *regularly* take some form of over-the-counter cough medicines (syrup or cough drops). Similarly, while 46% of respondents indicated on-going problems with skin rashes and 30% use a prescription for skin problems, more than 49% of respondents reported that they *regularly* use over-the-counter creams to treat skin rashes.

Reproductive health problems. Charts 11, 12, & 13 depict respondents' experiences with the following reproductive health problems: birth defects, problem pregnancies, and problems with conception. Some participants did not want to answer questions about their reproductive health because of the sensitive nature of the questions. This reluctance on the part of some respondents may have resulted in some of the figures being underreported.

Chart 11. Respondents who Have Children Born with Birth Defect(s)

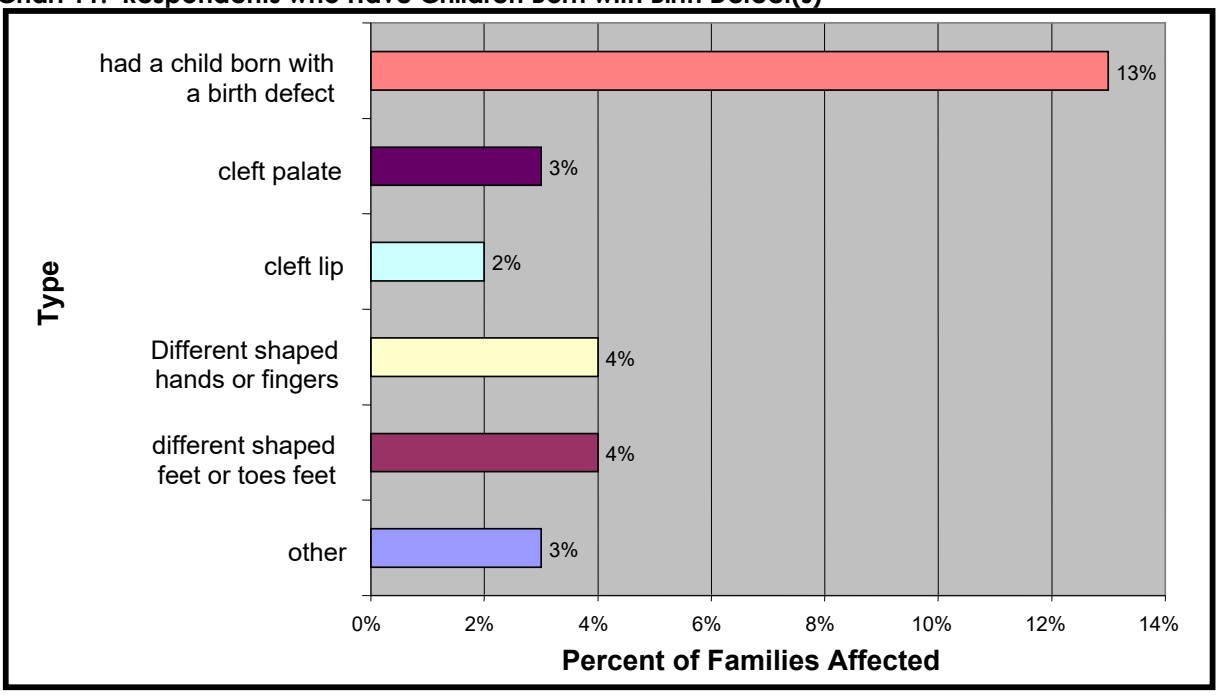


Chart 12. Respondents With Problem Pregnancies

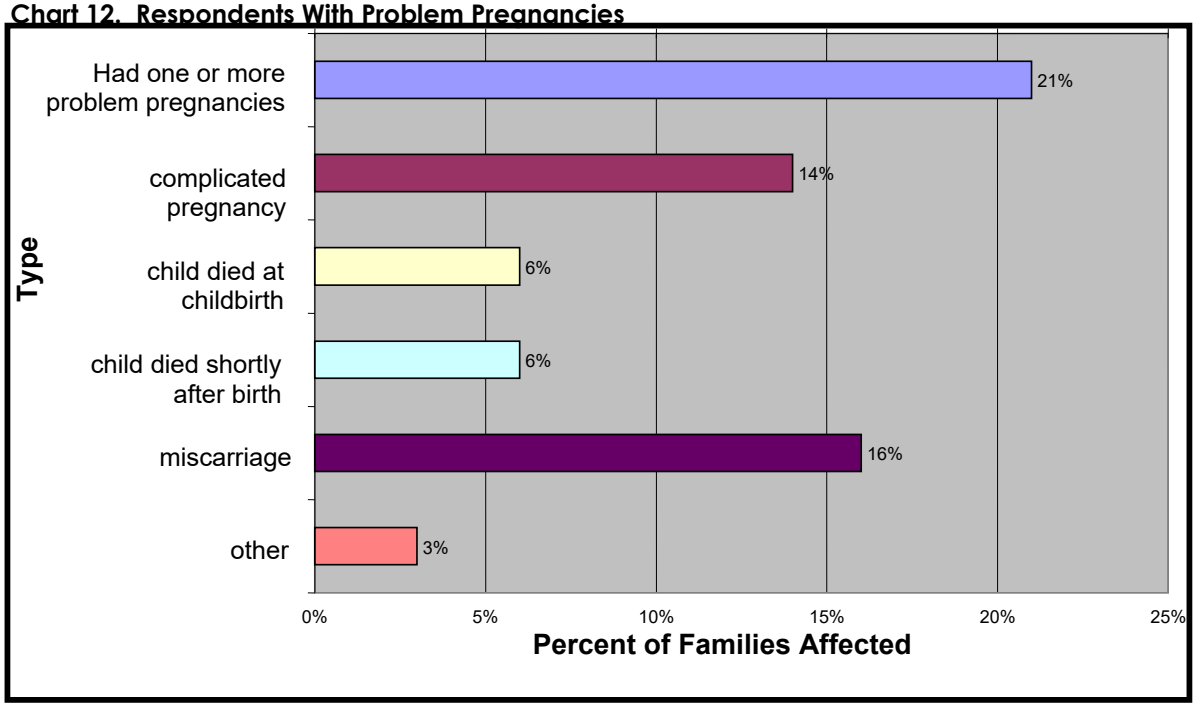
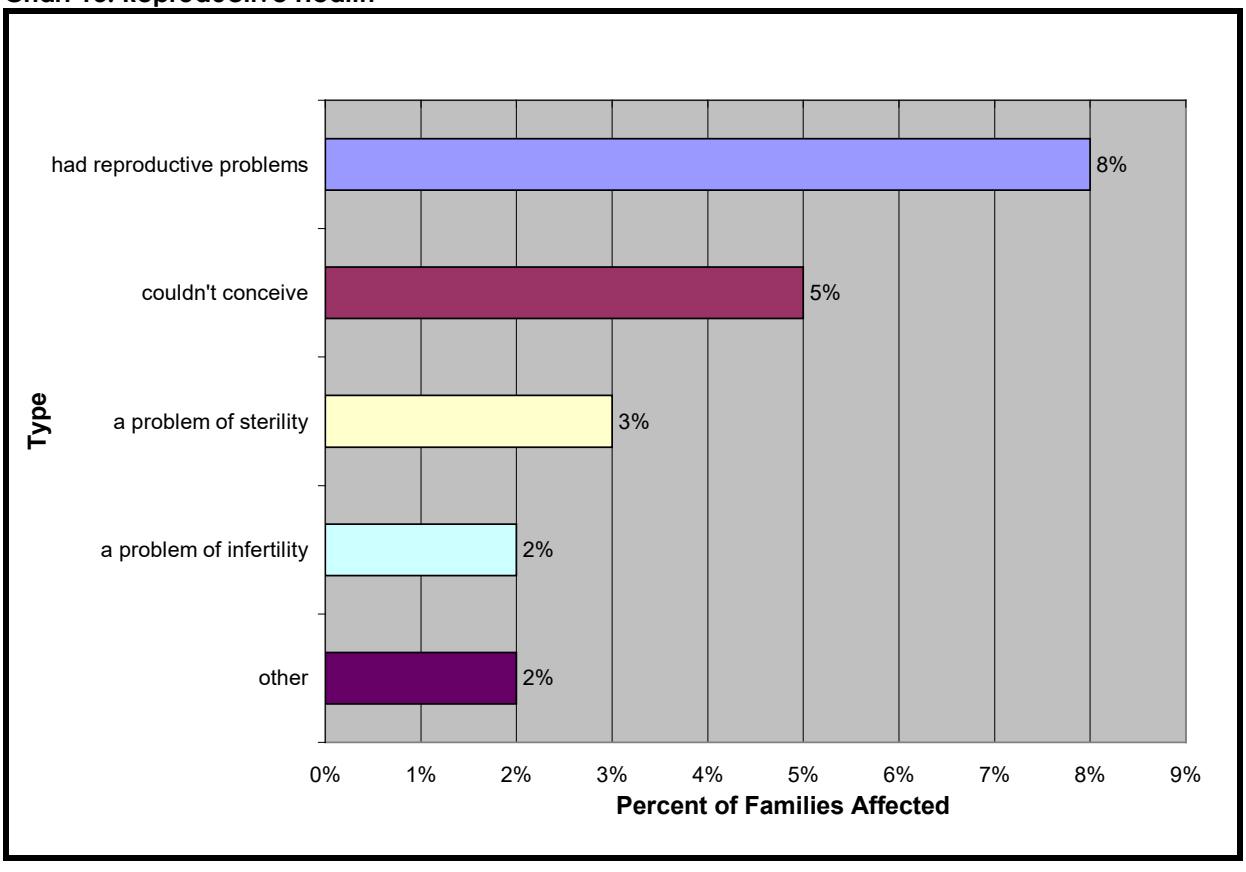


Chart 13. Reproductive Health



A non-profit organization, Birth Defect Research for Children, has done comprehensive studies of birth defects in concerned communities across the

country. Their surveys indicate elevated rates of birth defects related to environmental exposures of the mother and/or father to differing types of contamination and/or pollutants. Additionally, three high-profile and recent, widely-publicized cases of birth defects in babies born to mothers working on the same farm in Immokalee, Florida, only serves to emphasize the need to research this area in greater depth.

Yet, Florida has lagged behind the curve in tracking, documenting, and investigating the incidence of birth defects in the state. In 1996, the state Department of Health received a grant to implement a statewide birth defect registry. Only recently has the registry made its data available to the public. In spite of this, any detailed analysis on the number of birth defects recorded and possible links to environmental influences is lacking. Florida is the third largest agricultural state in the country, with a correspondingly high rate of pesticide application. Tracking of birth defects in relation to environmental exposures of both mother and father has yet to be investigated.

Cognitive health problems. A great concern to the farmworker community is whether their exposure to workplace chemicals has had multi-generational effects, in particular effects on the cognitive abilities of their children. Charts 14 and 15 indicate the number of respondents who have children with learning disabilities and the number of respondents who have grandchildren with learning disabilities. The learning disabilities reported by the respondents include Attention Deficit Disorder, inability to read or write, slow learning, speech impairment, confusion/inability to comprehend, and hyperactivity. More than 75% of the cases documented through the surveys were diagnosed by physicians, teachers, and other school personnel; the remaining were assessed by parental observation.

Chart 14. Respondents Who Have Children with Learning Disabilities

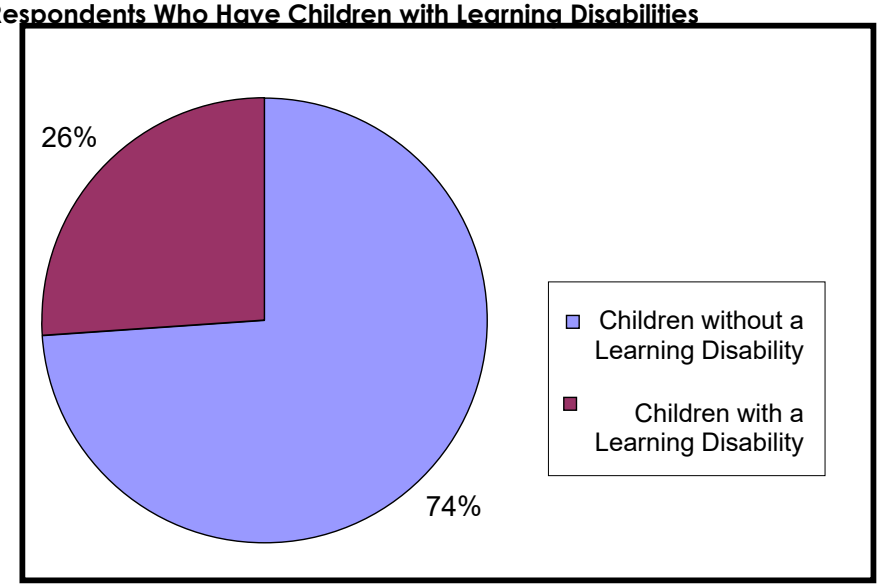
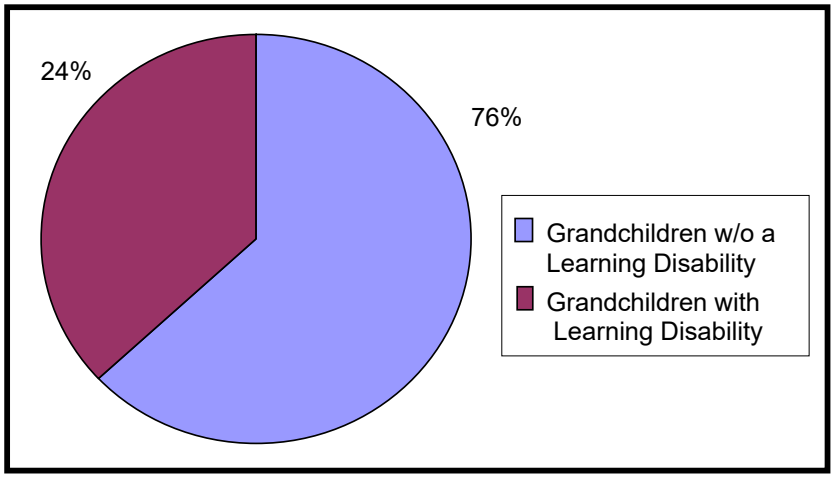


Chart 15. Respondents Who Have Grandchildren with Learning Disabilities



Principal Investigator's comment:
The results of the survey questions about learning disabilities demonstrate a disturbingly high propensity of former farmworkers to produce learning disabled children. The former farmworkers of Lake Apopka have a noticeably high proportion of their children and grandchildren showing demonstrative behavior that is formally diagnosed as learning disabled. Of all households queried, a full 26% report at least one learning disabled child in residence. A significant number of children are challenged in the fundamental cognitive areas of reading, writing, and/or speaking.

The results of our survey also demonstrate a frightening multi-generational trend. Of all households surveyed, 24% report at least one learning disabled grandchild. That statistic nearly mimics our findings of learning disabled children. Further, out of all households with grandchildren, a stunning 37% report at least one grandchild with a learning disability.

Deaths. One area of information missing from this project is the number of former Lake Apopka farmworkers who have died, prior to, during, or after the closing of the farms, their ages at the time of death, and the cause of death on record. This is significant information that warrants further investigation. Anecdotal accounts from community members suggest a high mortality rate of former farmworkers, in addition to, a notable number of severely disabled former workers who might not have been in a position, due to serious health problems, to undergo the survey interview process. Valuable data sets, therefore, could be missing that would lend further weight to any conclusions about health impacts that might be drawn as a result of this survey. Any future health study of former Lake Apopka farmworkers should include analysis of the records of the deceased.

Conclusion. The ***Lake Apopka Farmworkers Environmental Health Project*** arose out of the need of the community to be heard and for their health concerns to be addressed. These concerns emanated from two sources: 1) People's direct experience and observations of friends, family, co-workers, and themselves who appear to be suffering, at unusually high rates, from a variety of illnesses, diseases,

and recurring health problems; and 2) The unprecedented bird mortality in the community which was eventually definitively linked to organochlorine pesticides on the farm fields to which the farmworkers themselves had been exposed during their working careers. Much research time and money went into identifying the causes of the bird deaths, yet there has been no comprehensive study of the health effects on farmworkers. This is an imbalance and injustice that needs to be rectified. For years, multiple requests to local, state, and national government agencies to conduct an assessment of Lake Apopka farmworker health went unheeded. With this project and report, it is hoped that some of the people's concerns may at last be heard and addressed. Ideally, this project will generate increased interest in the community's concerns leading to constructive actions that will improve the health of individuals and of the community as a whole.

The results of this community health survey raise many questions: How many community members may be suffering from diseases that have gone undiagnosed? Which illnesses can be linked to pesticide exposures or immune system suppression due to exposures over long periods of time? What part do organochlorine pesticides play in the health problems of this community? Have endocrine-disrupting chemicals had an impact on the second or third generations of farmworker families? What cumulative and synergistic impacts have exposure to the various agricultural chemicals had on the community's health overall? What health hazards have these farmworkers endured to enable us to have an affordable and reliable food supply?

These are just some of the questions raised by this report. One conclusion that we can draw is that more study needs to be done. Fifty years of providing food for the people of this country should be repaid by focusing attention on the health needs of this hard-working group of people. We recognize that there is no easy solution to the complex health problems experienced by the former Lake Apopka farmworkers. However, our collective hope is that, through the release of this document, enough effort and resolve will be generated to undertake significant and positive next steps to assist the community in their quest for answers regarding their health. With that in mind, we submit the following recommendations.

PROPOSED ACTIONS NEEDED TO ADDRESS THE IDENTIFIED PROBLEMS IN THE LAKE APOPKA FARMWORKER COMMUNITY

Though the causes and sources of people's illnesses are of significant importance in the long term, the most pressing and immediate issue of concern for the former Lake Apopka farmworker community is their current state of health. In the eight years since the closing of the farms on Lake Apopka and the devastating bird death incident that followed, there have been no actions, interventions, or other efforts on the part of state and/or local government to address in any comprehensive way the community's actual and/or perceived health problems. Aside from a recommendation in 1999 that individuals refrain from eating large quantities of Brown Bull-head Catfish from Lake Apopka, there has been no outreach to this population to even determine the nature and extent of illness and disease that they are experiencing. The following is a list of actions and/or steps, arising out of the results of this work, that are herein proposed to be undertaken by appropriate agencies in order to remedy the years of neglect that this community has experienced.

Actions to Address the Health Needs of the Lake Apopka Farmworker Community

- Improve the accessibility of the community to local health care clinics and local health department facilities including:
    - shorter waiting times for appointments
    - financial assistance for those unable to pay even minimum fees
    - increased availability of specialists to address people's specific health needs, such as, dermatologists, rheumatologists, endocrinologists, and auto-immune specialists
    - reliable and consistent sources and resources for obtaining critical prescription medications (blood pressure and diabetes medications, for example)
    - improved diagnosis of diseases, including requiring a questionnaire about work history within the medical history requirements
    - access to timely testing to improve disease diagnoses and health care treatment
    - availability of transportation alternatives for those with serious mobility issues

Develop and conduct a comprehensive community health study of the former Lake Apopka farmworkers to look at both the health of adults and the incidence of health problems in their offspring, and to test participants for body burden levels of toxicity. Any such study should include input from the community and have two clear objectives

- to determine the extent and nature of chronic and acute illness and disease present within and among this community,
- to explore the relationship between exposure to environmental toxins and the community's health, both individually and intergenerationally.

- Conduct more targeted testing and monitoring of soil, well water, groundwater, and air pollutants in South Apopka, and in the surrounding communities, especially those adjacent to Lake Apopka. Report these results to the community. Clean up areas of contamination.

- Develop an educational and outreach campaign specifically designed for this community to:
    - meet as frequently as necessary with concerned community members to respond to their questions and health concerns, and work together to resolve problems
    - to inform them of their health care options
    - to discuss preventative and treatment measures, and to open frank and honest dialogue between health care providers and community residents
    - improve communication at all levels with the goal of improving health care outcomes

PROPOSED CHANGES NEEDED TO ADDRESS THE GENERAL HEALTH OF FARMWORKERS

Based on the survey data collected, anecdotal stories of health problems, and more than 20 years of experience working with various farmworker communities, we make the following recommendations to improve overall farmworker health:

Health Education/Training

- Ensure better training for health care providers in agricultural areas on the detection, treatment, and reporting of pesticide exposure and pesticide-related illnesses.
- Allocate more government dollars to grants to community-based organizations to conduct health outreach and pesticide trainings with farmworkers.
- Improve employer-provided training, in appropriate languages, about pesticide safety for farmworkers and pesticide applicators. Trainings should be conducted by independent persons or groups where possible, to prevent conflict of interest.

Health and Agricultural Practices Research

- Fund more scientific health studies of farmworker populations, focusing on the cumulative and synergistic effects of pesticide exposure, as well as the physical and cognitive multigenerational effects of chronic pesticide exposure.
- Strengthen farmworker housing regulations, and implement more stringent requirements when housing is on the site of or neighboring farms/fields.
- Increase research into sustainable agriculture practices.

Increased Enforcement of Farmworker Protections

- Increase enforcement of the laws protecting farmworkers, through the hiring of a sufficient number of state agricultural inspectors, in order to adequately monitor facilities throughout the state, and to impose greater penalties for violations of those protections when they occur.
- Allocate more government dollars for enforcement of farmworker health and safety protections.
- Conduct farm inspections without giving prior notice to farm operators.
- Impose greater restrictions on the water, air, and soil pollution caused by farming.
- Enforce implementation of the WPS provision that information about workplace chemicals be provided to farmworkers, in the appropriate language and in a format that they can take to their health care provider.
- Improve re-entry interval signage appropriate for illiterate workers.

Other

- Conduct independent evaluation of pesticides' effects on the environment and human health, prior to their authorized use.
- Implement a tax on agricultural pesticide manufacturers and consumers to be used for training, research, and enforcement to protect farmworkers.
- Revise zoning laws so that residential areas are not so close to polluting industries and environmentally-contaminated sites.

APPENDIX A

Background on Lake Apopka Farms and the Farmworker Community

Lake Apopka Farms. For over half a century, the north shore of Florida's fourth largest lake, Lake Apopka, was cultivated for the agricultural production of vegetables, including corn, carrots, cucumbers, radishes, and lettuce. During World War II, in an effort to increase crop production to support the war effort, the northern marshlands of the lake were drained to expose the rich muck soil bottom. A series of dikes and levees was constructed to separate some 20,000 acres of land from the lake itself. Water from the lake was pumped on to the fields for irrigation purposes and then, back into the lake to keep the water from flooding the cultivated fields. Thus, crops that were planted in this fertile soil were grown on land that was actually below the normal lake level. In the 1950's, the lake was so healthy that it was considered one of the premier bass fishing lakes in the country. However, the alternating cycles of flooding and draining of the fields with lake water resulted in decades' worth of run-off of fertilizers and pesticides. The result was that Lake Apopka became noted as the state's most polluted large body of water.

Public pressure to clean up the lake began as early as the late 1960's. Algae blooms in the phosphorous-rich water gave Lake Apopka its notorious pea-green color, but the color was just the visible symptom of a lake ecology that had drastically been altered. By the 1980's, the once-abundant bass population was gone, and in its place was a burgeoning population of shad, generally considered a "trash" fish. Recreation on the lake had virtually come to a halt, and the former tourist industry had gradually disappeared. Though many different solutions were proposed to clean up the lake, none were economically feasible and the lake continued to deteriorate. Finally, in the 1980's, the St. Johns River Water Management District (SJRWMD), the government agency charged with oversight of the water body, implemented a pilot Marsh Flow-way Project in an effort to address the problem. The District converted former farm land into a man-made marsh to serve as a filtering system. Lake water was pumped into the flow-way, and the natural filtering processes served to rid the water of the suspended phosphorous particulates. At the end of the cycle, cleaner, filtered water was pumped back into the lake. The pilot project was considered successful, allowing for construction of the full two-stage project to go forward. The Marsh Flow-way Project, once completed, is projected to "recycle" the total volume of lake water through the flow-way system twice yearly.

In addition to the Flow-way project, the SJRWMD imposed stricter regulations on the farming operations in an effort to reduce the nutrient load to the lake. A combination of this pressure on the farmers, growing public impatience for a solution to the lake's problems, and the increased visibility of this local dilemma, led to the passage of legislation for the allocation of state monies to purchase the farmlands on the lake. In 1996, then Governor Lawton Chiles signed into law the Lake Apopka Restoration Act, with a mandate to the SJRWMD to pursue land purchases from the growers. By the end of two years, with a combination of state and federal monies totaling over $100 million, the District had acquired most of the 15,000 acres of farmland that were to be included in the restoration project. Farm owners, that had originally obtained their lands for dollars on the acre, received millions of tax-payer money for the land, equipment, and buildings from which they had profited for years.

The SJRWMD conducted environmental analyses on the farm lands prior to completing contracts with the farmers. A. Duda & Sons Farms, the first to be purchased, incurred significant costs in environmental clean-up in order to comply with the standards that were set by the District. The other growers, seeing this, negotiated with the agency for

contracts that set financial limits to the amount of clean-up costs for which they would be responsible.

The End of Farming. May 31, 1998 was the official culmination of farming on Lake Apopka. After 50 years of the seasonal cycle of planting, harvesting, and packing of produce, all cultivation of crops came to a halt. Workers, who earned a living from these farming operations for years and even generations, lost their livelihoods and some, who lived in company-provided housing, even lost their homes. The Farmworker Association of Florida began working to address the needs of some 2,500 Lake Apopka farmworkers in 1996 with the passage of the law. In multiple meetings and conversations with local and state agencies and officials, FWAF was finally able to advocate for a retraining/re-employment program which was implemented in the summer of 1998. Later, through the Federal Relocation Act, the organization was able to help secure relocation assistance for some 70 farmworker families. However, farmworkers' concerns were soon to change focus in the winter following the farm closures.

Bird Mortality. Altering the decades-old pattern of flooding in the summer and draining of the fields in the winter, the SJRWMD, in the winter of 1998, flooded portions of the purchased farm lands for the purpose of attracting migrating water fowl. That winter, the Audubon Society's Annual Christmas Bird Count on Lake Apopka tallied the largest number of migrating birds ever recorded at an inland location. However, it was also during these birding trips that participants began to notice dead and dying birds. What followed was one of the worst bird death disasters in recorded U.S. history. By the end of the winter, over 1,000 fish-eating birds had died, including Great Blue Herons and Bald Eagles, with the majority being White Pelicans. Local, state and federal agencies were mobilized into action, and the fields were drained to lessen their attraction to water fowl.

Extensive soil and water testing revealed a 10-acre "hot spot" of the pesticide toxaphene on a former air strip of one of the farm lands. Toxaphene, which had been banned years earlier, was one of several organochlorine pesticide compounds that were identified in the tested bird tissue. Others included endrin, aldrin, dieldrin, DDD and DDE. The U.S. Fish and Wildlife Service (USFWS), under the Migratory Bird Act and with $1.5 million in government funding, undertook an intensive investigation that lasted for several years. Finally, in June 2001, a report by the USFWS determined that, indeed, organochlorine compounds were responsible for the unprecedented bird mortality. However, there still remained unanswered questions as to the impacts to the second generation of the birds that had survived though they had been exposed to the toxins.

Farmworker Health. Farmworkers were regularly exposed to the same chemicals implicated in the bird deaths. Yet, in all the discussion of the death of the birds, human health, specifically that of the farmworkers, was not addressed. FWAF tried to work with local agencies to enact precautionary measures for the community, who were known to continue to fish from the lake and to eat their catch. Overtures to the local health department to alert the community to avoid the lake and its environs were not acted upon for eight months. And, then, the action was inadequate at best. The health department issued a statement discouraging people from eating too many Brown-bullhead catfish, as their assessment was that other fish from the lake did not pose a threat to human health.

Fishing was and continues to be a food source for farmworkers and other people in the communities surrounding Lake Apopka. In general, the traditional way of preparing their catch included use of the whole fish. Toxins are stored in the fatty tissue of most organisms. This becomes significant if farmworkers, who were exposed to pesticides in

their work environments, then risked further impacts to their health through the consumption of fatty tissue in both fish and wildlife. Though any single mode, method or dosage of exposure may not prove a health risk, the combination of factors increases the body burden of chemical contamination that can lead to suppression of the immune systems in humans.

Long concerned about the impacts of pesticide exposure on workers, the Farmworker Association of Florida, in conjunction with a university, attempted multiple times to secure funding for a comprehensive health study with the former farmworkers. To date, such a study has yet to be funded. Thus, many pressing questions still remain and farmworkers' health concerns and health problems continue to go unaddressed.

Sources of Contamination. For years, clean-up efforts on Lake Apopka focused on the phosphorous content of the lake. However, the algae blooms from phosphorous excesses were only the most visible of the lake's problems. Two Superfund sites are located in the vicinity of Lake Apopka. The Tower Chemical Company superfund site, a 30-acre site on the south shore of Lake Apopka at Gourd Neck Springs, is notorious for a chemical spill that released DDT into a wetland adjacent to the lake. In 1980, the EPA investigated the site and determined that there had been significant contamination to both surface water and ground water. The Drum Chemical Company Superfund site, on the north shore of the lake and across from the farm land, is a site of chemical contamination, resulting from the commercial operations of the cleaning of pesticide drum containers. To date, both sites have been only partially remediated and are being periodically monitored by the EPA. In 1999, monitoring wells at the Drum Chemical Company Superfund site indicated movement of a plume of contaminated groundwater below the site.

Alligators and Lake Apopka (Endocrine Disruption). Researcher, Dr. Louis Guillette, of the University of Florida, was also interested in Lake Apopka. His research on alligators on the lake, beginning in the late 1980's and into the 1990's, uncovered disturbing data. Reproductive rates of alligators on the lake were far below that of similar alligator populations on pristine Lake Woodruff. Even more startling were the genetic abnormalities he was finding. Male alligators with elevated estrogen levels and stunted sexual organs, female alligators with abnormal hormone levels, and genetic mutations of both males and females were at statistically high levels in the alligator populations he studied. Continued research led him to conclude that breakdown components of DDT – DDD and DDE – were implicated in the mutations and abnormalities. His work became one of the seminal pieces of research in the ever-unfolding evidence of the impacts of hormone-disrupting or endocrine-disrupting chemicals in our environment and on the health of wildlife.

Our Stolen Future, a renowned book by Theo Colborn, Dianne Dumanoski, and John Peterson Myers is a chronicle of similar findings in wildlife colonies around the world. Endocrine-disrupting chemicals mimic hormones in the body and link to receptor cells, fooling the body and activating certain hormonal reactions. Many organochlorine pesticides are included in the category of endocrine-disrupting chemicals. It is significant to note that endocrine-disrupting chemicals impact the offspring of individuals that have been exposed.

Other Relevant Research

Pesticide Studies on Children in Mexico. Until very recently, few, if any, studies explored the impacts that pesticides have on human health. During the late 1990's, Dr. Elizabeth Guillette conducted an innovative study on Yaqui Indian children in a rural area of Sonora, Mexico. Two populations of the same tribe of people lived in two very different

environments. One community lived in the valley and worked in farm fields in which pesticides were regularly applied. The other, genetically similar, community of people lived in the mountains in a relatively pristine environment. Working with the children in each community, Dr. Guillette devised a series of games to test the children's cognitive abilities and motor skills. The results were dramatic. Children who had been in the exposed environment performed distinctly poorer on all tests, including the drawing of human figures. The mountain children were not only able to perform all tasks more rapidly and better, but the figures they drew, unlike their valley counterparts, looked more like humans, with eyes, arms, legs and hair.

Students' Project. In 2005, following Dr. Guillette's guidance, two students from Lake Brantley High School in Orlando undertook a school science project based on Dr. Guillette's study of the Yaqui children. Working in the Apopka area, they initially conducted a screening of parents that led to a grouping of participants into four categories. One category included children whose parents had worked for five or less years in agriculture; the second category was children whose parents had six or more years of employment in farm work; the third group included children whose parents consumed fish and/or wildlife from in or around Lake Apopka; and the fourth group served as the control, with no known exposures. The high school students played similar games with the more than 30 children, ages 3-5, in the study. The age limits of the children involved in the project were decided in order to control for influences that attending school might have on behavior.

Their results were dramatic and clearly observable, and corroborated those of the study conducted by Dr. Guillette. Children of parents who were subject to the greatest risks of exposure to pesticides because of their length of time working in agriculture not only had slower response times to activities engaged in, but were less able, when asked to draw figures of family members, to make drawings resembling humans. The statistics demonstrated the disparities in the abilities of the children whose parents were subjected to the greatest exposures in their workplaces compared to those who had no known exposures.

Relevance to Lake Apopka. The results of Dr. Guillette's study and the students' science project raise some alarming questions with relevance to the Lake Apopka farmworker community. There is evidence to support the possibility that, not only are the former workers' experiencing health outcomes that could be related to past exposures to work place chemicals and pesticides, but their children and grandchildren, may also, in turn be feeling the affects. The emerging science links endocrine-disrupting chemicals to impacts on offspring. The difficulty of studying this phenomenon is partially due to the importance of the timing of the incidence of exposure in the development of the fetus. Critical times in fetal development are more vulnerable to toxic impacts than others. Certainly, there are sufficient questions posed to warrant a critical study on the health of the offspring of the former Lake Apopka farmworkers.

In Conclusion. The majority of the agricultural production operations on Lake Apopka ended in the summer of 1998. Since then, the SJRWMD has undertaken preliminary measures to begin the lake restoration efforts. A protected tract of land on the south shore of the lake has opened to the public as the Oakland Nature Preserve. Losing its rural character, the area surrounding Lake Apopka has recently experienced a wave of unprecedented growth and development. New communities are being constructed on tracts of land that once supported orange groves. A new highway was built connecting Highway 441 to the Florida Turnpike and other points to the west. Yet, amid all the progress, there remain disturbing and unanswered questions. What is the true legacy of

the years of farming on Lake Apopka? What are the impacts on the wildlife on the lake? What long-term effects have years of pesticide and agricultural chemical use had on the health of the lake and its people? How much of the current state of health of the former Lake Apopka farmworkers and their families can be attributed, in whole or in part, to their years of work on contaminated farm lands? These are questions that need to be asked, and a community's concerns that need to be addressed. Though the news and attention that put Lake Apopka in the headlines for years has quieted down, there remains buried in the rich muck soil, a story whose pages have yet to be opened.

The Lake Apopka Farmworkers Environmental Health Project is an attempt to open a dialogue on the community's health. After years of providing food to feed a nation, the people deserve no less.

APPENDIX B

Lake Apopka Farmworkers Environmental Health Project

Hello Mr.or Ms. _____. My name is _____.

I've come today to try to understand how exposure to chemical pesticides and environmental contamination has affected our former farmworker community. This health survey is being conducted by the Farmworker Association of Florida. I wonder if you would agree to talk with me for about an hour? If you decide to help us, I will be happy to give you a food gift certificate to thank you for your time.

(If their answer is no, or if they are unsure, discontinue the interview.)

(If yes) Before we begin, I would like to hand you a copy and read our consent form. This form means that you have agreed to be interviewed and that your answers can be used as part of a public survey. Your name will be kept **absolutely confidential**.

I also want to tell you that you can change your mind about this interview at any time. For example, you could discontinue the interview today or call the farmworker's office in the future (the phone number is on the consent form) to discuss your questions or concerns with either staff member Ms. Geraldean Matthew or Sister Gail Grimes. Is that clear?

Good, now let's read the consent form. ***(Read the consent form.)*** If you agree, please sign on the bottom lines of each copy. You'll get to keep a copy and so will I.

Lake Apopka Farmworkers Environmental Health Project
Informed Consent Form

It is my job as an interviewer to listen to people in their homes as they talk about their experiences as farmworkers in the Lake Apopka area.

Thank you for participating in the **Lake Apopka Environmental Health Project**, which is conducted by the Farmworker Association of Florida. Our goal is to learn if there is any relationship between previous pesticide exposure of former farmworkers on the muck and around the lake, and people's current health conditions. Hopefully, this work will lead to a local health care system that is more knowledgeable about farmworker health problems.

If you decide to help out, the following will happen:

1. You will be asked to participate in a tape-recorded interview.

2. You may ask me any questions about the study or your part in it at any time.

3. Your name will not be on the survey in any place. I will, however, write and tape record your answers as part of a large survey whose results may be shown to the public. Remember, I won't use your name.

4. If you change your mind about this interview and say no, you can withdraw your consent and discontinue it at any time. Even if you change your mind later about the use of this interview, let us know by calling the Farmworker Association of Florida in Apopka at 407-886-5151 and asking for either staff member Ms. Geraldean Matthew or Sister Gail Grimes.

(Note: FWAF office makes 2 copies each of this sheet.) Survey #_____

Lake Apopka Farmworkers Environmental Health Project

Participant Consent and Signature

I have reviewed the above information and have had it carefully explained to me. I understand the purpose of this study as well as my role as a participant. I hereby give my informed consent to take part in it . I understand that I will be given a copy of this form to keep.

_____ _____

Participant's name (print) Date

_____

Participant's signature

Street Address_____

_____

_____

P.O. Box_____

Phone_____

_____ _____

Interviewer's signature Date

This is to show that I have received the gift certificate for my participation.

_____ _____

Participant's signature Certificate #

Lake Apopka Farmworkers Environmental Health Project

Community Health Survey

1. Survey # _____

2. Age _____

3. Gender: a) Male _____ b) Female _____

4. Race/Ethnicity: a) African American (black) _____

b) Hispanic – b1) Mexican _____ b2) Mexican-American _____

b3) Puerto Rican _____ b4) Other_____

c) Haitian _____ d) White _____

5. How long have you lived in this house? _____

6. Who else lives in your house? *(please list)*

Name Relation Age

_____

_____

_____

_____

_____

7. Before this house, did you live nearby? Y/N _____ **Where?** _____

_____ **How long?** _____

8. When you worked on the farm around Lake Apopka, what kind of work did you do?

_____

_____

8A. What kind of crops did you work with?

_____

9. How long did you do this farm work?

_____

10. Are you working now? Y/N _____

11. ***If yes*****, what kind of work are you doing now?** _____

Survey # _____

12. Do you smoke or chew tobacco? Y/N _____ **What do you smoke or chew?**

_____

Did you used to smoke or chew tobacco? Y/N _____ **What did you used to smoke or chew?** _____

What are the total number of years you have been smoking? _____

What are the total number of years you have been chewing? _____

13. Do you drink liquor, beer, or wine? Y/N _____ **What do you mostly drink?**

_____

Did you used to drink liquor, beer or wine? Y/N _____

What did you used to drink? _____

What are the total number of years that you have been drinking? _____

Interviewer use a check mark ….

14.When you need medical attention, where do you go?

a) local clinic _____

b) private doctor _____

c) hospital emergency room _____

d) urgent care center _____

e) company nurse _____

f) local healer _____ who would that be and what is their title?_____

g) take care of it at home _____

h) other_____

15. How often do you get medical attention?

a) at least once a month _____

b) every three months _____

c) every six months _____

d) once a year checkup _____

e) only go when I don't feel well _____

f) don't go to the doctor _____

15A. *If you live with a child or children, spouse, parent, or friend or friends:*

When they need medical attention, where do they go?

a) local clinic _____

b) private doctor _____

c) hospital emergency room _____

d) urgent care center _____

e) company nurse _____

f) local healer _____ who would that be and what is their title?_____

g) take care of it at home _____

h) other_____

16. Do you get preventive checkups like:

a) mammograms? (women) _____

b) PAP smears? (women) _____

c) blood pressure check ups? _____

d) cholesterol checks? _____

e) prostate exams? (men) _____

17. Do you think you are getting good health care from whomever you see?

Y/N _____

17A. ***If not*****, why not?** _____

17B. Do you have to travel long distances for healthcare? Y/N _____

If yes, how far do you travel? _____

18. Do you feel that you are in:

a) excellent health? _____

b) good health? _____

c) fair health? _____

d) poor health? _____

Survey # _____

19. Why are you in (either excellent, good, fair, or poor) health? _____

_____

20. When you were doing farm work, did you bring home pesticide containers?

Y/N _____

20A. *If yes*, what did you use them for?

a) to hold drinking water _____

b) to hold laundry detergent _____

c) as a trash can _____

d) as a place to keep clothing or children's clothing, like underwear, socks, or other clothing? __

if yes, what types of clothing? _____

e) as a place to store food like sugar, flour, or other food? _____

if yes, what types of food? _____

g) other use _____

21. Do you or anyone in your household suffer from any of the following conditions?

a) allergies _____ *if yes*, who? _____

b) frequent sinus problems _____ *if yes*, who? _____

c) throat problems like coughing _____ *if yes*, who? _____

d) ear aches or ear infections _____ *if yes*, who? _____

e) frequent infections _____ *if yes*, who? _____

f) skin problems, recurrent rashes _____*if yes*, who? _____

22. Do you or anyone in your household suffer from:

a) a lot of coughing? _____ *if yes*, who? _____

b) spitting up blood? _____ *if yes*, who? _____

22A. *If yes*, is there a pan by the bed for spitting? Y/N **_____**

If yes, what's that experience like? _____

_____

Survey # _____

23. Do any of your farmworker relatives or friends outside of your household have these same health problems?

a) a lot of coughing _____ *if yes*, who? _____

b) spitting up blood _____ *if yes*, who? _____

23A. Do they have a pan by their bed for spitting? Y/N _____

23B. Do they have any other health problems? Y/N _____ *If yes*, what are they?

_____

23C. Could you refer them to us to participate in the survey?

_____

(Interviewer make sure the referred person worked on Lake Apopka farms.)

24. Do you or anyone in your household have problems with:

a) skin? _____ *if yes*, who and what problem?_____

b) finger nails? _____ *if yes*, who and what problem?_____

c) toe nails? _____ *if yes*, who and what problem?_____

d) hair? _____ *if yes*, who and what problem?_____

e) has or had skin cancer? _____*if yes*, who and what problem?_____

25. Do you or anyone in your household suffer from:

a) asthma? _____ *if yes*, who? _____

b) emphysema? _____ *if yes*, who? _____

26. Do you or anyone in your household get frequent infections? Y/N _____

If yes, who? _____ *If yes*, what kind of infections? _____

_____

27. Do you or anyone in your household have, or ever had cancer? Y/N _____

If yes, who? _____ *If yes*, what kind of cancer? _____

Survey # _____

28. Do you or anyone in your household have urinary problems?

a) having to go to the bathroom a lot _____ *if yes*, who? _____

b) urinary tract or bladder infections _____ *if yes*, who? _____

c) urinary urgency at night _____ *if yes*, who? _____

29. Is anyone in the household overweight? Y/N _____ *If yes*, who? _____

_____

29A. Do they have any health problems related to their weight? Y/N _____ *If yes*, what is/are the problem(s)? _____

29B. Is anyone in the household underweight? Y/N _____ *If yes*, who? _____

_____

29C. Do they have any health problems related to their weight? Y/N _____ *If yes*, what is/are the problem(s)? _____

30. Do you have children? Y/N _____

a) *If yes*, how many? _____

b) How many of your children have a learning disability? _____

c) What is the learning disability? _____

d) How do you know they have this disability or disabilities?_____

_____

31. Do you have grandchildren? Y/N _____

a) *If yes*, how many? _____

b) How many of your grandchildren have a learning disability? _____

c) What is the learning disability? _____

d) How do you know they have this disability or disabilities? _____

_____

Survey # _____

32. Do you or anyone in your household suffer from any of the following conditions?

a) sadness a lot _____ *if yes*, who? _____

b) nervous for no apparent reason _____ *if yes*, who? _____

c) uncontrollable anger _____ *if yes*, who? _____

d) loss of memory _____ *if yes*, who? _____

33. Do you or anyone in your household suffer from:

a) arthritis? _____ *if yes*, who? _____

b) rheumatism? _____ *if yes*, who? _____

34. Was anybody in the family born with a birth defect? Y/N _____

a) cleft palate _____ *if yes*, who? _____

b) cleft lip _____ *if yes*, who? _____

c) different shaped hands or fingers _____ *if yes*, who? _____

d) different shaped feet or toes _____ *if yes*, who? _____

e) other_____ *if yes*, who? _____

34A. Was there any reason given by the doctor for this birth defect(s)? Y/N _____

34B. *If* yes, what was the reason? _____

35. Do you or anyone in your household have digestion problems like:

a) frequent nausea? _____ *if yes*, who? _____

b) frequent vomiting? _____ *if yes*, who? _____

c) stomach pain? _____ *if yes*, who? _____

d) liver disease? _____ *if yes*, who? _____

e) acid reflux? _____ *if yes*, who? _____

f) other? _____ *if yes*, who? _____

Survey # _____

36. Do you or anyone in your household have bowel problems like:

a) diarrhea? _____ *if yes*, who? _____

b) constipation? _____ *if yes*, who? _____

c) change in bowel movements? _____ *if yes*, who? _____

d) blood in the stool? _____ *if yes*, who? _____

e) other? _____ *if yes*, who? _____

37. Did you and your partner have reproductive problems? Y/N _____

If yes:

a) couldn't conceive _____

b) a problem of sterility _____

c) a problem of infertility _____

d) other _____ (please explain)_____

_____

37A. Was any reason given by the doctor to explain the reproductive problems?

Y/N _____ *If yes,* explain _____

38. Did you (or your partner) experience one or more problem pregnancies?

Y/N _____

If yes:

a) complicated pregnancy _____ how many? _____ explain _____

_____

b) child died at childbirth _____ how many? _____ explain _____

_____

c) child died shortly after birth _____ how many? _____ explain _____

_____

d) miscarriage _____ how many? _____ explain _____

_____

e) other type of problem(s)? _____ explain _____

_____

38A. Was any reason given by the doctor to explain the difficult pregnancy?

Y/N _____ *If yes*, explain _____

39. Do you or anyone in your household have problems with their blood like:

a) extreme tiredness? _____ *if yes*, who? _____

b) leukemia? _____ *if yes*, who? _____

c) sickle cell? _____ *if yes*, who? _____

d) other? _____ *if yes*, explain _____

40. Do you or anyone in the household often have swollen glands? Y/N _____

If yes, who? _____

41. Do you or anyone in the household have diabetes? Y/N _____ *If yes*, who?

_____

42. Do you or anyone in the household have:

a) a thyroid problem (either too fast or too slow)? _____ *if yes*, who? _____

b) a goiter or an unusual growth? _____ *if yes*, who? _____

43. Do you or anyone in your family suffer from lupus? Y/N _____

If yes, who? _____

Survey # _____

44. Were you exposed to pesticides or chemicals where you worked?

Y/N _____ Not sure _____

44A. In what way(s) were you exposed to pesticides or chemicals in the workplace?

Interviewer: read entire list, check all that apply.

a) Being sprayed by an airplane or drift from its spray _____

b) Entered an area after not being informed it was sprayed _____

c) Touched plants that were wet, or worked in the fields where plants were wet from pesticides, morning dew or rain _____

d) Through hands/skin lacerations _____

e) By not washing hands _____

f) When planting, potting or replanting _____

g) Through smell, breathing in, poor indoor ventilation _____

h) Washing/cleaning plants/ trees/ crops _____

i) Unpacking plants or cuttings _____

j) Pesticides drift into where you live _____

k) Other _____

l) Don't know _____

44B. Do you know what pesticides you were exposed to? Y/N _____ *If yes*, what was the name(s)? _____

45. Do you feel that your exposures to pesticides have affected your health?

Y/N _____ Not sure _____

45A. *If yes*, do you feel these exposures are directly related to your current health problems? Y/N _____ *If* yes, please explain_____

46. When you were exposed to pesticide chemicals, did you seek medical attention?

Y/N _____

46A. *If* yes, where did you go?

a) local clinic _____

b) private doctor _____

c) hospital emergency room _____

d) urgent care center _____

e) company nurse _____

f) local healer _____ who would that be and what is their title?_____

g) took care of it at home _____

h) other _____

47. *(Only if they sought medical attention)* What did the doctor or health care provider tell you to do? _____

_____

48. *(Only if they sought medical attention)* Did that advice help you?_____

_____

49. Did the doctor or health care provider ever diagnose you with pesticide poisoning?

Y/N _____ Not sure _____

49A. *If yes*, do you have a copy of that diagnosis? Y/N _____

(Note: We don't need to see it now.)

50. At the job, did you consistently wear any of the following protective gear or clothing:

Interviewer: read entire list, check all that apply.

a) gloves? _____

b) clothing apron? _____

c) long pants? _____

d) long sleeved shirt? _____

e) a mask? _____

f) a hat? _____

g) safety glasses? _____

h) other? what did you wear? _____

51. Do you take a doctor's prescription medicine for:

Interviewer: read entire list, check all that apply.

a) blood pressure? _____ *if yes*, high? _____ or low? _____

b) cholesterol? _____

c) allergies? _____

d) chronic cough? _____

e) skin rash? _____

f) urinary infections? _____

g) bowel problems like diarrhea or constipation? _____

h) extended sadness or depression? _____

i) being nervous? _____

j) arthritis? _____

k) rheumatism? _____

l) diabetes? _____

m) thyroid? _____ *if yes*, too fast? _____ or too slow? _____

n) lupus? _____

o) other? _____

51A. Are you taking prescription medicine for anything else? Y/N _____ *If* yes, for what condition? _____

52. Do you often use over-the-counter drugstore medicine(s) like:

a) cough drops? _____

b) cough syrup? _____

c) aspirin? _____ Tylenol? _____ Advil? _____ another pain reliever? _____

d) eye drops? _____

e) skin cream for rashes? _____

f) other? _____ *if* yes, what do you use? _____

53. Do you use treatments or remedies that you make at home? Y/N _____ *If* yes, what do you use? _____ What does it help?_____

_____

54. Do you eat any of the following varieties that are caught in the waterways of Lake Apopka?

a) fish _____

b) turtle _____

c) raccoons _____

d) rabbits _____

e) alligators _____

f) wild vegetables _____

54A. *If yes*, how often do you eat these varieties caught in the waterways of Lake Apopka?

a) once a week _____

b) twice a week _____

c) three or more times a week _____

d) once a month _____

e) twice a month _____

f) year round _____

54B. Did you <u>used to eat</u> any of the following varieties that are caught in the waterways of Lake Apopka?

a) fish _____

b) turtle _____

c) raccoons _____

d) rabbits _____

e) alligators _____

f) wild vegetables _____

54C. How often did you <u>used to eat</u> these varieties caught in the waterways of Lake Apopka?

a) once a week _____

b) twice a week _____

c) three or more times a week _____

d) once a month _____

e) twice a month _____

f) year round _____

55. Is there anything else you would like to tell me about your work experiences, your health or your family's health? Y/N _____ *If yes*, explain _____

_____

_____

56. Is your house near any of the following?

a) an industrial landfill _____ Don't Know _____

b) a Superfund site _____ Don't Know _____

c) a medical incinerator _____ Don't Know _____

57. Where does your home drinking water come from?

a) the city or town _____ b) a well _____ c) Not Sure _____

Thank you very much for participating in
the Lake Apopka Farmworkers Environmental Health Project.
We really appreciate your time and your help.

APPENDIX C

LIST OF CHARTS

CHART TITLE		Page
Chart 1.	Demographics of Survey Participants 1a. Gender of Participants 1b. Age of Participants 1c. Race of Participants	10
Chart 2.	Length of Survey Participants' Employment in Farm Work	12
Chart 3.	Methods of Pesticide Exposure Among Former Lake Apopka Farmworkers	14
Chart 4.	Respondents' Use of Protective Clothing/Gear	15
Chart 5.	Respondents' Consumption of Fish and Wildlife In/Around Lake Apopka	16
Chart 6.	Proximity of Respondents' Homes to Other Environmental Hazards/ Contamination	17
Chart 7.	Self-Identified State of Health	18
Chart 8.	Community's Perception of Connection Between Pesticide Exposure and Health Problems 8a. Respondents Who Feel Their Exposure to Pesticides Has Affected Their Health 8b. Respondents Who Feel Their Exposure to Pesticides Is Directly Related to Their Current Health Problems	18
Chart 9.	Health Problems of Respondents	20
Chart 10.	Respondents Taking Doctors' Prescriptions	22
Chart 11.	Respondents With Children with Birth Defects	23
Chart 12.	Respondents With Problem Pregnancies	24
Chart 13.	Respondents with Other Reproductive Health Problems	24
Chart 14.	Respondents Who Have Children with Learning Disabilities	25
Chart 15.	Respondents Who Have Grandchildren with Learning Disabilities	26