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# Social Vulnerabilities Among Hired Migrant and Seasonal Farmworkers During COVID-19: The Need for Employment-Based Indicators

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## ABSTRACT

**Objectives:** This study aimed to explore farmworkers' experiences of social vulnerability during the peak period of the COVID-19 pandemic.

**Methods:** Telephone surveys of 63 migrant and seasonal farmworkers across three major agricultural areas in Florida were conducted. The survey, designed and disseminated with critical support from a statewide farmworker membership and advocacy organization, included items related to social and occupational precarity and a suite of demographic conditions, including specific employment-based indicators and categories. Data were analyzed with SPSS using a series of statistical significance tests including Pearson's Chi-Square, Fisher's Exact, T-tests, and Mann-Whitney U. An open-ended question regarding employment precarity was also analyzed for frequencies of responses pertaining to a set of descriptive categories.

**Results:** Survey findings demonstrated a high degree of social vulnerability among the farmworker sample, with notable variation in the type and severity of vulnerability and risk exposure across employment-based indicators and occupational categories. For example, a cross-industry comparison between vegetable field workers and greenhouse nursery workers revealed a disparity in COVID-exposure risk through commuting characteristics, as 43% of vegetable field workers used shared, employer-provided transport, while 68% of nursery workers used personal vehicles.

**Conclusion:** While previous research has broadly established the extreme precarity of migrant and seasonal farmworkers during the peak COVID-19 period, the variability of experience, exposure to risk, and social vulnerability between farmworkers representing distinct employment-based indicators and occupational categories demonstrated in this study contributes to widening awareness of the importance of assessing farmworker experiences at a more granular level. In addition to delineating social vulnerability across key demographic categories, cross-industry comparisons between farmworkers revealed significant discrepancies in risk and vulnerability to COVID-19. Future research that further explores this variability may reveal opportunities to improve disaster-relief planning and mitigate social vulnerability in future disaster scenarios. The importance of surveying the vulnerability of worker populations, aside from geographic communities, is highlighted.



## KEYWORDS


COVID-19; essential workers; hired migrant and seasonal farmworkers; pandemic; Social vulnerability, precarious work

## Introduction

Disasters such as the COVID-19 pandemic highlight the need for comprehensive measurement and mitigation of social vulnerabilities: the patterns of suffering and recovery among certain groups and communities.<sup>1,2</sup> Migrant and seasonal farmworkers (MSFWs) are individuals who leave their permanent homes to work in agriculture (migrant workers) or work in agriculture for only part of the year (seasonal workers). We also include year-round agricultural workers who face employment instability. They are among the most

vulnerable occupational populations in the United States (U.S.) due to inadequate pay, lack of health and employment benefits, unfavorable legal status, language barriers, crowded and substandard housing conditions, comorbidities, mental health concerns, and the inherent risk and environmental exposures of agricultural work.<sup>3–7</sup> Many of these inequities arise from the long history of agricultural exceptionalism: the pattern of exempting the agriculture sector from certain labor, health, and immigration protections and standards, thus enabling persistent and widespread exploitation

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of vulnerable worker populations,<sup>5,8</sup> [p. 14–15]. The COVID-19 pandemic starkly demonstrates some of the consequences of this history, as farm workers were exempted from stay-at-home orders as part of the essential workforce.<sup>3,9–13</sup> Compounding these issues was the lack of systematic public health and occupational surveillance during the pandemic, and the lack of a surveillance system that captures farmworkers, in general.<sup>14,15</sup>

Farmworkers as an occupational and social category have been largely left out of social vulnerability indices, which synthesize various socioeconomic variables that predict vulnerability. One example is the Centers for Disease Control and Prevention (CDC)/Agency for Toxic Substances and Disease Registry (ATSDR) Social Vulnerability Index (SVI), which aims to “help public health officials and emergency response planners identify and map the communities that will most likely need support before, during, and after a hazardous event”<sup>1</sup> [p. 1]. This index uses 16 social factors to rank U.S. Census tracts on overall vulnerability, as well as on the topics of socioeconomic status, household characteristics, racial and ethnic minority status, housing type, and transportation. Even within the socioeconomic status category, the only employment-related indicator is the rate of unemployment. Moreover, this index “maps” communities on a geographic basis and does not focus on special populations that may be dispersed more widely.

Several studies have revealed farmworkers’ unique vulnerability to COVID-19 infection and death, even when controlling for poverty, health insurance access, and language limitations.<sup>13,16–18</sup> Florida was not exempt from outbreaks in agricultural hotspots.<sup>11</sup> In June 2020, local infection outbreaks in Immokalee, Florida, prompted Doctors Without Borders to establish a testing and public health program in the farm labor community, where they found a 36% positivity test rate compared with the 5.6% rate for the state, overall.<sup>19</sup> Additional adverse impacts on farmworkers have also been directly investigated through surveys in key agricultural states. These impacts include increased levels of stress and mental health risk, loss of work and income, difficulties obtaining childcare, food insecurity, and the exacerbation

of inequities within the migrant farmworker population, itself, according to gender and indigeneity.<sup>3,6,10,12,20</sup> Due to COVID-19’s novelty and rapidly changing nature, these studies only reflect a snapshot of the farmworker population at any given time. Therefore, each of these studies contributes to a more accurate picture of the effects of the COVID-19 pandemic within this population.

Also crucial to this understanding is a recognition of the litany of factors that make surviving and thriving a challenge for MSFWs and their families, even in non-emergency conditions. These factors include comorbidities, education levels, limited English and/or Spanish proficiency, workplace conditions, and features of housing and transportation.<sup>4,17,18</sup> Due to structural inequities, farmworkers have high rates of underlying risk factors such as obesity, hypertension, and diabetes.<sup>3,4,18</sup> Access to basic field sanitation is often lacking, and bathroom facilities are often substandard and/or poorly maintained.<sup>5,20</sup> Long work hours with little rest contribute to high stress levels and habituation to physical hardships that make it difficult for workers to recognize warning signs of illness.<sup>3,6,21</sup> Fear of retaliation and/or deportation can make workers – especially undocumented workers – hesitant to advocate for their own needs and well-being at work.<sup>5,21</sup> Many farmworkers – especially workers living in employer-provided housing – live in poor-quality, overcrowded, dormitory-style housing infrastructure.<sup>4,17,18,22</sup>

Existing research has thus established the particular social vulnerabilities of migrant farmworkers and groups within this population. To fully understand how individuals, households, and communities navigate risk, SVIs must incorporate the experiences of these hard-to-reach groups. While farm work as a broad occupational category is necessary for understanding and mitigating risk, the specific characteristics of the conditions of work represent an important component that largely defines these populations.

In this article, we draw upon existing literature as well as findings from a study of Florida farmworkers’ social vulnerabilities during the COVID-19 pandemic to argue that it is important to understand not only *whether* a person is employed

but also *how* a person is employed (e.g., in what industry, with what benefits and protections). Documenting disaster vulnerability in a way that accounts for the variety of work-life experiences of MSFWs employed in diverse agricultural industries is essential to understanding exactly how risk is experienced by individuals and households. A more precise and comprehensive understanding of how a disaster event such as the COVID-19 pandemic was experienced across the agriculture sector is critical to improving both the disaster response and labor conditions for agricultural workers in the future.

## Methods

The aim of the present study was to explore Florida MSFWs' experiences during COVID-19, including how their employment conditions influenced their experience of occupational risk. In partnership with the Farmworker Association of Florida (FWAF), university researchers conducted a phone survey with FWAF members in three Florida communities. FWAF is the oldest and largest farmworker advocacy organization in Florida and has five offices in key agricultural regions across the state, covering important crops such as tomatoes, citrus, and plant nurseries.<sup>23</sup> The survey was conducted during the spring of 2021 and provides a cross-sectional snapshot of respondents' experiences at that time.

The survey tool (see Supplemental Material) was developed by the researchers and staff of the FWAF. The instrument included a series of questions about demographics (gender, origins, time in agriculture), work description, method of payment, and health insurance status. There were also questions about the effects of COVID-19 on their employment, household finances, and the conditions of work such as training and risk.

The surveys were conducted via phone by FWAF staff located in the rural towns of Fellsmere and Immokalee and the urban metropolitan area of Homestead. All three locations have extensive agriculture along with FWAF offices and membership. The interviewers were native Spanish speakers with IRB training and experience in university-directed research with farmworkers. The entire consent and interview process were

conducted in Spanish. Once phone contact was established, participants were screened to make sure they had been actively working since November 1, 2020 (near the beginning of the second harvesting season after the COVID-19 pandemic commenced). After obtaining verbal consent, the questions and answer choices were read verbatim by the interviewer over the phone and recorded manually on survey paper copies. Participants were offered a \$15 gift card as compensation for their time. This study and its instruments were approved by the University of Florida Institutional Review Board (IRB 201801797).

Research participants were randomly selected from a list of existing members of FWAF, stratified by the three office locations. Invitations were sent to registered, dues-paying members of the Association. There are no differentiated membership levels within the organization. A total of 63 surveys were conducted between February and May 2021, at the height of the second harvesting season after the start of the pandemic the previous year. In contrast to the major disruptions in production during the spring of 2020, at the beginning of many lockdown policies, the second harvest season was, by and large, back to its regular scheduling and was therefore an opportune time to query the impacts of the pandemic on this workforce.

Survey responses were entered into an MS Excel spreadsheet for cleaning and organizing and then exported to SPSS (Version 28; IBM SPSS Statistics, Chicago, IL, USA). Data analysis for the overall sample consisted of generating descriptive statistics for the quantitative questions. In addition, a native Spanish speaker analyzed responses to an open-ended question about the impact of COVID-19 on respondents' employment hours, salary, and other conditions. This analyst generated a quantitative summary of the responses and created several descriptive categories for reporting frequencies. In addition, a subsample analysis was conducted comparing respondents who reported working with vegetable field crops (predominantly tomatoes and peppers;  $n = 30$ ) with those who reported working with nursery plants ( $n = 22$ ). Thus, nine respondents were omitted from the subsample analysis for working in neither industry (i.e., citrus only), and two were omitted for

working in both. Two vegetable crop workers and three nursery workers also reported working in citrus, but these respondents were not omitted from the subsample analysis.

The industry-based subsample designation was used as the independent variable in a series of significance tests. Pearson Chi-Square was used for nominal response variables when no expected cell values were below five. In cases with expected cell counts below five, Fisher's Exact Test or the Fisher-Freeman-Halton Exact Test was used. T-tests were used for continuous response variables unless the Shapiro-Wilk test indicated a violation of the assumption of normality of the response variable across levels of the predictor variable. Mann-Whitney U tests were used in these cases as well as for ordinal response variables. SPSS output provided the effect sizes for Chi-Square, Fisher's Exact, Fisher-Freeman-Halton Exact, and T-tests. R-square values for Mann-Whitney U tests were calculated in MS Excel using the formula  $(Z/\sqrt{N})^2$ .

## Results

### Sample demographics

Approximately one-third of respondents lived in each of the three locations, Homestead ( $n = 25$ ), Immokalee ( $n = 21$ ), and Fellsmere ( $n = 17$ ). Location was strongly related to whether the respondent worked with vegetable field crops or nursery plants ( $p < .001$ ;  $V = .68$ ). Most Immokalee respondents worked with vegetable field crops, and nursery workers were most commonly in Homestead. The subsamples of vegetable field workers ( $n = 30$ ) and nursery workers ( $n = 22$ ) are described in detail below, preceded by a description of the overall sample ( $n = 63$ ). Sample and subsample demographics are provided in Table 1.

The overall sample mostly identified as female and was approximately split between Mexicans and Central Americans. The median age of the overall sample was 45 years, with a range of 19 to 70 years. Respondents had a median of six years of schooling and had spent between zero and 45 years working and/or living in the U.S., with a median

of 19 years. Most respondents (62%) had at least one child living in their household, with a median of one. Finally, most respondents (59%) reported having an acquaintance who had contracted COVID-19.

In the subsample comparison, males ( $p = .02$ ;  $\phi = -.32$ ) and Mexicans ( $p = .03$ ;  $\phi = .31$ ) were more likely to be vegetable field workers than nursery workers. The subsamples did not differ significantly on any of the other variables. The median age was 39.5 years for vegetable field workers and 44 years for nursery workers. Vegetable field workers had a median of six years of schooling, and nursery workers had a median of eight. Vegetable workers had spent a median of 19 years living and/or working in the U.S., with a range of 0–42. Nursery workers had lived and/or worked in the U.S. for a median of 17 years, with a range of 2–36. Both groups had a median of two children in the household, and in both groups, over half reported having an acquaintance who had contracted COVID-19.

### Employment context

The overall sample had a median of 20 years' experience in agriculture, with a range of 2–60. About half worked for either a grower or a contractor. Only eight respondents (13%) reported being paid by means other than hourly (e.g., piece rate). Most respondents (78%) reported receiving training about COVID-19. In the subsample comparison, vegetable field workers and nursery workers did not differ significantly on any of these variables. Median years in agriculture differed only by 0.5 years between groups. Vegetable field workers had higher rates of working for contractors and receiving any COVID-19 training, but these patterns were not statistically significant. Detailed work context data are provided below in Table 2.

### Commutes

Overall, only about a fifth of respondents used employer-provided transportation to get to work; the rest were split between paying for rides and using their own vehicles. The median commute length was 30 minutes, with a range of 5 minutes to



**Table 1.** Sample demographics overall and by subsample.

	Overall		Vegetable		Nursery	
	N	%	N	%	N	%
Location						
Fellsmere	17	27.0	3	10.0	6	27.3
Immokalee	21	33.3	20	66.7	0	0.0
Homestead	25	39.7	7	23.3	16	72.7
Gender						
Female	38	60.3	15	50.0	17	77.3
Male	23	36.5	15	50.0	4	18.2
Missing	2	3.2	0	0.0	1	4.5
Birthplace						
Mexico	33	52.4	18	60.0	6	27.3
Centr. Amer.	28	44.4	12	40.0	15	68.2
Missing	2	3.2	0	0.0	1	4.5
Age						
18-29	6	9.5	3	10.0	3	13.6
30-39	17	27.0	12	40.0	4	18.2
40-49	18	28.6	7	23.3	8	36.4
50-59	11	17.5	5	16.7	3	13.6
60+	9	14.3	3	10.0	3	13.6
Missing	2	3.2	0	0.0	1	4.5
Years of schooling						
0	5	7.9	3	10.0	2	9.1
1-5	11	17.5	4	13.3	3	13.6
6-8	20	31.7	11	36.7	5	22.7
9-12	22	34.9	10	33.3	10	45.5
13+	2	3.2	1	3.3	1	4.5
Missing	3	4.8	1	3.3	1	4.5
Years worked and/or lived in the U.S.						
0-9	14	22.2	8	26.7	5	22.7
10-19	18	28.6	8	26.7	6	27.3
20-29	16	25.4	8	26.7	5	22.7
30-39	8	12.7	4	13.3	4	18.2
40+	4	6.3	2	6.7	0	0.0
Missing	3	4.8	0	0.0	2	9.1
Number of children in household						
0	20	31.7	8	26.7	5	22.7
1	11	17.5	6	20.0	4	18.2
2	18	28.6	9	30.0	8	36.4
3-7	10	15.9	6	20.0	3	13.6
Missing	4	6.3	1	3.3	2	9.1
Acquaintance has had COVID-19						
No	24	38.1	14	46.7	7	31.8
Yes	37	58.7	16	53.3	14	63.6
Missing	2	3.2	0	0.0	1	4.5

2 hours. Respondents shared rides with a median of three other people, with a range of 0–25. The subsamples differed significantly and strongly on how they commuted to work ( $p = .001$ ;  $V = .541$ ). Slightly less than half of vegetable field workers used employer-provided transport (43%), while none of the nursery workers did. Most nursery workers used their own vehicles to commute (68%). About a third of each group paid for rides to work. Consequently, vegetable field workers shared rides with significantly more fellow commuters than nursery workers did ( $p = .002$ ;  $r^2 = .20$ ). Further details are provided in Table 3 below.

### Income and expenses

When workers were asked an open-ended question about the effects of the COVID-19 pandemic on their employment hours, salary, and other conditions, over half (53%) reported a decreased number of days and hours of work, which meant less income. About a quarter (26%) indicated there were no changes to their work hours and pay. Several (8%) indicated their pay rate had been decreased, while a few (5%) indicated there was actually more work for them. Transportation became more difficult for some, and a few workers

**Table 2.** Employment contextual factors overall and by subsample.

	Overall		Vegetable		Nursery	
	N	%	N	%	N	%
Years worked in agriculture						
0-9	12	19.0	6	20.0	5	22.7
10-19	11	17.5	5	16.7	5	22.7
20-29	17	27.0	9	30.0	6	27.3
30-39	13	20.6	6	20.0	4	18.2
40+	8	12.7	4	13.3	1	4.5
Missing	2	3.2	0	0.0	1	4.5
Type of employer (last 2 weeks)						
Grower	17	27.0	9	30.0	6	27.3
Contractor	18	28.6	13	43.3	4	18.2
Other	26	41.3	8	26.7	11	50.0
Missing	2	3.2	0	0.0	1	4.5
Payment method						
Hourly	52	82.5	25	83.3	19	86.4
Other	8	12.7	5	16.7	1	4.5
Missing	3	4.8	0	0.0	2	9.1
Received COVID-19 training						
No	12	19.0	5	16.7	7	31.8
Yes	49	77.8	24	80.0	15	68.2
Missing	2	3.2	1	3.3	0	0.0

**Table 3.** Commute characteristics overall and by subsample.

	Overall		Vegetable		Nursery	
	N	%	N	%	N	%
Mode of transportation to work						
Paid ride	23	36.5	9	30.0	7	31.8
Employer	14	22.2	12	40.0	0	0.0
Own vehicle	23	36.5	7	23.3	15	68.2
Missing	3	4.8	2	6.7	0	0.0
Length of commute (mins)						
5-20	17	27.0	5	16.7	6	27.3
21-40	25	39.7	15	50.0	8	36.4
41-60	15	23.8	6	20.0	8	36.4
61+	5	7.9	4	13.3	0	0.0
Missing	1	1.6	0	0.0	0	0.0
Fellow commuters in vehicle						
0-1	11	17.5	4	13.3	6	27.3
2-3	26	41.3	9	30.0	13	59.1
4-5	8	12.7	3	10.0	2	9.1
6-10	7	11.1	6	20.0	0	0.0
11+	7	11.1	5	16.7	0	0.0
Missing	4	6.3	3	10.0	1	4.5

also reported being fired without receiving pay, while some saw an increase in their pay rate.

The majority of overall respondents (60%) reported annual incomes between \$5,000 and \$15,000. Alarming proportions of respondents reported being unable to pay for food (40%), rent (44%), and childcare (24%). Half of respondents (51%) reported being unable to pay for at least one of these necessities, and 10 respondents (16%) reported being unable to pay for all three. In the subsample comparison, vegetable field workers were more likely than nursery workers to report being unable to pay for rent ( $p = .04$ ;  $\phi = -.31$ ).

They also more frequently reported being unable to pay for at least one of the following: food, rent, or childcare. However, this relationship fell short of statistical significance ( $p = .096$ ;  $\phi = -.24$ ). Further details on economic vulnerabilities are provided below in Table 4.

### Healthcare access

The majority of the overall sample (62%) reported having no health insurance. Over half (59%) said cost would keep them from seeking medical care

**Table 4.** Economic factors overall and by crop type.

	Overall		Vegetable		Nursery	
	N	%	N	%	N	%
Annual income						
< \$5K	3	4.8	2	6.7	1	4.5
\$5K-\$10K	19	30.2	11	36.7	3	13.6
\$10K-\$15K	19	30.2	8	26.7	7	31.8
\$15K-\$20K	13	20.6	5	16.7	7	31.8
> \$20K	4	6.3	2	6.7	2	9.1
Missing	5	7.9	2	6.7	2	9.1
Can pay for food						
No	25	39.7	16	53.3	7	31.8
Yes	28	44.4	11	36.7	11	50.0
Missing	10	15.9	3	10.0	4	18.2
Can pay for rent						
No	28	44.4	19	63.3	7	31.8
Yes	25	39.7	8	26.7	11	50.0
N/A	3	4.8	1	3.3	1	4.5
Missing	7	11.1	2	6.7	3	13.6
Can pay for childcare						
No	15	23.8	8	26.7	5	22.7
Yes	19	30.2	7	23.3	10	45.5
N/A	18	28.6	10	33.3	3	13.6
Missing	11	17.5	5	16.7	4	18.2
Inability to pay for any of the above (food, rent, and/or childcare)						
Yes	32	50.8	20	66.7	9	40.9
No	23	36.5	8	26.7	10	45.5
Missing	8	12.7	2	6.7	3	13.6

during the COVID-19 crisis. When asked where they would go if they or their family needed medical care during COVID-19, about half (52%) listed the hospital, while only 14% listed the doctor's office. About 40% of respondents reported they would visit a health clinic, which is generally less expensive than a doctor's office. The subsamples did not differ significantly on any of these variables. Further details are provided below in Table 5.

## Discussion

The initial economic impact of COVID-19 in Spring 2020 was particularly hard on farmworkers in Florida operating at the peak of the fruit and vegetable harvesting season. The drastic decline in demand from the tourism-focused food service market led to growers dumping produce and turning over their fields without harvesting, resulting in the loss of millions of pounds of produce.<sup>24</sup>

**Table 5.** Healthcare access indicators overall and by subsample.

	Overall		Vegetable		Nursery	
	N	%	N	%	N	%
Has health insurance						
No	39	61.9	22	73.3	13	59.1
Yes	19	30.2	8	26.7	7	31.8
Missing	5	7.9	0	0.0	2	9.1
Medical care resources						
Clinic	26	41.3	13	43.3	6	27.3
Doctor	9	14.3	4	13.3	3	13.6
Hospital	33	52.4	16	53.3	13	59.1
Barriers to receiving care						
Cost	37	58.7	14	46.7	14	63.6
Lack of sick pay	7	11.1	1	3.3	2	9.1
Lack of transportation	9	14.3	6	20.0	3	13.6
Reported any of the above barriers (cost, lack of sick pay, or lack of transport)						
Yes	44	69.8	18	60.0	17	77.3
No	18	28.6	12	40.0	5	22.7
Missing	1	1.6	0	0.0	0	0.0



Within this context, participants of this study faced considerable economic vulnerabilities. Over half of respondents reported lost work and income as a result of the COVID-19 pandemic. Most reported annual incomes between \$5,000 and \$15,000. About half reported being unable to pay for food, rent, and/or childcare, and 16% reported being unable to pay for all three. These findings align with results from studies conducted elsewhere in the U.S. For example, the California farmworker study<sup>25</sup> documented difficulty paying for basic needs such as childcare (43%), water (49%), utilities (58%), rent (62%), and food (68%). Similar difficulties in affording these basic needs were reported in the Oregon and Washington studies.<sup>10,26</sup>

In addition, most respondents in this study reported that cost would keep them from seeking medical care, and over 62% were without health insurance. Lack of access to healthcare is a key inequity facing farmworkers even in non-pandemic years. Sometimes a single clinic serves a rural area, and if it closes – as has been the case in at least one area of Florida – traveling to access care becomes incredibly burdensome. During the COVID-19 pandemic, multiple clinics closed to members of the public without appointments. On top of this additional challenge, lost work hours and lost income decreased the funds to pay for medical services, which, for many farmworkers, comes out of pocket. In these conditions, some workers opted for natural cold remedies such as ginger, lime, lemon, garlic, or turmeric. Although this item was not included in the indicators of focus for this paper, about 18% of respondents reported preferring home remedies to seeking out medical care. Other key issues preventing farmworkers from receiving adequate healthcare include a lack of provider fluency in patients' preferred languages as well as employer arrangements with providers where workers would be less likely to report occupational injuries.<sup>27,28</sup>

Like other research, this study has also demonstrated that although MSFWs, as a whole, constitute a vulnerable social and occupational category, the type of exposure hazards and degree of risk are not evenly distributed among its members. Other research has highlighted the additional inequities facing women,

indigenous, and undocumented workers.<sup>7,10,20</sup> This study is unique in its cross-industry comparison, which found that respondents who worked with vegetable crops were more likely to rely on employer-provided transport and ride in vehicles with more people. Those in plant nurseries were more likely to be female, to be slightly less impacted by disruptions in food production, and to have more job stability year-round. This finding is useful, not only because it adds to the existing literature on the variability of experience within the farmworker population, but more importantly because it highlights how measuring details of *where* people are employed – industry sub-sectors and occupations – and not just *whether* they are employed, is important for disaster planning that accounts for the specific kinds of risks people with social vulnerabilities are facing. In addition, considering the occupational groups residing within communities could give a more granular approach to resources, rather than “averaging” whole communities. Notably, a significant portion of farmworkers work in the cash economy and are not counted in the census or other surveillance systems.

Planning efforts should thus consider qualitative differences between types of workplaces and their employees' experiences. It is not surprising that this study found different kinds of vulnerabilities between nursery workers and crop workers. Nursery workers are typically year-round workers, tend to live near their jobs, and tend to be paid by the hour instead of by piece rate. This creates a modicum of stability, though these workers can still be subject to layoffs from seasonal fluctuations, agricultural consolidation, and the precarious nature of all agricultural work. While the data from this study reflect these patterns in comparing nursery workers with crop workers, future research should explore the diversity of conditions faced by crop workers in fruits, vegetables, and berries. These may include seasonal changes (different categories of work tasks), distance to the fields, and overall job stability.

### Limitations

The sample size for this study was small, and most distributions of the continuous variables were

nonnormal, necessitating the use of nonparametric significance testing. This likely increased the chance of Type II error; in other words, failing to detect a relationship between variables that exist[s] in the population. Respondents were those that were active members of the FWAF and skewed towards those who live in the state and were available for contact on their mobile devices. Also, the survey was cross-sectional; therefore, while the data can provide useful descriptive statistics and illustrate variations in experiences across nursery and vegetable crop workers, these analyses cannot be used to attribute causation to specific conditions.

In addition, this hyperlocal and small sample is not necessarily representative of the farmworker population in the U.S. or even a whole state; however, farmworkers are not a monolithic occupational group – they tend markedly different crops and are exposed to a wide array of job hazards, labor conditions, and immigration/employment statuses. The US Department of Labor National Agricultural Workers Survey, the most comprehensive survey of MSFWs, uses employer-based sampling, does not include H-2A work visa holders, and, notably, aggregates data at the national level.<sup>29</sup> This hyperlocal population and narrative responses captured in this study stand to better inform interventions required during a disaster.

### **Recommendations and implications**

Public health disaster preparedness and response requires an understanding of the nature of agricultural work so it can tailor work-based mitigation strategies alongside preventive measures that target the social and economic vulnerabilities MSFWs face, even in non-emergency times. Proximate measures include rapid and responsive provision of personal protective equipment (PPE), education and training, hygiene stations, and free on-site healthcare services. As a lesson for future emergencies, agricultural workers should join healthcare providers as the top priority populations for testing and vaccinations. Improving economic structural measures would include paid sick leave and health insurance for all farmworkers as well as livable wages for these essential workers.

While social vulnerability indices are useful for highlighting where the most at-risk populations live, this research points out that some populations are also defined by the work they do and the structural features of immigration status, language, high mobility, and the precariousness of their jobs. Not all farm work is the same, and it varies by crop, location, season, and patterns of production. Work in nurseries and greenhouses, while typically classified as agricultural production, can be significantly different than field work even while sharing the common risks of heat and pesticide exposure and musculoskeletal injury. Payment standards (piece rate vs hourly) can also make a large difference in the lives of farmworkers. Future research is needed to better define the estimated 2.5 million farmworkers in the U.S., including an accurate census count, health- and work-related injury surveillance, and needs assessments. The inclusion of economic sector and work arrangement with indicators of precarity may be useful in more effectively supporting highly vulnerable populations.

### **Conclusion**

Farmworkers were considered “essential” during the pandemic and continued to leave home for work, as the U.S. government prioritized the food supply chain as critical infrastructure.<sup>2</sup> At the beginning of the pandemic when testing was limited, vaccines were unavailable, and healthcare was stretched thin – particularly in rural areas – farmworkers went to work to earn subsistence wages. As paid sick leave was unavailable and employment precarious, farmworkers attended work even while sick. Farmworkers often live in crowded housing and use shared transportation to work. In some agricultural settings, farmworkers work in close proximity to coworkers, and there was evidence that the spread of COVID from workplaces into rural communities occurred early in the pandemic.<sup>30</sup> Several studies have shown farmworkers were hard hit by the pandemic, and the data from these three communities in Florida supports that finding.<sup>30,31</sup> The structural issues MSFWs face in terms of low-wage employment and a lack of social welfare support systems stands in contrast to their essential role in the nation’s food supply. The COVID pandemic, like many

disasters that impact workers, highlighted the disparities faced by this population.

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## Data availability statement

The data that support the findings of this study are available on request from the corresponding author, MCM. The data are not publicly available due to their containing information that could compromise the privacy and safety of research participants.

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