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COVID-19 Pandemic Response in a Migrant Farmworker Community: Excess Mortality, Testing Access and Contact Tracing in Immokalee, Florida

ORIGINAL RESEARCH

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ABSTRACT

Background: Migrant and seasonal farmworkers face enormous barriers to health and have been a particularly vulnerable population during the COVID-19 pandemic, but their pandemic experiences and potential inequities have not been well studied.

Objectives: We aimed to assess the impact of COVID-19 in Immokalee, Florida, a community with a significant population of migrant and seasonal farmworkers. We evaluated for differences in pandemic experience by language, a known barrier to healthcare, to inform and strengthen future public health efforts.

Methods: First, to estimate the burden of COVID in the area, we conducted a descriptive analysis of data on COVID-19 deaths for Collier County from May-August 2020. We then surveyed a cross-sectional, randomized representative sample of 318 adults living in Immokalee from March-November 2020 to assess socio-demographics, workplace conditions, sources of information, ability to follow guidelines, and experiences with testing and contact tracing programs. Results were compared across language groups.

Findings: Average excess mortality in Collier County was 108%. The majority surveyed in Immokalee had socio-demographic factors associated with higher COVID risk. Non-English speakers had higher workplace risk due to less ability to work from home. Haitian Creole speakers were less likely to be tested, though all participants were willing to get symptomatic testing and quarantine. Those participants who tested positive or had COVID-19 exposures had low engagement with the contact tracing program, and Spanish-speakers reported lower quality of contact tracing than English speakers.

Conclusions: The community of Immokalee, FL is a vulnerable population that suffered disproportionate deaths from COVID-19. This study reveals language inequities in COVID testing and contact tracing that should be targeted in future pandemic response in Immokalee and other migrant farmworker communities.

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testing in Immokalee, with results given within an hour by Spanish- and Haitian Creole-speaking staff. Both HCN and DOH created community health worker programs for COVID-19 outreach, but all positive results from HCN's testing were forwarded to the DOH's contact tracing system (see timeline in Figure 1 below).

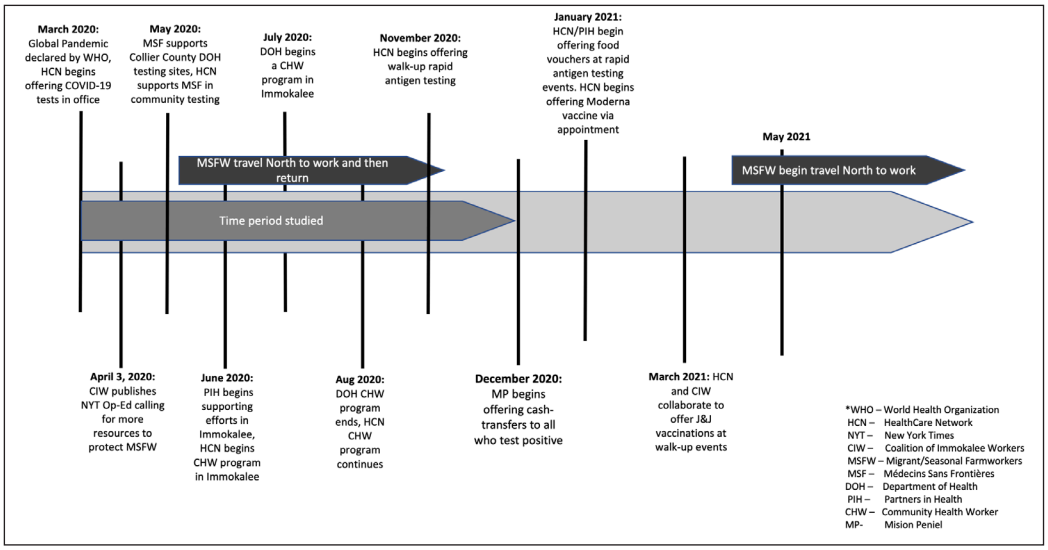

Figure 1 Timeline of COVID-19 Related Services in Collier County, Florida, March 2020–May 2021.

In this study, we first aimed to estimate the impact of COVID-19 on Immokalee, FL by calculating excess mortality from publicly available data. Then, we conducted a household survey to collect sociodemographic information and assess community experiences with workplace conditions, access to testing, sources of information, and the DOH contact tracing program. Given the linguistic diversity in Immokalee and MSFW populations in general, and limited English proficiency as a known barrier to care, we evaluated for differences in experience by language.

2. METHODS

2.1. DESCRIPTIVE ANALYSIS

We collated data from the Florida Department of Health and Medical Examiners Offices for Collier, Lee, Hendry, Glades and Orange Counties. First, we tabulated the total deaths from COVID-19 for residents of Collier County. Data for the Immokalee zip code alone were not available. We then compared deaths for Collier County during May-August 2015–2019 with deaths from May-August 2020. Excess mortality was calculated in accordance with CDC guidelines, where death data were grouped weekly to account for temporal effects [22]. Excess mortality was calculated for each week and then summed together to find excess mortality for the period beginning 4/27/20 and ending 8/16/20. Data were disaggregated by age (under 60 or ≥ 60 years) and sex.

2.2. QUESTIONNAIRE

The questionnaire was created using demographic and social screening tools from the National Agricultural Workers Survey and various farmworker healthcare organizations [7–9]. Spanish- and Haitian Creole-speaking CIW staff reviewed the tool for understandability by the local population. The final questionnaire assessed the following thematic areas [dataset 23]:

- Demographic and socioeconomic information
- Sources of news and information on COVID-19
- Ability to follow COVID-19 precautions
- Experiences with contact tracing

2.3. SAMPLE SIZE

Our target population was adults living in Immokalee during the months of March-November 2020. We estimated a population of 12,000 adults in Immokalee, a 95% confidence interval, a precision of 5%, and a prevalence of 15–20% of the population meeting requirements to be contacted by contact tracers (given an estimated local COVID-19 prevalence of 8%) to calculate a prevalence sample size. From our initial prevalence sample size of 193–241 participants, we accounted for intercorrelation that occurs when surveying multiple people per household. We used an intra-cluster correlation (ICC) of 0.1–0.33 and an estimated household size (m) of ~4 to calculate a design effect of 1.3–2, giving us a final sample size goal of 300–350 participants.

To choose addresses, we first obtained a publicly available address list from the Collier County Property Appraiser's office. Then, given that many MSFW live in temporary or mobile housing [1] that is likely underrepresented in census data, we examined the public address list and added apartment complexes and clusters of mobile homes that were missing. These additional 669 addresses were added in consultation with local organizations, like CIW, who were familiar with the community. We then extracted 350 addresses from this compiled list using a random number generator. Study staff visited each address, and after exhausting that first address list, extracted 100 further addresses at a time to reach a sample size of 300–350 participants.

2.4. STUDY PROCEDURES

From January 18-March 11, 2021, study staff (FM and BN) visited addresses from the random address list on weekends and evenings, when adults were most likely to be home from work. They wore appropriate personal protective equipment including a mask and eye protection at all times and conducting interviews outside to maintain social distance. They conducted multiple surveys per household as household members may have had different experiences, and it is common for multiple families in Immokalee to cohabitate.

Study staff started each visit with an initial screening to confirm each participant 1) was 18 years or older, 2) lived in Immokalee, and 3) lived in Immokalee for at least 2 weeks between March-November 2020. If inclusion criteria were met, study staff obtained verbal informed consent in the participants' preferred language. FM is bilingual in Haitian Creole/English and BN is bilingual in Spanish/English. Verbal consent was obtained due to the population's literacy level and to maintain participant anonymity. If participants preferred to participate at a different time or no adults were home, one follow-up visit was done at the same address. All households visited received a paper pamphlet detailing available health resources in their preferred language.

Questionnaires were administered on a secure tablet by the study staff. Participants' responses were recorded by study staff directly into REDCap at the time of survey administration [24, 25]. The data were checked weekly by the co-investigators to ensure internal validity. The study was reviewed and exempted by the Institutional Review Boards at Mass General Brigham (Protocol 2020P003045) and the Harvard School of Public Health (IRB20-1755). All data was de-identified and published online [dataset 23].

2.5. DATA ANALYSES

All analyses were conducted utilizing R (Version 4.0.2, The R Foundation, 2021) and RStudio (Version 1.3.959, RStudio Team, 2021). Chi-square and Fisher's exact tests were used to compare variables as appropriate. Of note, data from a question on sick leave was not analyzed due to participant misinterpretation of the question.

3. RESULTS

3.1. DESCRIPTIVE ANALYSIS

As shown in Table 1, analysis of Collier County mortality data from April 27th through August 16th revealed an average excess mortality of 108% (167 excess deaths). When data were disaggregated by sex alone, age alone, and both sex and age, excess mortality findings were largely consistent (107%, 115%, and 115%, respectively).

	MAY 2020					JUNE 2020				JULY 2020					AUGUST 2020		TOTAL
WEEK	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	
Date	4/27–5/3	5/4–5/10	5/11–5/17	5/18–5/24	5/25–5/31	6/1–6/7	6/8–6/14	6/15–5/21	6/22–6/28	6/29–7/5	7/6–7/12	7/13–7/19	7/20–7/26	7/27–8/2	8/3–8/9	8/10–8/16	
Total all-cause recorded deaths, no.	0	5	20	24	12	16	25	16	27	23	30	32	22	29	37	1	319
Predicted deaths, no.	0	2.4	9.6	4.5	13.5	15.3	13.0	14.5	14.2	11.2	8.1	12.1	11.0	13.5	10.7	0.4	154
Excess deaths, no.	0	2.6	10.4	19.5	0.0	0.7	12.0	1.5	12.8	11.8	21.9	19.9	11.0	15.5	26.3	0.6	167
Excess deaths,%	0	108	108	433	0	5	92	10	90	105	270	164	100	115	246	150	108

Table 1 Results for total recorded deaths, predicted deaths, and estimated excess deaths in Collier County.

3.2. STUDY POPULATION

Of 550 households randomized, 131 (23.8%) did not answer the door, 140 (25.5%) were not interested in participating, and 279 (50.7%) agreed to participate. From these 279 households, 318 individuals consented to participate and were surveyed (Figure 2).

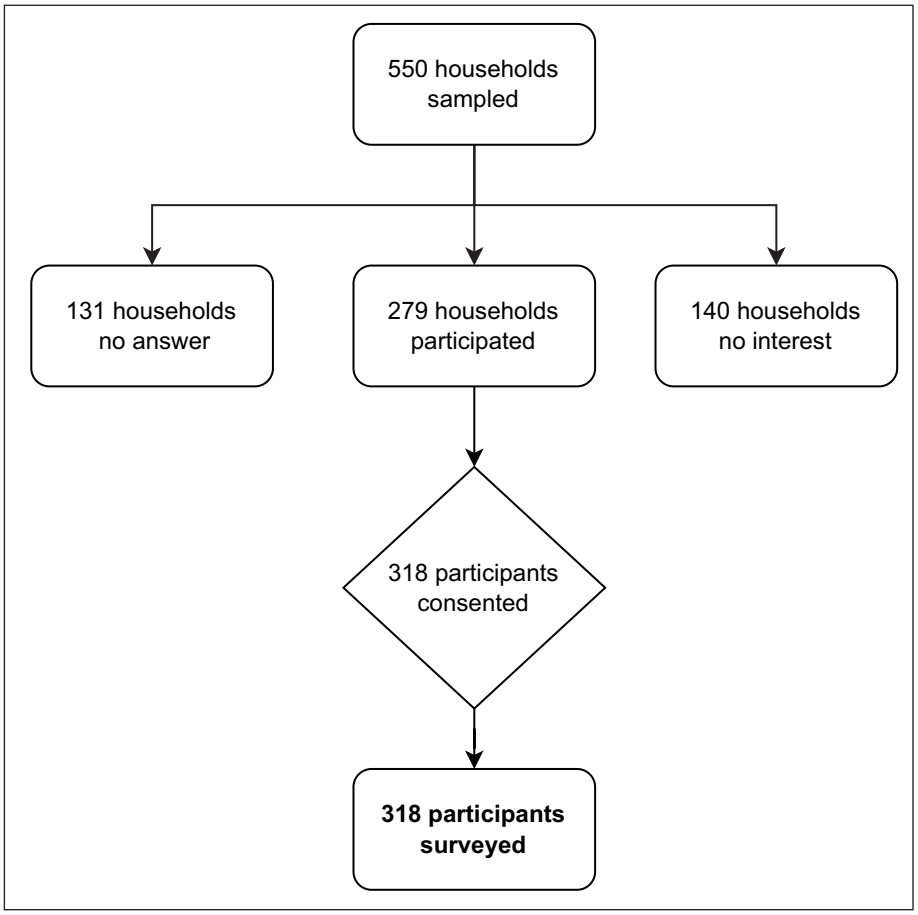

Figure 2 Flow Diagram of Participant Recruitment.

Baseline participant and household demographics are depicted in Table 2. All race/ethnicity/language data is per participants' self-identification. Spanish (42.1%) was the most frequent preferred language, with English (37.3%) and Haitian Creole (18.7%) accounting for most other participants. Nearly one-fifth of participants reported food insecurity during the past month (19.2%). The mean household size was 3.95 persons with homes averaging 0.856 bedrooms per person and 0.483 bathrooms per person. Twenty-five percent of those surveyed were farm or packinghouse workers, 16.7% were unemployed, and many in the other category worked in service occupations including childcare, cleaning, maintenance, and sales.

CHARACTERISTIC	PARTICIPANTS N*	%
Gender	N = 312	
Female	165	52.9%
Male	147	47.1%
Age group (yrs)	N = 313	
18–24	34	10.9%
25–34	76	24.3%
35–44	73	23.3%
45–64	96	30.7%
65–80	29	9.3%
81+	5	1.6%
Race/Ethnicity	N = 316	
White	10	3.2%
Black	76	24.1%
Latino/a	213	67.4%
Indigenous	1	0.3%
Bi- or Multi-racial	11	3.5%
Prefer not to answer	2	0.6%
Other	3	0.9%
Preferred language	N = 313	
English	118	37.7%
Spanish	133	42.5%
Haitian Creole	59	18.8%
Mam	3	1.0%
Educational attainment	N = 314	
No formal schooling	26	8.30%
Kindergarten-5th grade	42	13.40%
6–8th grade	44	14.00%
9–12th grade	161	51.30%
Beyond high school	41	13.10%
Housing situation	N = 317	
No housing	2	0.60%
Housed but housing insecure	83	26.20%
Housed	230	72.60%
Other	2	0.60%
Housing characteristics (mean)		
Household members	3.95	
Bathrooms	1.52	

(Contd.)

Table 2 Demographic characteristics of survey participants.

* N ranges between 312–318 based on lack of response to certain questions.

CHARACTERISTIC	PARTICIPANTS	
	N*	%
Bathrooms per person	0.48	
Bedrooms	2.79	
Bedrooms per person	0.86	
Food insecurity during last month	N = 318	
Yes	61	19.20%
Primary occupation	N = 318	
Farmworker	64	20.10%
Other	64	20.10%
Construction	25	7.90%
Landscaping	18	5.70%
Packinghouse worker	16	5.00%
Healthcare worker	13	4.10%
Food service	13	4.10%
Maintenance or custodian	9	2.80%
Driver	8	2.50%
Painter	7	2.20%
Education	7	2.20%
Agricultural supervisor	4	1.30%
Casino Employee	3	0.90%
Unemployed	53	16.70%
Retired	14	4.40%

3.3. ESSENTIAL WORKER STATUS AND WORKPLACE POLICIES

Table 3 details participants' occupational status and policies. Most employed individuals in all language groups were categorized as essential workers by the state of Florida based on their occupation [26]. Twenty-six percent of English speakers stated they were offered the option to work from home during the pandemic. By contrast, only 3% of both Spanish and Haitian Creole speakers reported being given the option to work from home ($p < 0.001$ English vs. Spanish; $p = 0.0023$ English vs. Haitian Creole).

	ANSWER	PRIMARY LANGUAGE SPOKEN						COMPARISON	
		ENGLISH		SPANISH		HAITIAN CREOLE		ENGLISH/ SPANISH (*p*)	ENGLISH/ CREOLE (*p*)
		%	NO.	%	NO.	%	NO.		
Essential Worker	Yes	68.60%	81	76.70%	102	66.10%	39		
	No	31.40%	37	23.30%	31	33.90%	20	0.1522	0.7329
Option to work from home?	No	74.40%	67	97.00%	96	97.10%	34		
	Yes	25.60%	23	3.00%	3	2.90%	1	**<0.0000**	**0.0023**
PPE at work?	No	15.90%	14	26.50%	26	19.40%	7		
	Yes	84.10%	74	73.50%	72	80.60%	29	0.0784	0.6388

Table 3 Self-reported workplace policies of participants and essential worker status, stratified by primary language spoken.

Note: Boldface indicates statistical significance ($p < 0.05$).

3.4. COVID-19 TESTING EXPERIENCES

Table 4 shows participants' testing experiences, compared by preferred language. Of English, Spanish, and Haitian Creole speakers, 38.1%, 48.1%, and 57.6% respectively reported that they had never been tested for COVID-19. Significantly fewer Haitian Creole than English speakers reported being tested (p = 0.014). English and Spanish speakers reported being tested at similar sites, primarily by the DOH, while Haitian Creole speakers were more likely to report being tested at the HCN Immokalee Clinic or HCN-affiliated mobile testing sites (p < .0001). English speakers were more likely to report being tested at sites outside of Immokalee, namely Fort Myers and Naples, compared to Spanish and Haitian Creole speakers.

Table 4 Participant experiences with COVID-19 testing, stratified by primary language spoken.

Note: Boldface indicates statistical significance (p < 0.05).

[a] Chi square.

[b] Fisher's exact.

SURVEY QUESTION	ANSWER	PRIMARY LANGUAGE SPOKEN						COMPARISON	
		ENGLISH		SPANISH		HAITIAN CREOLE		ENGLISH/ SPANISH (*p*)	ENGLISH/ CREOLE (*p*)
		%	NO.	%	NO.	%	NO.		
Have you been tested for COVID-19?	Yes	61.90%	73	51.90%	69	42.40%	25		
	No	38.10%	45	48.10%	64	57.60%	34	0.1112	**0.0139**[a]
Where were you tested?	DOH	23.90%	21	25.70%	19	7.10%	2		
	Immokalee Clinic	18.20%	16	36.50%	27	60.70%	17		
	Naples	20.50%	18	16.20%	12	14.30%	4		
	Fort Myers	22.70%	20	10.80%	8	0.00%	0		
	Other	14.80%	13	10.80%	8	17.90%	5	**0.0547**	**<0.0000**[b]
How long for results?	<24 hours	31.50%	23	22.10%	15	56.00%	14		
	2–3 days	26.00%	19	25.00%	17	16.00%	4		
	4–6 days	11.00%	8	10.30%	7	12.00%	3		
	1 week+	31.50%	23	42.60%	29	16.00%	4	0.4967	0.1617[b]
What was the result?	Positive	27.40%	20	26.10%	18	0.00%	0		
	Negative	71.20%	52	73.90%	51	96.00%	24	0.8514	**0.0026**[b]
If you or another person in your household was showing symptoms such as fever, cough, fatigue, would you get tested for COVID-19?	Yes	87.30%	103	89.50%	119	91.40%	53		
	No	11.90%	14	3.00%	4	6.90%	4		
	Not sure	0.80%	1	7.50%	10	1.70%	1	**0.0132**	0.4292[b]
If you were to be unable to isolate in your current housing for COVID-19, would you be open to temporarily going to a supportive isolation shelter?	Yes	53.40%	63	65.40%	87	66.70%	38		
	No	38.10%	45	29.30%	39	24.60%	14		
	Not sure	8.50%	10	5.30%	7	8.80%	5	0.0885	0.0702[a]

There were no differences in the length of time that lapsed before results were available, though 31.5% of English and 42.6% of Spanish speakers reported waiting one week or more before receiving their results. More positive COVID-19 test results were reported for English-speaking participants (27.4%) than Haitian Creole-speaking participants (0%), though no significant difference was reported between English and Spanish speaking (26.1%) participants.

When asked whether participants would utilize testing resources if exposed to COVID-19, a large share of Spanish (89.5%), Haitian Creole (91.4%) and English speakers (87.3%) reported they would be willing to be tested. Most English (53.4%), Spanish (65.4%), and Haitian Creole speakers (66.7%) reported that they would be willing to isolate themselves in a temporary shelter if necessary and they were unable to do so inside their own home.

3.5. QUALITY OF CONTACT TRACING

Per the DOH guidelines at the time of the study, those who tested positive for COVID-19 should have been called by the DOH to trace close contacts, inquire about their ability to quarantine, and provide information about local resources supporting quarantine. Calls were expected to be completed in the patient's preferred language. Table 5 reflects participants' experiences with the contact tracing process. No Haitian Creole speakers from our sample reported having tested

positive. Only 35% of English speakers and 33% of Spanish speakers who tested positive were asked for names and phone numbers of individuals with whom they had been in close contact. Seventy percent of English speakers were asked about their ability to safely quarantine, compared to only 39% of Spanish speakers (p = 0.041). Forty-five percent of English speakers reported being provided information on local resources helping with quarantine, compared to 28% of Spanish speakers. Only 26% of English speakers reported being asked about their language preference compared to 82% of Spanish speakers, suggesting that most calls started in English and switched to Spanish if the recipient stated they did not understand English.

SURVEY QUESTION	ANSWER	PRIMARY LANGUAGE SPOKEN				COMPARISON
		ENGLISH		SPANISH		ENGLISH/SPANISH (*P*)
		%	NO.	%	NO.	
Participants who tested positive			20		18	
Contact tracing occurred[a]	Yes	35.00%	7	33.30%	6	1
	No	60.00%	12	66.70%	12	
Quarantine guidance given[b]	Yes	70.00%	14	38.90%	7	**0.0409**
	No	20.00%	4	61.10%	11	
Connected to resources[c]	Yes	45.00%	9	27.80%	5	0.3133
	No	50.00%	10	72.20%	13	
Asked language preference	Yes	26.30%	5	81.80%	9	**0.0183**
	No	57.90%	11	18.20%	2	
Language of phone call	English	94.70%	18	9.10%	1	**<0.0000**
	Spanish	5.30%	1	90.90%	10	
Participants with positive close contact			42		24	
Informed of positive contact	Yes	33.30%	14	41.70%	10	0.6005
	No	64.30%	27	58.30%	14	

Table 5 Contact tracing experiences of participants, stratified by primary language spoken.

[a] Did they ask for assistance in identifying the names and phone numbers of individuals you were in contact with?

[b] Did they ask about your ability to safely isolate and quarantine in your current housing situation?

[c] Did they provide information on any resources that exist to help assist with isolation or quarantine?

Note: Boldface indicates statistical significance (p < 0.05).

Individuals that were identified as close contacts of someone that had tested positive for COVID-19 were also supposed to be called about their exposure and need to quarantine. Thirty-three percent of English speakers and 42% of Spanish speakers reported being called by the DOH about their positive close contact.

4. DISCUSSION

In this first study of COVID-19 impact on a MSFW population, we found high excess mortality and high COVID-19 risk, with low testing and contact tracing rates and multiple language-based disparities despite many actions from a coalition of community organizations. The 108% excess mortality rate in Collier County calculated in this study is extremely high. In comparison, average excess mortality in Florida was estimated to be 15.5% from March to September, with a peak of 38.1% in August [27], while nationwide data showed an average of 18.5% excess deaths from March through the end of July [28]. While we cannot discern how many of these excess deaths were specifically from Immokalee, we know it is an especially vulnerable community within the county, as demonstrated by our data. With an average household size of ~4 people with shared bathrooms, over 20% with food and housing insecurity, and a preponderance of essential workers, the risk of COVID-19 infection was and continues to be high in this community [10]. For non-English speakers, that risk is even higher, as our data show they are less frequently able to work from home.