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Multifaceted Public Health Response to a COVID-19 Outbreak Among Meat-Processing Workers, Utah, March-June 2020

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ABSTRACT

Objective: To identify potential strategies to mitigate COVID-19 transmission in a Utah meat-processing facility and surrounding community.

Design/Setting: During March-June 2020, 502 workers at a Utah meat-processing facility (facility A) tested positive for SARS-CoV-2. Using merged data from the state disease surveillance system and facility A, we analyzed the relationship between SARS-CoV-2 positivity and worker demographics, work section, and geospatial data on worker residence. We analyzed worker survey responses to questions regarding COVID-19 knowledge, beliefs, and behaviors at work and home.

Participants: (1) Facility A workers (n = 1373) with specimen collection dates and SARS-CoV-2 RT-PCR test results; (2) residential addresses of all persons (workers and nonworkers) with a SARS-CoV-2 diagnostic test (n = 1036), living within the 3 counties included in the health department catchment area; and (3) facility A workers (n = 64) who agreed to participate in the knowledge, attitudes, and practices survey.

Main Outcome Measures: New cases over time, COVID-19 attack rates, worker characteristics by SARS-CoV-2 test results, geospatially clustered cases, space-time proximity of cases among workers and nonworkers; frequency of quantitative responses, crude prevalence ratios, and counts and frequency of coded responses to open-ended questions from the COVID-19 knowledge, attitudes, and practices survey.

Results: Statistically significant differences in race ($P = .01$), linguistic group ($P < .001$), and work section ($P < .001$) were found between workers with positive and negative SARS-CoV-2 test results. Geographically, only 6% of cases were within statistically significant spatiotemporal case clusters. Workers reported using handwashing (57%) and social distancing (21%) as mitigation strategies outside work but reported apprehension with taking COVID-19–associated sick leave.

Conclusions: Mitigating COVID-19 outbreaks among workers in congregate settings requires a multifaceted public health response that is tailored to the workforce.

Implications for Policy and Practice: Tailored, multifaceted mitigation strategies are crucial for reducing COVID-19–associated health disparities among disproportionately affected populations.

KEY WORDS: attitudes, COVID-19, coronavirus infections, health behavior, health disparities, occupational health, outbreak management, risk communication, survey

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Work in congregate settings presents an increased risk for transmission of SARS-CoV-2, the virus that causes coronavirus disease 2019 (COVID-19).[1,2] Meat-processing facility workers are at an increased risk for rapid SARS-CoV-2 transmission, in part, because of high worker density and prolonged close contact.[3,4] Identifying workplace-associated transmission factors (eg, environmental risk and workplace practices, policies, and processes) and worker factors (eg, knowledge, attitudes, and mitigation practices at work and outside of work) can help state and local health departments (LHDs) and employers implement effective COVID-19 mitigation strategies. Understanding health and economic disparities and cultural differences can provide insight into disproportionate infection rates and health outcomes among workers. Between March 30 and June 29, 2020, among 1373 workers employed at a Utah meat-processing facility (facility A), 502 (37%) were diagnosed with laboratory-confirmed SARS-CoV-2 infection using the real-time polymerase chain reaction (RT-PCR) test. Of those identified as infected, 306 (65%) diagnoses occurred during voluntary mass testing events at the facility on May 30 and June 2. On June 12, 2020, the Centers for Disease Control and Prevention (CDC) deployed a team to assist the LHD and the Utah Department of Health (UDoH) with investigating and mitigating COVID-19 transmission at facility A and in the community. This article describes 3 objectives of this response, including (1) characterize the epidemiology of the COVID-19 outbreak within facility A, (2) quantify geographic proximity of COVID-19 infections among facility A workers and nonworker cases in the community by using geospatial analyses to examine the likelihood of potential transmission in the community, and (3) understand workers' knowledge, attitudes, and practices (KAP) regarding COVID-19.

Methods

This study incorporated data collected as a part of the COVID-19 outbreak response and surveillance activities at facility A and in the surrounding community and a cross-sectional survey of facility A workers' KAP regarding COVID-19. This activity was reviewed by CDC and was conducted consistent with applicable federal law and CDC policy.*

Merging of state surveillance and employer-provided data

We merged reported results of molecular viral testing for SARS-CoV-2 and associated case investigation data logged in EpiTrax, UDoH's statewide electronic reporting and surveillance system, with a worker roster, with test results provided by facility A. EpiTrax and employer data were linked using personally identifiable information (PII) because no unique identifier was shared between the data sets. Unsuccessful linkages for laboratory-confirmed cases identified in the worker roster were checked in EpiTrax and manually provided a linkage between data sets. Facility workers with negative test results and unsuccessful linkages with EpiTrax records were appended directly to create the final analytic data set. Workers without complete data on specimen collection dates and positive or negative test results were excluded. For those with a positive SARS-CoV-2 RT-PCR test, we examined demographics and constructed an epidemic curve using testing date to depict new cases over time. In addition, we calculated COVID-19 attack rates for each of the 3 facility A work sections including harvesting (where cattle are processed into beef carcasses), fabrication (where beef carcasses are cut into final products and packaged for shipment), or nonproduction (where facility functions outside of the production line are conducted). Attack rates were calculated as the percentage of workers in each section testing positive for SARS-CoV-2. Pearson's chi-squared test was used to compare characteristics of workers with positive and negative SARS-CoV-2 results during the described outbreak. Data merging and analyses were performed using R version 3.6.0.[5] All data, including PII, were maintained on the LHD server, with local permission required for access; final study analyses were performed and reported using de-identified data.

Geospatial analysis

Residential addresses of all persons with a SARS-CoV-2 diagnostic test, including all workers at facility A and all nonworkers (defined as members of the community unassociated with facility A) living within the 3 counties included in the health department catchment area, were downloaded from EpiTrax and geocoded (n = 12 776). After excluding those who tested negative, those without an address listed, those with a post office box address, and those without a test date, the remaining 1036 coordinates (631 records of workers and their contacts; 405 records of those with no known association to facility A workers or their contacts) were used as inputs in 2 different geospatial analyses.

First, to identify statistically significant clusters of cases on the basis of residential location, we used the Kulldorf method of space-time permutation in SaTScan version 9.6.[6,7] The space-time permutation model does not require information on population at risk, which is useful when residential addresses

*See for example, 45 CFR part 46, 21 CFR part 56; 42 USC §241(d); 5 USC §552a; 44 USC §3501 et seq.

of cases are available or when aggregating data to the few census tracts or block groups of a small metropolitan area would limit the spatial and temporal details of the analysis. For the model parameters, we used a moving cylindrical window, a circular geographic base with height corresponding to time, delineated into 1-day increments. The number of observed COVID-19 cases in each geographical space and time period was compared with what would have been expected if all COVID-19 cases were spatiotemporally independent. Significance estimates were attained using 999 Monte Carlo replications of the clustering model, with $P < .05$ constituting the significance threshold. We set the maximum temporal and spatial windows at 50% of the time period and 50% of the cases during the study period, respectively. In addition, we set the minimum number of cases in a cluster to 2 and prohibited the overlapping of clusters.

Second, we quantified the number of instances in which a person who tested positive for SARS-CoV-2, stratified by worker status, and divided by test date week, resided at either the same address or different addresses within a 100-m radius, enabling the capturing of parcels across the street, as another person who tested positive. We used this method to quantify the number of cases among workers and nonworkers in high space-time proximity to each other, regardless of statistically significant space-time clustering. The sample period was broken into weeklong increments for analysis, totaling 13 weeks from March 30 to June 28, 2020.

Worker KAP survey

We conducted a mixed-methods survey to investigate COVID-19 KAP among a cross-sectional sample of facility A workers by work section and self-identified preferred language. To achieve a representative sample, we subdivided a complete worker roster by work section, with the goal proportions of our sample determined by population proportional to size (55% from fabrication, 25% from harvesting, and 20% from nonproduction). We oversampled speakers of languages spoken by more than 1% of the workers as a proxy to ensure inclusion of all linguistic groups. We used systematic random sampling from each section, aiming for a total sample of 60 respondents. By using a substitution list, we created a pool of 120 workers across the facility.

Trained staff used a standardized questionnaire to ascertain worker knowledge and beliefs about COVID-19; protective behaviors at work, home, and in the community; and demographics. Staff interviewed workers privately, and responses were kept confidential by using a custom Epi Info version application.[8] Participants provided open-ended insights after answers to closed-ended questions in their preferred language. On-site survey staff obtained consent to interview and use PII from participants. Face-to-face interviews were conducted in private rooms, wearing personal protective equipment. Interviews were conducted in English, Spanish, and Burmese by native speakers or through interpretation services by telephone.

For the KAP survey quantitative analyses, respondents were stratified by sex, age group (≥ or < the median age of respondents), preferred language, self-reported SARS-CoV-2 test result, and work section. Frequencies of given responses were calculated overall and by stratified groups. Crude prevalence ratios were calculated. Data were analyzed by using SAS version 9.4.[9] For the qualitative analyses, open-ended responses from the survey were professionally transcribed and analyzed by a team of 3 coders and 1 supervisor. To generate a common codebook, a subset of responses was randomly selected and coded by using closed- and open-coding techniques.[10] After agreement regarding the codebook, the team triple-coded the responses, with the option of adding codes as needed. Codes receiving coder agreement were used to generate counts, frequencies, and overall themes.[11]

Results

Descriptive epidemiology

Facility A employed 1493 workers as of June 16, 2020, and 1373 (92%) workers were tested for SARS-CoV-2, resulting in a definitive (either positive or negative) test result. Among those tested, 502 (37%) workers had a positive SARS-CoV-2 RT-PCR test result. Frequency of positive SARS-CoV-2 test results and attack rates by facility A worker characteristics are included in Table 1. Percentages for each characteristic presented exclude those with missing data for that characteristic.

Statistically significant differences in race ($P = .01$), preferred language ($P < .001$), and work section ($P < .001$) were found between workers with positive and negative SARS-CoV-2 test results. Among the 785 (57%) workers for whom race was self-identified, attack rates were highest among multiracial (66.7%) workers. Among the 555 (40%) workers for whom linguistic group was reported, attack rates were highest among Burmese- (100%) and Karen- (90%) speaking workers. Among the 1321 (96%) workers for whom work section was reported, attack rates were highest among workers in the harvesting section (71%). Workers in the fabrication section had

TABLE 1
Frequency of Positive SARS-CoV-2 Test Results by Facility A Worker Characteristics During a COVID-19 Outbreak, March-June 2020

	Total N (Column %)	n (%) Positive (Row %)	*P*[a]
All employees	1373	502 (36.6%)	
Any COVID-19 symptoms			.90[b]
N—Missing	984 (71.7)	180 (18.3)	
Yes	310 (79.7)	257 (82.9)	
No	79 (20.3)	65 (82.3)	
Birth sex			.49[b]
N—Missing	2 (12.5)	0 (00.0)	
Female	482 (35.2)	172 (35.7)	
Male	889 (64.8)	330 (37.1)	
Age group, y			.08[b]
N—Missing	0	0	
<18-24	194 (14.1)	60 (30.9)	
25-29	165 (12.1)	59 (35.8)	
30-39	332 (24.2)	113 (34.0)	
40-49	275 (20.0)	112 (40.7)	
50-64	407 (29.6)	158 (38.8)	
Race			**.08**[b]
N—Missing	588 (42.8)	155 (26.4)	
White	438 (55.8)	175 (40.0)	
American Indian/Alaskan Native	16 (2.0)	4 (25.0)	
Asian	57 (7.5)	34 (59.6)	
Black or African American	135 (17.2)	62 (45.9)	
Multiracial	3 (0.4)	2 (66.7)	
Native Hawaiian or Pacific Islander	59 (7.5)	35 (59.3)	
Other race	77 (9.8)	35 (45.5)	
Linguistic group			**<.001**[b]
N—Missing	818 (59.57)	195 (23.8)	
English	255 (45.9)	116 (70.5)	
Spanish	234 (42.2)	138 (59.0)	
Arabic	12 (2.2)	10 (83.3)	
Burmese	5 (0.9)	5 (100)	
Karen	10 (1.8)	9 (90.0)	
Marshallese	4 (0.7)	3 (75.0)	
Tigrinya	19 (3.4)	16 (84.2)	
Other	16 (2.9)	10 (62.5)	
Work Section			**<.001**[b]
N—Missing	52 (20.8)	24 (46.2)	
Harvesting	412 (31.2)	291 (70.6)	
Fabrication	716 (54.2)	139 (19.4)	
Nonproduction	193 (14.6)	50 (25.9)	

[a] *Bold values indicate statistical significance (P < .05).*
[b] *Pearson's chi-squared test.*

a 19% attack rate, and nonproduction workers had an attack rate of 26%. There were no statistically significant differences found by reported COVID-19 symptoms ($P = .90$), birth sex ($P = .49$), or age group ($P = .08$) between workers with positive and negative SARS-CoV-2 test results.

The epidemic curve of testing dates for workers with a laboratory-confirmed positive result (Figure)

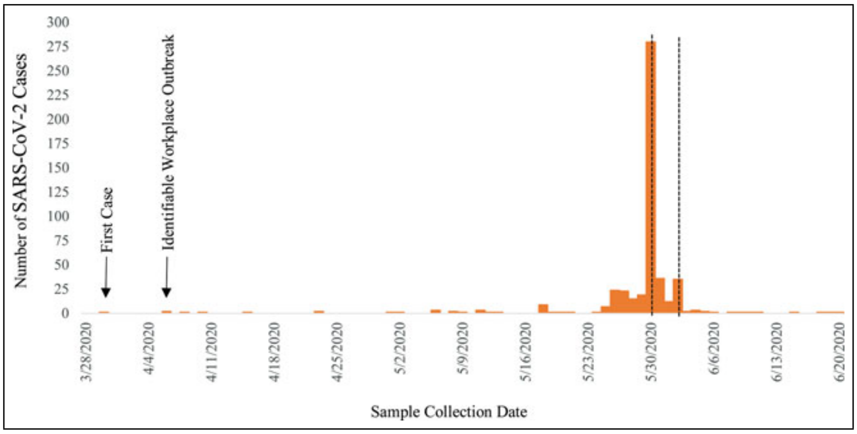

FIGURE Laboratory-Confirmed COVID-19 Cases Among Meat-Processing Facility Workers Testing Positive for SARS-CoV-2[a] by Sample Collection Date, Facility A, Utah, March 30-June 29, 2020
Dashed lines indicate the dates of mass testing at facility A on May 30, 2020, and June 2, 2020.
[a]Counts include the number of workers with definitive SARS-CoV-2 test results by real-time polymerase chain reaction. This figure is available in color online (www.JPHMP.com)

demonstrates that the first worker tested positive on March 30, followed by 2 more the next week, signaling a potential workplace-associated outbreak.[12] Mass testing events on May 30 and June 2 accounted for the high numbers of cases identified on those days. Nine workers with a positive test result were identified between June 6 and 29, 2020.

Geospatial analysis

The results of the first geospatial analysis indicated that 66 (6%) of the 1036 analyzed cases, including cases among workers and nonworkers, were significantly ($P < .05$) clustered by residential address. These cases were divided into 3 statistically significant clusters. The first had a 0.21-km^2 area and included 3 total residences. It encompassed 3 worker cases, 4 worker contact cases, and 2 cases among people with no known association to workers or worker contacts. The second cluster had a 0.72-km^2 area and included 5 total residences. It included 3 worker cases, 4 worker contact cases, and 2 cases among people with no known association to workers or worker contacts. The last cluster, the largest, occurred across 24 residences in a 33-km^2 area. It included 1 worker case, 6 worker contact cases, and 20 cases among people with no known association to workers or worker contacts.

In the second geospatial analysis, we found that 8 of the 13 weeks involved instances of cases among people with no known association to facility A workers or worker contacts residing within 100 m of a worker or worker contact case. Over the course of the 13-week study period, these instances constituted a total of 162 cases, at 142 residential addresses, equating to 40% of the 405 cases among people with no known association to facility A workers or worker contacts.

Worker KAP results

Of 65 workers approached for an interview, 64 (98%) agreed to participate (39 males [61%]; median age, 45 years [range, 19-62 years]). The option not to respond was provided on questions, which accounts for differing denominators on some results reported. Of the 63 workers who reported their preferred language, 31 (48%) spoke Spanish, 13 (20%) English, and 19 (30%) another language, including Tigrinya, Burmese, Karen, French, Arabic, and Marshallese. Fifty-nine workers reported receiving a COVID-19 test, with 27 of those (46%) reporting they had a positive result. Among 64 respondents, 32 (50%) worked in fabrication, 22 (34%) in harvesting, and 10 (16%) in nonproduction. Knowledge of COVID-19 mitigation strategies implemented at the facility was assessed by using an unaided recall item without a list of mitigation strategies: "In response to COVID-19, what changes did you see in your work section and at work?" (see Supplemental Digital Content Appendix 1, available at http://links.lww.com/JPHMP/A810). The 3 mitigation strategies mentioned most often were using face coverings or masks (n = 43; 67%), installation of additional handwashing stations (n = 37; 58%), and maintaining distance of 6 ft (n = 29; 45%) (Table 2). Leave policy changes were mentioned least often (n = 5; 8%). Harvesting workers mentioned barriers (eg, plexiglass) less often than fabrication

TABLE 2
Workplace Mitigation Strategies Stratified by Worker Section (N = 64) in a Knowledge, Attitudes, and Practices Survey Conducted Among Meat-Processing Facility Workers, Facility A, Utah, 2020

		Work Section					
		Harvesting (n = 22)		Nonproduction (n = 10)		Fabrication (n = 32)	
Workplace Mitigation Strategy[a]	All (N = 64), n (%)	n (%)	Crude PR (95% CI)	n (%)	Crude PR (95% CI)	n (%)	PR (95% CI)
Face covering/mask	43 (67)	16 (72.7)	1.22 (0.83-1.80)	8 (80)	1.35 (0.88-2.06)	19 (59.4)	Ref
Handwashing stations	37 (58)	11 (50)	0.84 (0.51-1.40)	7 (70)	1.18 (0.72-1.94)	19 (59.4)	Ref
Social distancing	29 (45)	11 (50)	1.23 (0.68-2.22)	6 (60)	1.48 (0.77-2.85)	13 (40.6)	Ref
Barriers	23 (36)	2 (9.1)	**0.17 (0.04-0.67)**[b]	4 (40)	0.75 (0.33-1.72)	17 (53.1)	Ref
Screening	14 (22)	4 (18.2)	0.65 (0.23-1.84)	1 (10)	0.36 (0.05-2.47)	9 (28.1)	Ref
Employer information[c]	8 (13)	2 (9.1)	0.73 (0.15-3.63)	2 (20)	1.60 (0.34-7.48)	4 (12.5)	Ref
Cafeteria layout	7 (11)	1 (4.5)	0.36 (0.04-3.04)	2 (20)	1.60 (0.34-7.48)	4 (12.5)	Ref
Staggered break times	6 (9)	0	0	2 (20)	1.60 (0.34-7.48)	4 (12.5)	Ref
Leave policy changes	5 (8)	0	0	3 (30)	4.80 (0.93-24.8)	2 (6.3)	Ref

Abbreviations: CI, confidence interval; PR, prevalence ratio; Ref, reference.
[a]In response to COVID-19, what changes did you see in your work section and at work? (Unaided recall item).
[b]PRs in bold are statistically significant ($P < .05$).
[c]Any information received from the employer about COVID-19.

workers (prevalence ratio, 0.17; 95% confidence interval [CI], 0.04-0.67) (Table 2). Participants who indicated English as their preferred language mentioned mask-wearing 1.54 (95% CI, 1.04-2.29) times and additional handwashing stations 1.68 (95% CI, 1.18-2.40) times that of Spanish speakers (Table 3).

Although 62% of respondents (37/60 valid responses) who answered a question about leave reported that they thought it was easy to take COVID-19–related sick leave, 19 (32%) said it was difficult. Follow-up qualitative responses indicated concerns or confusion regarding taking leave, despite its availability (Table 4); the short-term disability pay available to those with confirmed COVID-19 was less than their hourly work pay, resulting in lost wages; and missing work without a positive test meant no access to this short-term disability pay, resulting in complete loss of wages.

Perceived susceptibility to COVID-19 was assessed using 4 items, for which responses indicated that workers felt avoiding COVID-19 infection was beyond their individual control, despite efforts at work and home (Table 4). When asked, "Do you think these changes [mitigation efforts at the facility] are keeping you safe from being infected with COVID-19?" 25 of 52 valid open-ended responses (48%) indicated *Yes*. Predominant themes among those who were not sure included that the virus could be anywhere and sick people might be working. Participants also perceived that completely preventing transmission was impossible because of the close working conditions. When asked about the item if "someone in my family or someone I know will become infected with COVID-19," 42 of 62 (68%) respondents agreed or strongly agreed. In a follow-up question, 10 of the 27 (37%) who expected infection explained that the virus was already among their contacts. Others noted that they were doing their part but others in the community were not. Among 63 respondents, 49 (78%) agreed or strongly agreed with the statement, "You are worried that your family or you will be affected by COVID-19."

When asked about changes made at home or in the community to protect themselves and their families from COVID-19, 39 (62%) of 63 respondents mentioned disinfecting at home and 36 (57%) mentioned handwashing (Table 3) while 13 (21%) mentioned social distancing. Workers in minority linguistic groups (non-English or non-Spanish) mentioned limiting visitors in their home 3.03 (95% CI, 1.48-6.22) times that of Spanish speakers; English speakers mentioned this action 2.0 (95% CI, 0.9-4.9) times that of Spanish speakers.

Discussion

Triangulation of state and employer surveillance data demonstrated that the earliest case among workers in facility A was reported in EpiTrax during the last week in March 2020, with 2 additional cases reported on the first week in April, earlier than when case counts in the facility increased in late

TABLE 3
Workplace, Home, and Community Mitigation Strategies Workers Mentioned by Preferred Language (N = 63) in a Knowledge, Attitudes, and Practices Survey Conducted Among Meat-Processing Facility Workers, Facility A, Utah, 2020

		Preferred Language Group					
		English (n = 13)		Other (n = 19)		Spanish (n = 31)	
Mitigation Strategy	All (N = 63), n (%)	n (%)	Crude PR[a] (95% CI)	n (%)	Crude PR (95% CI)	n (%)	Crude PR (95% CI)
Workplace[b]							
Face covering/mask	43 (68)	11 (85)	**1.54 (1.04-2.29)**	15 (79)	1.44 (0.97-2.14)	17 (55)	Ref
Handwashing stations	37 (59)	12 (92)	**1.68 (1.18-2.40)**	8 (42)	0.77 (0.41-1.42)	17 (55)	Ref
Distancing (6 ft)	29 (46)	6 (46)	1.30 (0.61-2.77)	12 (63)	1.78 (0.99-3.18)	11 (36)	Ref
Barriers (eg, plexiglass)	23 (37)	8 (62)	1.59 (0.86-2.95)	3 (16)	0.41 (0.13-1.26)	12 (39)	Ref
Screening	14 (22)	5 (39)	**5.96 (1.32-26.9)**	7 (37)	**5.71 (1.32-24.69)**	2 (7)	Ref
Employer information	8 (13)	1 (8)	0.60 (0.07-4.84)	3 (16)	1.22 (0.31-4.88)	4 (13)	Ref
Cafeteria layout	7 (11)	2 (15)	1.19 (0.25-5.73)	1 (5)	0.41 (0.05-3.38)	4 (13)	Ref
Staggered break times	6 (10)	3 (23)	2.38 (0.55-10.30)	0	0	3 (10)	Ref
Leave policy changes	5 (8)	1 (8)	2.38 (0.16-35.31)	3 (16)	4.90 (0.55-43.7)	1 (3)	Ref
Home or community[c]							
Disinfecting home	39 (62)	9 (69)	.98 (0.64-1.50)	8 (42)	0.59 (0.33-1.05)	22 (71)	Ref
Handwashing	36 (57)	6 (46)	0.75 (0.39-1.44)	11 (58)	0.94 (0.59-1.52)	19 (61)	Ref
Using hand sanitizer	30 (48)	6 (46)	0.75 (0.39-1.44)	5 (26)	**0.43 (0.19-0.99)**	19 (61)	Ref
Limiting visitors in home	26 (41)	6 (46)	2.04 (0.85-4.91)	13 (68)	**3.03 (1.48-6.22)**	7 (23)	Ref
Face covering/mask	23 (37)	4 (31)	1.06 (0.40-2.83)	10 (53)	1.81 (0.90-3.64)	9 (29)	Ref
Limit outings	23 (37)	6 (46)	1.79 (0.77-4.13)	9 (47)	1.84 (0.86-3.93)	8 (26)	Ref
Social distancing (6 ft)	13 (21)	4 (31)	3.18 (0.82-12.26)	6 (32)	3.26 (0.92-11.53)	3 (10)	Ref

Abbreviations: CI, confidence interval; Prev, prevalence; Ref, reference.
[a] *PRs in bold are statistically significant ($P < .05$).*
[b] *In response to COVID-19, what changes did you see in your work section and at work? (Unaided recall item).*
[c] *In response to COVID-19, what changes have you and your family made at home to protect yourself and your family members? (Unaided recall item).*

May 2020. However, inconsistent reporting of case and contact employment information to EpiTrax obscured this surveillance signal. Improved, integrated surveillance data, including documentation of workplace during initial case investigations, are important to understand and respond to workplace-associated COVID-19 outbreaks.

The harvesting section of the meat processing facility had the highest attack rate, and those workers mentioned barrier use less often than fabrication workers. In harvesting, room configuration, workers' movements, and requirements of the work limit the use of barriers and distancing. However, insufficient information was available to determine whether lack of barriers contributed to the high attack rate or whether other unidentified work section transmission risk factors or unidentified household or community contacts among affected workers potentially contributed. In contrast, the lowest attack rate was among workers in fabrication, which contained workstations that were conducive to distancing and installation of barriers between workers.

Geospatial results indicated that 40% of cases among those with no known association to a worker or worker contact lived in residences within 100 m of a residence of a worker or worker contact case reported in the same week. However, only 6% of total cases were included within statistically significant spatiotemporal case clusters. This disparity between the 2 geospatial analyses implies a spatially homogeneous distribution of positive cases. These findings highlight the importance of implementing evidence-based transmission mitigation measures in nonresidential locations, including workplaces, businesses, or social settings.

In the KAP survey, only half of respondents across the facility believed that changes at work to mitigate COVID-19 transmission were keeping them safe. Workers whose preferred language was not English were less likely to mention key workplace mitigation strategies. Employers should communicate COVID-19–specific changes to work leave policies using materials that are designed to address differences by working conditions (section) and linguistic

TABLE 4
Illustrative Quotations by Key Topic From Workers During a Knowledge, Attitudes, and Practices Survey Conducted Among Meat-Processing Facility Workers, Facility A, Utah, 2020

Topic	Quotations
Taking sick leave	
Lost wages	[L]ook, the check was not paid for the 32 hours that the sick people supposedly do not feel well and one has to be at home. They don't pay us. What's the use? What policy is that going to be? That they don't pay us. So people in need come to work sick . . . . They don't pay us. That is why people in need come to work sick even if [sick]. So who is going to pay the "bills" for me? That's why I tell you that the company is a liar. [Okay. So if, let's say if you get sick again, how would you feel to ask for permission to leave?] Well, the truth is, I don't know how I would feel because honestly they put you as absent and they don't pay you. That's not fair. It is not fair what the company is doing because I know that everyone right now look at theirs checks they are going to get mad. Because they didn't pay them. But unfortunately, economically we are not all the same . . . . So if the company give us that permission to take some time at home but they don't pay us. I know that it is only if you are positive . . . . Whoever has money saved can do so with confidence, but those of us who don't have (unclear audio) . . . . For me I do not . . . I would like to but . . . it is not possible.
Fear of retaliation	I don't because I feel sometimes they can turn that against you. And, so you know you don't know where you stand on your [work absences] points[a]
Production pressure	Already on Monday, they were already calling me to come to work . . . [I said], "And do you think that this goes away from night to morning? If you knew how I am, you would not even dare to speak to me. I will [not] go until I am well, until I feel more or less I will return, but not right now." About three times they called me that I had to come to work on Tuesday.
Supported to take leave	I feel comfortable [taking leave] . . . . We were rested for 2 weeks and it was for our good. And for the good of others. So as not to continue infecting other people.
Perceived COVID-19 susceptibility	
The virus is everywhere	[T]here are many people don't know that they are sick so they go around people. Then, we are exposed to them. I'm worried that I will get sick too.
People at work are sick	But people keep getting sick every day. Every time we arrive, they have a lot of people there because they have a fever, or anything, that is, that does not guarantee that we will not get sick. Since they are still sick.
Others not taking action	I see people in stores not wearing masks, but they're not even six feet apart, but they go buy food in groups, instead of one household member going. But they go with their own families—people not wearing masks. I don't see people disinfecting the carts. Like if they don't care, they don't believe in it.
Differing risk perception	I am not worried about getting sick from COVID-19 because we came from refugee camp where there is no food to eat, and we survived through all kind of illnesses, including malaria in refugees' camp.

[a] *"[Work absences] points" refers to facility A's system to track work absences, which had been suspended by facility management during the COVID-19 outbreak.*

group. Differences by linguistic group were identified regarding specific protective behaviors both inside and outside the workplace. These results indicate an opportunity for addressing disparities in knowledge and potential health outcomes by tailoring health risk communication to workers whose language is less widely spoken among their social networks and by work section.[13-15] For example, employers should present leave policy information, which can be complex, in plain, preferred languages, supported by visuals, providing clear action steps on printed materials that can be reviewed with family members.[16-20] Message framing should consider barriers to action that can result from differing perceptions of risk, including those related to cultural factors.[21,22] To ensure effectiveness, all leave policy messages and materials should be tested with a subset of workers.[23,24] The same strategies can be used to address potential COVID-19–related observed knowledge and motivation gaps among workers. Common scripts for facility supervisors, supported with handouts and posters, should be created, tailored with specific messages that address work section–related challenges.

To address concerns among workers regarding effectiveness of COVID-19 mitigation strategies, LHDs and facility managers can use risk communication strategies suited to the evolving science.[25] These include providing regular updates about successes and challenges, remaining transparent about changes, and both acknowledging and addressing concerns of workers, including lost wages. Management can also partner with the LHD to provide tangible support for actions among workers' communities that increase self-efficacy in fighting infections.[26]

Increasing evidence indicates that certain racial and ethnic minority groups are disproportionately affected by COVID-19 because of interrelated inequities in social determinants of health.[27-31] Our results illustrate potential ways in which COVID-19–related disparities are associated with meat-processing facilities.[4,32] Factors potentially contributing to disparities include overrepresentation of racial/ethnic minority workers in the meat-processing industry where risk for SARS-CoV-2 exposure can be higher than the risk in noncongregate workplace settings. Additional factors may include financial pressure to work when sick to avoid reduced earnings or retaliation, lower socioeconomic status contributing to increased risk for community transmission through shared housing, and an inability to quarantine when exposed or to isolate when sick.[32-34] Implementing targeted community- and workplace-specific interventions that protect disproportionately affected groups is essential for preventing SARS-CoV-2 transmission and reducing both COVID-19–associated occupational risk and health disparities among these populations.

This COVID-19 outbreak among workers at facility A underscores the potential for rapid SARS-CoV-2 transmission in congregate settings[1,2] and the need for swift, comprehensive public health response and mitigation in both work and community settings. As a result of this multifaceted public health response, the LHD developed standardized enhanced data collection and review processes to generate alerts of potential workplace-associated COVID-19 outbreaks and hired a workplace disease investigator, providing affected worksites with COVID-19–related education and mitigation guidance. Facility A is changing the layout of portions of the harvesting section of the meat-processing facility to improve social distancing. The LHD partnered with facility A to install a dedicated health educator to provide ongoing COVID-19 information to workers. Finally, the LHD has implemented facility and community health outreach strategies that include tailoring risk communication by work section and linguistic group.

The findings in this report are subject to at least 6 limitations. First, missing epidemiologic data from the utilized data sources may limit generalizability of conclusions using those data. Second, case investigation form data were sometimes missing, including home addresses, which might have precluded documentation of potential household transmission. Third, sample size for the KAP survey was determined by feasibility within a public health response, rather than statistical power. Although we obtained a sample representative of work sections, the sample might not be representative of other worker demographic or workplace differences. Fourth, sampling was performed as the outbreak was resolving. Thus, the sample might have excluded workers who were infected later or had longer courses of illness and had not yet returned to work. Fifth, while people living within high proximity to each other have more common mobility patterns than those in distant proximity, the spatiotemporal distribution of cases alone must be viewed as correlational, while causal linkages between high proximity cases cannot be determined without genetic sequencing. Finally, geospatial analysis focused on residence and workplace. We did not gather geospatial information about transport to and from work or on other social congregate settings outside of residence or workplace.

Implications for Policy & Practice

- Improved, integrated surveillance data, including documentation of workplace during initial case investigations, are important to understand and respond to workplace-associated COVID-19 outbreaks.
- Evidence-based transmission mitigation measures in nonresidential locations, including workplaces, businesses, or social settings, are key components in slowing the spread of COVID-19.
- Employers should communicate COVID-19–specific changes to work leave policies using materials that are designed to address differences by working conditions and linguistic group, highlighting changes from regular policies that may address financial hardships.
- Disparities in knowledge and potential health outcomes can be addressed by tailoring complex health risk communication to workers whose language is less widely spoken among their social networks.
- Message framing should consider barriers to action that can result from differing perceptions of risk, including those related to cultural factors.
- Management can also partner with the LHD to provide tangible support for actions among workers' communities that increase self-efficacy in fighting infections more broadly.

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