

“We Were on Our Own”: Animal Slaughtering and Processing Industry Workers’ Perspectives on Workplace Health and Safety During the COVID-19 Pandemic in North Carolina

NEW SOLUTIONS: A Journal of
Environmental and Occupational
Health Policy
2026, Vol. 35(4) 410–423
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DOI: 10.1177/10482911251384254
journals.sagepub.com/home/new
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A Part of Sage

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Abstract

Workers in the animal slaughtering and processing industry have been disproportionately affected by the COVID-19 pandemic. Our mixed methods study aimed to describe worker experiences during the pandemic, focusing on workplace health and safety. We surveyed 69 animal slaughtering and processing workers in North Carolina between April 2021 and July 2022 and conducted in-depth interviews with 9 workers between July 2022 and April 2023. Nearly all survey participants reported their employers provided (94%) and required (90%) face masks, but fewer reported engineering or administrative controls. Interviewed participants described production as management’s priority, over health and safety; difficulty taking time off when ill; inadequate communication from management; and an overall sense that “we were on our own” in maintaining health and safety at work, especially later during the pandemic. Though unlikely under the current administration, an enforceable Occupational Safety and Health Administration infectious disease standard, including appropriate policies for isolation and paid time off, could help protect worker health.

Keywords

COVID-19, infectious disease, animal slaughtering and processing, occupational safety, mixed methods

Introduction

The animal slaughtering and processing industry (North American Industry Classification System code 3116) employed 530,470 people in the United States in 2022, including 31,999 in North Carolina.¹ Work in this industry is dangerous, dirty, and demanding (3-D).^{2–4} In 2022, workers in the industry had twice the rate of recordable work-related injuries or illnesses (6.0 per 100 full-time workers per year) compared to all US workers (3.0 per 100 full-time workers per year).⁵ Repeated, forceful motions with sharp tools put workers at risk of both acute and repetitive strain injuries.^{2,3,6,7} In addition, workers can be exposed to extreme temperatures, hazardous chemicals (eg, peracetic acid, ammonia), and high levels of noise. They are at risk of diseases of the skin and respiratory system, both noninfectious and infectious, including zoonoses.^{2,3,8,9} Lower wages and levels of formal education compared to other US workers, challenges related to documentation or citizenship status, and/or limited English proficiency can also impede animal slaughtering and processing workers’ access to health information and protections at work.^{3,4,10}

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COVID-19 became a health effect associated with animal slaughtering and processing work during the spring of 2020. In the first year of the pandemic, at least 59,000 animal slaughtering and processing workers contracted COVID-19, and at least 269 died.¹¹ Close contact with large numbers of coworkers, long working hours, noise necessitating workers speak loudly or shout, cold temperatures, low humidity, inadequate ventilation, and limited access to paid sick leave contribute to an environment where SARS-CoV-2 can spread rapidly.^{12–14} We previously reported on antibody test results for animal slaughtering and processing industry workers in the cohort whose survey results we present here: 75% of animal slaughtering and processing industry workers had evidence of past SARS-CoV-2 infection, 1.4- to 3.9-fold higher than North Carolina general population estimates during the same period.¹⁵ In a survey offered to a random sample of US-based Facebook users, a disproportionately high number of food processing workers (including animal slaughtering and processing industry workers) reported positive SARS-CoV-2 test results (24.2%, compared to 13.2% of all those working outside the home).¹⁶ Klein et al found that half of food processing workers sampled, including 65% of meatpacking workers, had antibody-based evidence of past SARS-CoV-2 infection, 5 times the prevalence of general US population estimates at the time of the survey.¹⁷ COVID-19 has disproportionately harmed Black and Hispanic/Latinx populations,¹⁸ and disparities by race and ethnicity are also evident among meatpacking workers.¹²

Despite the risks of SARS-CoV-2 exposure and infection among meatpacking and other essential workers, the US Department of Labor's Occupational Safety and Health Administration (OSHA) did not issue any enforceable workplace standards for COVID-19-specific protections until June 2021 and withdrew all those it had issued by December 2021.^{19–21} Occupational Safety and Health Administration's Personal Protective Equipment (PPE) standards and General Duty Clause do pertain to preventing occupational exposure to SARS-CoV-2.^{22–24} Occupational Safety and Health Administration received more than 2,700 formal and more than 16,900 informal complaints related to COVID-19 between January 2020 and February 2023, but followed up with inspections on 23% and 7%, respectively.²⁵

While OSHA did provide voluntary guidance to employers on mitigating and preventing the spread of COVID-19,²⁶ engineering control recommendations were inadequate compared to recommendations from the American Conference of Governmental Industrial Hygienists (ACGIH),²⁷ the American Industrial Hygiene Association (AIHA),²⁸ and the American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE).²⁹ OSHA recommended employers provide physical barriers between workstations,²⁶ even after significant evidence of airborne (vs primarily respiratory droplet) transmission of COVID-19,³⁰ which would render barriers minimally effective. OSHA recommended employers facilitate employee vaccination; instruct workers with COVID-19

symptoms and unvaccinated workers with close contact with a COVID-19 case to stay home; change policies that might encourage sick workers to come in; train workers on COVID-19 policies and procedures using accessible formats and language; and implement protections from retaliation for workers with concerns related to COVID-19.²⁶ In terms of PPE, OSHA recommended employers make face coverings or surgical masks available at no cost.²⁶ OSHA did not recommend N95 respirators for all employees, although these have been shown to have significantly lower inward and outward leakage compared to face coverings or surgical masks, improving both source control and protection from infectious particles.³¹ Comprehensive COVID-19 prevention and control measures in the workplace have been associated with lower worker SARS-CoV-2 positivity,³² as well as with workers' feelings of protection.³³ However, simulation studies suggest that even adherence to OSHA masking and distancing recommendations would result in high levels of COVID-19 transmission, given meatpacking plant design.³⁴

The COVID-19 pandemic has also been connected with a range of negative psychosocial outcomes among essential workers, including psychological stress, distress, and anxiety; burnout; stigma and feelings of isolation; and insomnia.³⁵ Most studies to date have focused on healthcare workers.³⁵ Literature documents poor working conditions and high rates of COVID-19 among animal slaughtering and processing workers.^{12,36} However, despite media, union, and worker reports, there has been limited peer-reviewed literature on slaughtering and processing workers' experiences during the pandemic. In this study, we aimed to better understand animal slaughtering and processing industry worker experiences during the COVID-19 pandemic, with a focus on health and safety practices, including the extent to which these practices met OSHA guidance—although this guidance was inadequate compared to recommendations from ACGIH, AIHA, and ASHRAE and current research—and affected workers' physical and emotional well-being.

Methods

Study Design and Population

This study was designed and carried out in collaboration between the Johns Hopkins Bloomberg School of Public Health (JHSPH) and the Rural Empowerment Association for Community Help (REACH), a community nonprofit organization based in Duplin County, North Carolina, as described previously.³⁷ In short, we enrolled North Carolina households, primarily near industrial livestock operations (ILOs). We used a snowball sampling approach rather than population-based sampling because of resource constraints. Eligibility criteria included the ability to understand spoken English or Spanish and access to a household phone or mobile device. Each participant was provided

an incentive of \$50 at the baseline visit, which included a survey, salivary COVID-19 antibody test, and household surface dust sampling for zoonotic microbes. Study team members collected survey responses during a phone or video call visit, entering responses into the secure site REDCap (see Supplemental Materials for survey question text).^{38,39} Participants reported job title and category, workplace characteristics, workplace infection prevention and control (IPC) measures in response to COVID-19, COVID-19 impacts, COVID-19 stress and mental health effects, and demographic characteristics. Employed adult (≥ 18 years) participants' industries were identified using the National Institute for Occupational Safety and Health Industry and Occupation Computerized Coding System (NIOCCS, <https://csams.cdc.gov/nioccs/>) to code based on free-text job title, job category, and ILO category, as described previously.¹⁵

We previously reported on demographics and SARS-CoV-2 antibody results for participants of any age and industry (including not employed),³⁷ as well as on industry, workplace characteristics, and workplace IPC measures and antibody results for adult participants.¹⁵ This analysis uses an explanatory sequential mixed-methods design, with collection and analysis of cross-sectional survey data followed by collection and analysis of in-depth interviews.⁴⁰ The JHSPH institutional review board approved this study (IRB00014420).

Quantitative Analysis

We calculated descriptive statistics of workplace characteristics, workplace IPC measures, COVID-19 impacts, and COVID-19 stress and mental health effects among animal slaughtering and processing industry workers. All quantitative analyses were completed using R 4.2.2 (2022-10-31).⁴¹

In-Depth Interviews

We conducted in-depth interviews with 9 animal slaughtering and processing industry workers between July 2022 and April 2023. Each interview participant received an additional incentive of \$30. One interviewer (CG) spoke with all participants. The interviewer followed a semistructured interview guide (Supplemental Materials) to facilitate discussion on animal slaughtering and processing industry work tasks and workplace conditions; work effects on physical health and emotional well-being; workplace health and safety protections; and what changes participants wanted to see in their workplaces to improve protection of health and safety. We identified these topics through analysis of survey data and discussion with JHSPH faculty and REACH advisors and staff. All interviews were in English, via phone or video call, and about an hour in length.

Qualitative Analysis

All interviews were recorded, deidentified, and professionally transcribed. After all interviews were conducted, one analyst (CG) coded interview transcripts line-by-line with *Atlas.ti* qualitative data analysis software⁴² using a combination of deductive and inductive coding. Deductive coding used the following *a priori* codes derived from the OSHA COVID-19 guidance: absence policies, paid time off, and masks at no cost. Inductive *in vivo* coding was used to focus on participants' language and perspectives. CG conducted a second cycle of pattern coding to explore additional nuance and relationships between concepts.⁴³ A secondary analyst (ZS) reviewed all interview transcripts and identified themes using a grounded approach, blinded to coding from the primary analyst. CG and ZS used analytic memos to categorize relationships between the study's research questions and the patterns and themes identified by inductive coding.^{43,44} The study team met to discuss themes identified from coding and full-transcript review and to explore and synthesize links, connections, and tensions across interviews. We also used memos, meetings, and joint displays of quantitative and qualitative data to integrate our results. We aimed to use qualitative results for the elaboration and clarification of quantitative results.

Research Team and Positionality

CG was the primary investigator in this study, conducted in pursuit of a PhD in Environmental Health and Engineering (EHE), where she was affiliated with the Education and Research Center for Occupational Safety and Health (ERC). ZS is also an EHE PhD student and has experience working on infectious disease hazards among animal slaughtering and processing workers. ZS, KK, GM, and CDH are also all affiliated with the ERC, and DJH is the cofounder and director of the REACH in Duplin County, NC. CG, ZS, KK, GM, and CDH, as occupational health researchers, and DJH, as a community activist, recognize the policy implications of this study, which are discussed at the end of the discussion section, and have a prior record of community-driven research and publication about health and safety in 3-D work environments. The parent study, which focused on the disproportionate impacts of SARS-CoV-2 and zoonotic pathogens on ILO workers,^{15,37,45} also informed the goals of this study. We acknowledge that our team's identities and experiences—as academic researchers and as a community advocate—influenced this work. In particular, we held greater educational privilege, financial security, and social power than most participants, which may have shaped both how we framed research questions and how we interpreted findings. We reviewed interview guides and questionnaires with REACH team members with livestock industry work experience and revised them to use clearer language and center community concerns. However, we did not employ a formal process for examining

Table 1. Participant Characteristics, North Carolina, 2021 to 2023.

Characteristic	Survey participants, N = 69	Interview participants, N = 9
Age in years, median (interquartile range [IQR])	40 (29, 49)	30 (24, 40)
Gender, n (%)		
Female	38 (55%)	5 (55%)
Male	31 (45%)	4 (44%)
Race/ethnicity, n (%)		
Black	62 (90%)	8 (89%)
Hispanic/Latino	4 (5.8%)	1 (11%)
White	1 (1.4%)	0
Multiple	2 (2.9%)	0
Duration of employment in current job (years), median (IQR)	3 (1, 9)	2 (1, 4)
Occupation (within the animal slaughtering and processing industry; Standard Occupational Classification major group), n (%)		
Production	54 (78%)	5 (55%)
Transportation and Material Moving	5 (7.2%)	2 (22%)
Cleaning and Maintenance	4 (5.8%)	0
Office and Administrative Support	3 (4.3%)	2 (22%)
Food Preparation and Serving	2 (2.9%)	0
Operation type, n (%)		
Hog	35 (51%)	4 (44%)
Poultry	25 (36%)	5 (55%)
Multiple	3 (4.3%)	0
Date, range	April 2021 to July 2022	July 2022 to April 2023

Note: Information on length of employment was missing for 1 survey-only participant.

assumptions or uncovering biases during the study. As such, we cannot fully describe how our positionality influenced each stage of the research. We recognize, however, that our work—like all research conducted by human beings—is subject to biases related to positionality, and that not all of these biases may have been identified or addressed.

Results

Of 69 adult animal slaughtering and processing industry workers who completed the survey between April 2021 and July 2022, 8 also participated in an in-depth interview between July 2022 and April 2023. One worker participated in an in-depth interview but did not complete the survey (Table 1). The median age in years of survey respondents was 40 (interquartile range [IQR] 29, 49), and in-depth interview participants were 30 (IQR 24, 40). About half of survey and interview participants identified as female and half as male. Most survey (90%) and interview participants (n = 8) identified as Black. The median duration of employment in current job was 3 years (IQR 1, 9) for survey respondents and 2 years (IQR 1, 4) for interview participants. Participants worked in a variety of occupations within the animal slaughtering and processing industry. Most survey and interview participants worked in production occupations (eg, slaughtering animals; cutting, deboning, and packing meat), but some also worked in transportation (eg, truck

driver for a production and processing operation, transporting animals to the processing plant), cleaning and maintenance, office and administrative support (eg, clerk checking in and out equipment), or food preparation and serving (eg, cafeteria server at a slaughtering and processing operation) (Table 1). More survey participants worked at hog slaughtering and processing operations (51%) compared to poultry (36%) or multiple operations (4.3%). More interview participants worked at poultry (5) than hog (4) operations, and no interview participants worked at both poultry and hog operations.

Survey participants reported IPC measures at work, but incomplete adherence to OSHA standards and guidance. Some measures prioritized by the hierarchy of controls were less frequently reported: 35% of workers reported physical barriers between workstations, and 19% any change in sick leave or bonus program policies, compared with 94% reporting provision of face masks and 90% mask requirements (Table 2). Additionally, 2 participants (3%) reported mask requirements but no provision of face masks, potential employer violations of OSHA's PPE standard.²² Almost all participants (92%) reported feeling able to isolate if they tested positive for SARS-CoV-2 or quarantine if exposed to someone with COVID-19 without concern for losing their job, although 5 participants did not respond to either of these questions. Most (74%) also reported feeling able to maintain at least 6 feet of distance from others most of the time at work.

Table 2. OSHA COVID-19 Guidance, With Corresponding Survey Items and Animal Processing and Slaughtering Industry Worker Responses (N = 69), North Carolina, 2021 to 2022.

	OSHA guidance ²⁶	Survey item	n (%)
Engineering controls	“Barriers should block face-to-face pathways” ^a	Physical barriers at/between workstations	24 (35%)
Administrative controls	“Barriers do not replace the need for physical distancing—at least 6 feet of separation”	Able to maintain 6 + feet distance majority of time at work	50 (74%)
	“Instruct any workers who are infection, unvaccinated workers who have had close contact with someone who tested positive for SARS-CoV-2, and all workers with COVID-19 symptoms to stay home”	Could isolate if SARS-CoV-2+	59 (92%)
	“Eliminate or revise policies that encourage workers to come to work sick”	Could quarantine if COVID-19 exposed	59 (92%)
		Changes in sick leave or bonus program policies	13 (19%)
Personal protective equipment (PPE)	“Provide workers with face coverings or surgical masks”	Employer ever provides face masks (any)	65 (94%)
		Employer provides N95/KN95/resp.	12 (17%)
		Employer provides N95/KN95/resp.	46 (67%)
		Employer provides surgical masks	22 (32%)
		Employer provides cloth masks	
		Face masks required (any)	62 (90%)

Abbreviation: OSHA, Occupational Safety and Health Administration.

^aEvidence physical barriers are ineffective in reducing COVID-19 spread.^{46,47}

We based survey items based on OSHA guidance²⁶ and CDC's Example COVID-19 Prioritization Questions for Non-Healthcare Worksite Assessments,⁴⁸ which included physical barriers as a COVID-19 protection measure. We did not differentiate between National Institute for Occupational Safety and Health (NIOSH)-approved respirators and others (eg, KN95) that may not have passed NIOSH quality assurance and performance requirements. One participant was missing information on ability to distance and 5 on ability to isolate/quarantine.

Animal slaughtering and processing industry workers reported a range of adverse outcomes related to the COVID-19 pandemic. Almost a fifth (16%) reported a family member died from COVID-19, 13% reported job loss within their households, 7% reported that they themselves had lost a job, and 6% reported losing health insurance (Table 3). Almost half (41%) reported challenges accessing or paying for electricity, utilities, rent or mortgage, transportation, healthcare, and/or food, compared with 25% of survey participants working in other industries (see Supplemental Materials).

Majorities of animal slaughtering and processing workers reported worry about family and friends contracting COVID-19 (63%) and about contracting COVID-19 themselves (51%) (Figure 1). Compared with those working in other industries, larger proportions reported worry about loss of income, medical bills, and having enough food (Supplemental Materials). Compared with those working in other industries, smaller proportions reported difficulty sleeping and a somewhat smaller proportion reported difficulties concentrating because of pandemic-related fear and anxiety (Supplemental Materials).

Qualitative Results From In-Depth Interviews

We identified 4 major themes from in-depth interviews, including (1) production as management's priority, (2)

workers' difficulty taking time off when ill, (3) inadequate communication from management, and (4) workers' sense that “we were on our own.”

Production Perceived as Management's Priority

Participants across occupations characterized work in the animal slaughtering and processing industry as “fast-paced” (Worker 1, 5, 6) and “nonstop” (Worker 2), with management emphasizing production speed over worker health and safety. Workers noted this emphasis on production persisted regardless of the number of employees at work. A hog processing administrative worker described management priorities during the COVID-19 pandemic, “Their main concern was getting the product out. I don't think it really mattered who was sick and who wasn't... They didn't care” (Worker 9).

“Line speed” is the number of animals slaughtered and processed for human consumption per minute, as they move down a processing line conveyor belt at which workers are stationed. Each employee's “work speed” is therefore a combination of line speed and the number of other employees performing the same task.³ A poultry processing worker described consequences for not meeting a work speed target of packing “33 pieces of meat per minute”:

Table 3. Impacts of COVID-19 Pandemic Reported by Animal Slaughtering and Processing Industry Workers (N = 69), North Carolina, 2021 to 2022.

Impact	n (%)
Lost childcare	14 (88%) ^a
Family member died from COVID-19	11 (16%)
Someone in household lost job	9 (13%)
Lost eldercare	5 (7.4%)
Lost job	5 (7.2%)
Lost health insurance	4 (6.0%)
Gained health insurance	3 (4.5%)
<i>Challenges with accessing...</i>	
Electricity or other utilities	17 (25%)
Rent or mortgage	15 (22%)
Transportation	10 (15%)
Healthcare	8 (12%)
Enough food	5 (7.4%)
Medication	4 (5.9%)
At least one of the above	28 (41%)

^aFifty-three participants did not report on childcare; 3 on gaining health insurance; 2 on family member death from COVID-19, someone in household losing a job, and losing health insurance; 1 on electricity or other utilities, rent or mortgage, transportation, healthcare, food, medication, and losing eldercare.

They [management] want you to move very fast paced, the whole time you're in there... I know they're trying to get the stuff out, but I wish they would change how they do stuff, like with, "If you don't get this speed, then we're going to write you up." (Worker 1)

Even when describing a supportive supervisor whose intervention helped limit back pain, this worker first explained how the intervention helped with hitting work speed targets, then its impact on back pain:

My supervisor, she's really good. She works with me and she moves me on the higher part of the line, and that helps me a little with my speed, also. But it also helps with my back, because I don't have to reach down as far to pick my meat. (Worker 1)

Some workers suggested spreading workers further apart on the line in order to reduce the spread of COVID-19 but believed this would be unlikely to happen because doing so would require reducing the number of people working on each line, thereby reducing line speed and limiting production. Several participants perceived this management emphasis on production as a health and safety concern, especially during the COVID-19 pandemic. A poultry processing worker attributed a pulled chest muscle, which necessitated outside medical care, to emphasis on hitting line speed and production targets, even when many other workers were out sick with COVID-19:

It was that we were understaffed and overworked, and we still had to get production out. That didn't change... And it was definitely fewer people, and like I said, we had to continue to get the same amount of work that we normally would have to get out. Therefore, we were working much harder. (Worker 3)

One worker also connected management emphasis on production with high rates of worker turnover, and several workers reported that frequent turnover resulted in more difficult and sometimes dangerous situations. A poultry processing worker noted, "You might have a new hire on a cutting machine, and that's what's scary as shit" (Worker 8). Another poultry processing worker linked turnover with PPE not provided until workers had been at the plant for a certain time, "After 90 days, they do offer boots, but you have to get to your 90 days" (Worker 1).

Difficulty Taking Time Off When Ill

Many participants described barriers to taking time off work when ill, including "points-based," so-called "no-fault" attendance policies common in the industry,⁴⁹ where employees receive points for missing work or arriving late, and face consequences, including termination, after a certain number of points. One worker explained how even excused absences for illness would lead to accumulating points and risking termination. A hog truck wash worker explained how the point system attendance policy meant workers could sometimes but not always take off work when ill:

I was able to say I was sick and tell them I could not make it there till I get myself together, but I didn't do that much because I didn't have room for that. It's like a revolving door, somebody else will be there. (Worker 2)

Some workers described attendance policy flexibility during the COVID-19 pandemic, where individual managers might allow workers to take time off for illness or to get tested without accumulating points. However, even one of the workers who noted some ability to take off without accumulating points during the COVID-19 pandemic described how the strictness and inconsistent application of the attendance policy caused their termination when they got COVID-19:

I actually got COVID from somebody, a lady that showed up to work, and she usually wasn't supposed to be there. She had COVID, she gave it to me. I was telling everybody that I had to go to the hospital and whatnot, so my supervisor told me... "Go ahead, go get checked out." And I had my note and everything... It was HR that actually fired me... I think they had a new hire that day and I think that the new hire made a mistake. (Worker 8)

Participants also described the lack of paid leave as an obstacle to taking off when ill. A poultry processing

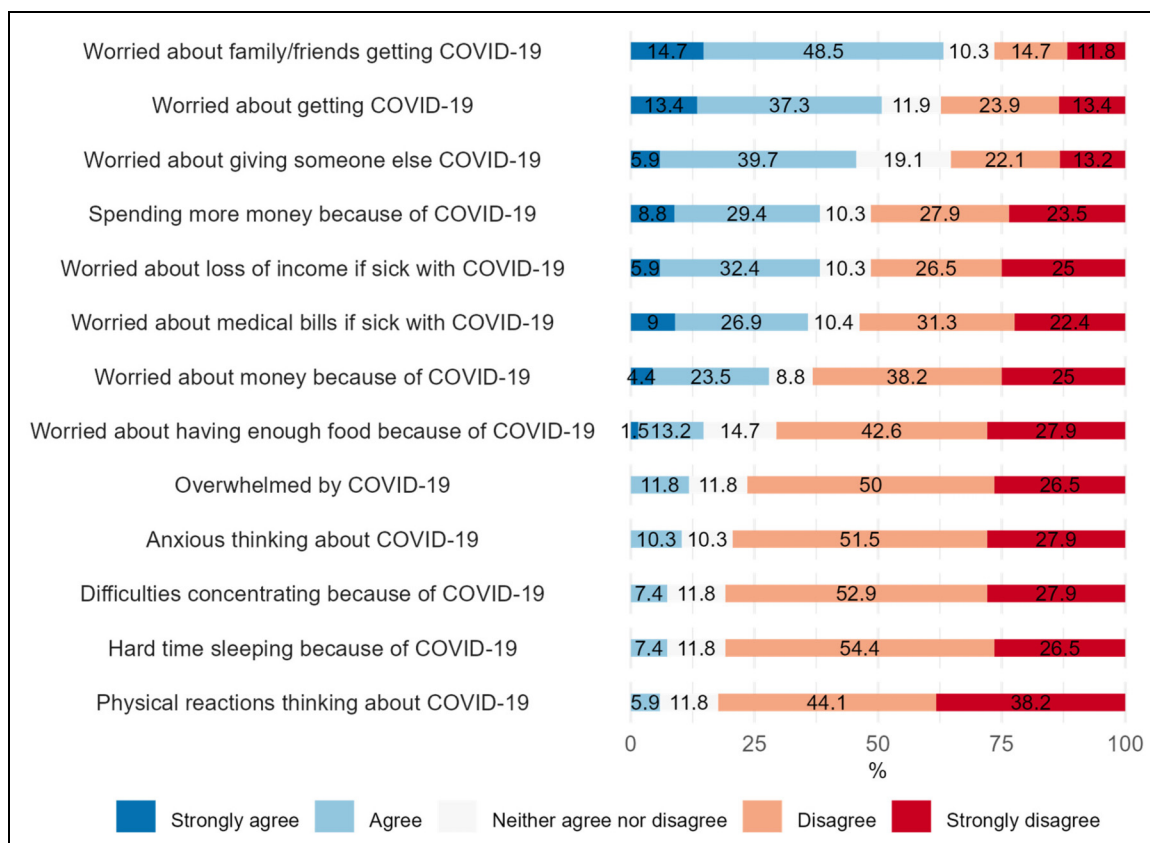


Figure 1. Stress and mental health effects of COVID-19 reported by animal slaughtering and processing industry workers (N=69), North Carolina, 2021 to 2022.

Note: Two participants did not report on “Worried about getting COVID-19” and “Worried about medical bills if sick with COVID-19”; 1 participant did not report on “Worried about family/friends getting COVID-19”; “Worried about giving someone else COVID-19,” “Spending more money because of COVID-19,” and “Worried about money because of COVID-19.”

worker explained, “I’m still in my [first] 90 days. So, if I get sick with COVID, I show them proof, it won’t count against me, but I don’t get paid for it” (Worker 1). Even at a facility where management provided paid leave for workers testing positive for COVID-19, limitations of the policy led to workers coming in when ill. An administrative worker described the situation:

A lot of them [other workers at the processing operation] came in and were waiting for test results. Because they were like, well, the wait period doesn’t guarantee I’ll get paid, so I’ll just come and until they call me. So a lot of them would say, “Oh, you know, I got my test result today and it was positive.” And they’re like, “But you’ve been working.” So it’s like, “Well, I didn’t know. But I couldn’t afford to stay home four days and wait for a test result.” So it was just hectic. It was a lot... I can’t afford to stay home and I can’t afford to come in (Worker 9)

The same worker described being called on to translate from English to Spanish and explain absence policies in Spanish to other workers:

And it was just a lot. It was so overwhelming. Trying to, you know, be understanding and compassionate when I translate. Because I’m listening to their [other workers requesting sick or bereavement leave] stories. And, you know, it’s heart-breaking, but at the same time management is pretty much saying we don’t care. Sorry, buddy. You have a job and that’s your responsibility. So it was really difficult trying to translate that. You know, they [other workers] look at you like, “Why are you saying that?” (Worker 9)

Inadequate Communication From Management

Participants reported inadequate communication from management, especially during training and related to COVID-19 transmission and controls. A poultry processing worker said:

They don’t like to teach you, I will say that. They don’t like to teach you, they want you to look and see. Like my first day, they were like, “Oh, look and see what they’re doing. Okay. Now, do that.” (Worker 3)

A poultry processing administrative worker explained minimal training made the general work environment more

difficult, with “People learning the job that they just happened to run into, things of that sort” (Worker 7). Similarly, a hog processing administrative worker expressed safety concerns around inadequate training for people working with heavy machinery:

A lot of people just they think if you throw someone out there, they’re going to learn. And I don’t think it’s like that when it comes to that type of machinery. I feel like you have to teach them. (Worker 9)

Only one worker, a processing truck driver, expressed general satisfaction with training and continuing training after orientation (Worker 5).

Participants also reported limited management communication around hazards or policy changes, especially related to COVID-19. A poultry processing worker reported that management put up posters and showed a video in response to COVID-19:

I know they were saying that they’re doing their part to keep the spread down. It was just like a little short commercial-like video. It wasn’t giving a bunch of information, but it had a little talking in the background, like the different words, phrases, and stuff like that. It was nothing like an informational-type thing. (Worker 1)

Several processing workers reported hearing about COVID-19 cases and exposure risks from coworkers but not management:

They did not tell us how bad COVID was, at the plant. It’s basically, if someone was sent home, they would tell someone there by phone, after work or during break or whatever. And it’s like, “Yo, I was sent home for COVID or I was sent home because I was exposed,” that’s how we found out. They did not tell us anything. And at some point, when we found out, it was over 203 people... in one department.” (Worker 3)

A processing worker commented that with non-COVID-related workplace policy changes, workers also heard from coworkers rather than management: “Most of the time, when anything changes, we always find out by the co-workers... Not the supervisors, the co-workers” (Worker 6).

The same worker explained that management wouldn’t communicate when a worker had tested positive in order to attribute cases to spread outside the plant and avoid a COVID-19 paid time off policy:

And then they [a worker next to someone who’d tested positive] would come back with symptoms and they would be like, “Well, am I getting paid for this?” And they’d [management] be like, “No, we don’t know where you got Covid

from. You could have been out and about or something.” It was like, okay. (Worker 9)

However, some processing workers reported receiving information from management on possible SARS-CoV-2 exposure risks (Worker 4, 8).

“We Were on Our Own”

Overall, participants described feeling that “we were on our own” in maintaining health and safety at work. A poultry processing worker described several employer interventions in response to COVID-19, all of which required employee actions and did not ultimately provide protection from the disease (Worker 3). They explained,

I can protect myself at home, but when I get to work, I couldn’t protect myself. Even though I had masks, sanitized my hands, got my temperature taken everyday, I still had to work around hundreds of people that did God-knows-what, when they weren’t. (Worker 3)

Several workers described more comprehensive IPC measures earlier in the COVID-19 pandemic that scaled back over time. A hog processing administrative worker noted that there had been an onsite nurse performing COVID-19 tests around January 2021, “And then they told us that she was going to leave. And that was it. We were on our own. We had to get our own Covid test [to avoid consequences for missing work]” (Worker 9). The same worker noted that mask provision and requirement had initially stopped when the nurse left, but after an increase in COVID-19 cases later in winter 2021, “they [management] just told us to wear our mask, but that was it” (Worker 9). Another hog processing worker expressed satisfaction with company IPC measures early on, but explained that almost all were no longer in place:

They did the best they could in COVID... They supplied the mask and they still supply masks. They put the bars up, and then they started making people sit one, about one at a table, and everything. But see, they’re trying to take all that stuff like that off... Well, the only thing they haven’t stopped doing is getting out the mask. (Worker 6)

A few workers also reported management not soliciting or listening to worker suggestions. A hog processing box worker commented on an unsuccessful process change, “you just stand back, and you watch, because they consider you as a little man, they don’t come get your opinion or nothing” (Worker 6).

Many meatpacking plants have on-site workplace clinics, given the large size and dangerous nature of the work.⁵⁰ A few participants mentioned these clinics, but expressed dissatisfaction with the level of care.

One hog processing industry driver discussed both lack of change in the industry and a sense of responsibility to improve working conditions:

They don't change too much there. We right here as people make a change. We got to do that, that's our job. Because they're going to keep making millions of dollars, and we're going to keep getting sick. And we're going to keep dying. So, we got to do what we have to do. (Worker 2)

Interview participants recommended a range of changes to improve workplace health and safety. Several mentioned reducing emphasis only on production targets, such as allowing for slower line speeds if full work crews were not present. A few workers suggested spreading workers further apart on the line. Several workers also recommended more comprehensive training, "by example," and clear communication about hazards and policy changes.

Discussion

Between 2021 and 2023, we surveyed 69 and interviewed 9 North Carolina animal slaughtering and processing industry workers about their experiences during the COVID-19 pandemic. Participants' concerns about management prioritization of processing and processing speed over safety are consistent with interviews with workers in the Midwest before the COVID-19 pandemic.^{3,4} Participants' concerns about crowding and spread of COVID-19 related to processing speed also align with research showing poultry plants with waivers to operate at faster processing line speeds were connected with more COVID-19 cases through July 2020, compared to plants which did not receive waivers.¹⁴

One participant connected an injury necessitating outside medical care with higher work speeds, due to management's unwillingness to slow line speed. This aligns with information from a study of Nebraska meatpacking workers, in which some workers stated that line speed remained the same whether or not a full crew was onsite.⁵¹ It raises concern that the COVID-19 pandemic may have increased injury risk among meatpacking workers. Recordable work-related injuries or illnesses among US animal slaughtering and processing workers decreased from 2010 to 2019, then increased from 2020 to 2022, although rates were approximately consistent over time for all industry workers (Supplemental Materials).⁵ For 2020 and 2021, these rates included COVID-19 when infection was attributed to work-related duties and other recordkeeping criteria were met,⁵ although there is evidence of significant underreporting of COVID-19 cases on OSHA logs.^{52,53} The US Government Accountability Office, the National Institute for Occupational Safety and Health (NIOSH), and OSHA estimated injury and illness rates for animal slaughtering and processing workers were likely significantly underreported prior to the COVID-19 pandemic.^{3,54} This likely was also

the case during the pandemic, especially during periods when many workers were absent due to illness. Unfortunately, the lack of evidence as to whether underreporting was consistent over time makes it difficult to determine whether the reported increases and decreases reflect real changes in rates of injuries and illnesses or just changes in the degree to which they were reported.

Participants connected management emphasis on production with stress related to performing additional job duties. In a review of COVID-19 effects on workers' mental health and well-being, Woods et al identified increased job demands and role conflicts across many industries and studies.³⁵ Berkowitz et al also discussed moral distress among meatpacking onsite clinic healthcare workers when providing appropriate medical treatment conflicted with management pressure or institutional constraints.⁵⁰

Interviewees' description of an emphasis on production aligned with survey responses showing implemented health and safety measures in response to COVID-19 focused on those at the bottom of the hierarchy of controls. Employers might preferentially implement interventions that would not affect the speed of production and require fewer resources. However, interventions lower on the hierarchy of controls, especially PPE, emphasize individual behavior change over systematic changes to work processes and are generally less effective.⁵⁵ Our findings correspond with a survey of 585 Midwest meatpacking workers during May 2020³⁶ and a survey of 111 meatpacking facilities across the United States during April and May 2020¹² (Supplemental Materials). Mask requirements were somewhat more frequently reported and physical barriers somewhat less frequently reported in our survey (April 2021-July 2022) compared with the April and May 2020 surveys, which might partially reflect changes over time (eg, increasing availability of respirators and surgical masks, evidence of SARS-CoV-2 aerosol transmission and ineffectiveness of physical barriers). While most workers reported ability to maintain 6 feet of distance from others for most of the workday, crowded break room or transportation conditions could still present a significant risk of infection.

Participants described barriers to taking time off when ill, including "points-based" attendance policies, which have been previously shown to sometimes fail to inform workers about legally protected rights to time off for medical, pregnancy, and caregiving needs.⁵⁶ Participants described point policies that were inconsistent and inconsistently enforced. Similar policies were documented in Nebraska meatpacking plants.⁵¹ Some participants described having the option to take time off when ill or exposed without accruing point penalties, but the leave was unpaid. This distinction may help reconcile the apparent discrepancy between survey and interview findings: survey participants may have reported that they could isolate or quarantine without losing their jobs, while interview participants emphasized that the lack of pay created financial barriers to actually taking time off

when ill. Wages in the industry are lower than other manufacturing work³ and participants reported challenges accessing basic needs, which could prevent workers from using unpaid sick leave. Participants reported worry about loss of income, at higher rates than worry about getting COVID-19 (Figure 1). This may be related to the high-risk nature of the work and timing of the survey during 2021 to 2022—many participants may have already been ill with and recovered from COVID-19. High concern around lost income when sick suggests comprehensive, clear paid sick leave policies could improve worker health and well-being and reduce the spread of disease at work.

Interview participants described inadequate communication from management during the pandemic as a source of stress and distress. This is consistent with prior research identifying organizational stressors among workers during the pandemic.³⁵ In a study of Nebraska meatpacking workers, many described a culture where new workers had to “figure things out” themselves, and one attributed an injury to inadequate training.⁴ Almost all interview participants commented on high turnover, including associated safety concerns, such as that boots were provided only after 90 days working at the operation. This may represent a violation of OSHA’s PPE standard.²² New workers are generally at higher risk of injury compared to workers more familiar with duties and safety procedures.⁵⁷ One participant, a driver, expressed satisfaction with his training and monthly safety meeting.

While survey participants did report health and safety measures during the COVID-19 pandemic and the ability to distance, isolate, and quarantine, interview participants reported feeling “on our own” to stay safe and healthy at work. Several reported management’s ending or removing most measures in response to COVID-19, even as spread continued at operations. Some of these differences could be because the in-depth interviews occurred later in the pandemic than the surveys and/or the fact that interviews can provide greater detail and more nuanced information than surveys. A few interview participants noted onsite clinics but expressed dissatisfaction with their services or functions. An analysis by Berkowitz et al showed that onsite clinics could harm meatpacking workers by delaying treatment—workers were generally required to seek care at the onsite clinic before outside medical care.⁵⁰ Injury or illness requiring medical treatment beyond first aid, lost time, or light duty must be recorded and posted under the OSH Act,⁵⁸ which can lead to management pressure on onsite clinic workers to provide minimal treatment.⁵⁰

There are several important considerations in interpreting our results. Given limited peer-reviewed research and concerns raised by workers and organizers, we aimed to contribute to evidence of concerns about worker health and safety related to the pandemic and to begin to address gaps in knowledge about their nature. Our study population was not representative of the industry as a whole, and therefore,

findings may not be generalizable. Most survey and interview participants were women (Table 1), although women made up only 38% of all those employed in the animal slaughtering and processing industry in the United States in 2022.⁵⁹ Most survey and interview participants identified as Black and few as Hispanic/Latinx, compared to 23% and 34%, respectively, of the industry in the United States in 2022.⁵⁹ This could be due to higher rates of legal status among Black workers and therefore less fear of consequences of retaliation for research participation. All workers interviewed participated in English, although many workers in the animal slaughtering and processing industry have limited English proficiency, and a single operation might include workers speaking dozens of different languages.³ Workers with limited English proficiency might experience even more problems related to inadequate management communication, as well as with ability to access workplace health and safety protections. The parent study focused on SARS-CoV-2 and zoonotic pathogens; community members with greater concerns about these issues may have been more likely to participate in this study, and interview participants might have focused on these issues over other work-related concerns. We had a relatively long enrollment period from April 2021 to July 2022 (surveys) and July 2022 to April 2023 (in-depth interviews), time periods during which levels of COVID-19 transmission, COVID-19 vaccination availability and prevalence, and federal policy all changed (see Supplemental Materials). We had a relatively small sample size for both surveys and interviews, which prevented us from stratifying survey results by date. Our questionnaire failed to distinguish between requirements for minimally effective face coverings, moderately effective surgical masks, and N95 respirators, which are NIOSH-approved and substantially more protective. Hence, we cannot determine whether any employer provided effective respiratory protection against SARS-CoV-2. Additionally, interview participants had a median duration of 2 years in their current job. Since interviews were conducted between July 2022 and April 2023, some interview participants may not have been working in the industry at the height of COVID-19 impacts. However, some interview participants commented on changes over time, including reduced IPC measures as early as winter 2021, while new cases remained high. Qualitative interviewers generally aim to reach saturation, where no new information emerges from additional interviews.⁴⁰ While we believe more interviews with workers may have revealed additional information, limited resources prevented us from conducting further interviews. Also, because this research focuses on worker perspectives, our findings could reflect the absence of appropriate policies, lack of management adherence to policies, the need for better communication with all workers about existing policies, or some combination of these.³⁶

Even with these limitations, the applicability of these findings extends to other infectious diseases, particularly

zoonoses whose rapid reassortment requires proactive and transparent monitoring of spillover events between wild and domesticated food-producing animals and humans.^{60,61} *Mycobacterium tuberculosis*, *Campylobacter*, *Escherichia coli*, *Staphylococcus aureus*, and swine (eg, H1N1) and avian (eg, H5N1) influenza viruses are some of the infectious agents workers in the animal slaughtering and process industry can be exposed to.^{9,62–65} These and other agents have the potential for sustained transmission among food-producing animals and in animal production, slaughtering and processing workplaces, as well as spillover into adjacent communities.^{66,67} The experiences of participants in this study underscore the widespread harm of infectious diseases in the workplace at ILOs and the need to develop and implement strategies to prevent the spread of infectious disease from person-to-person as well as monitor and surveil zoonoses at all levels of the hierarchy of controls. NIOSH is the US federal agency responsible for research and recommendations on work-related injury and illness, but unprecedented mass firings threaten the agency's ability to operate. As of May 2, 2025, NIOSH was slated to lose at least 900 workers—the majority of its staff.⁶⁸ As of May 14, 2025, 328 of those employees were reinstated, following lawsuits and pressure from some lawmakers.⁶⁹ NIOSH funding cuts put at risk tools such as NIOCCs and the Education and Research Center that enabled this research.

While this is unlikely in the current administration, there is a need for more robust enforcement of existing OSHA standards and for infectious disease-specific protections. Workers in occupations deemed essential must be offered basic protections and health coverage. We recommend a national requirement for paid sick leave to improve worker well-being and reduce the spread of disease in workplaces and the broader community.

Conclusion

While most workers reported mask provision and masking requirements during the COVID-19 pandemic, workers also described limited provision of more-effective respirators, limited engineering and administrative controls, barriers to taking time off when ill, and inadequate safety communication. Workers suggested many avenues to improve health, safety, and well-being in the industry, including management emphasis on health and safety over production targets, improved training, and clear, consistent policies. Increased OSHA enforcement of existing standards could better ensure adequate provision of information and PPE to workers, although this is insufficient to adequately protect workers from infectious disease and unlikely given the current administration. An enforceable OSHA infectious disease standard and national requirement for paid sick leave could help better protect worker health. The current administration's moves to dramatically cut funding and staff at NIOSH and limit OSHA's regulatory activity and

enforcement actions⁷⁰ threaten worker safety and health. The ongoing, rapidly evolving situation with highly pathogenic avian influenza in dairy cattle, poultry, and other livestock facilities across the United States underscores the relevance of our findings and need for policies to prevent workers from feeling “on their own” to protect themselves, their families, and communities. Worker organizations and labor unions, including the United Food and Commercial Workers, the American Federation of Labor and Congress of Industrial Organizations, and REACH, play a critical role in advocating for the enforcement of safety standards and the implementation of appropriate protections against infectious diseases. It is essential that federal agencies such as NIOSH and OSHA are supported in fulfilling their legal mandates to protect worker health and safety, rather than facing threats of defunding or dismantlement.

Acknowledgments

The authors thank the community organizers at REACH, especially Devon J. Hall, Jr., Leroy Mitchell, Linda Johnson, Phyla Holmes, Margaret Carr, Clesha Hall, Unique Hall, Angela Matthews, Arika Miller, and Helen Santizo, as well as all participants, without whom this research would not have been possible. The authors acknowledge Dr. Nora Pisanic, Kristoffer Spicer, Devon J. Hall, Jr., Kate Kruczynski, Magdielis Gregory Rivera, and Dr. Pranay Randad for assistance with study design and launch, and Dr. Meghan F. Davis for advice and comments.

Data Availability Statement

Deidentified data and code can be requested by email to the corresponding authors.

Declaration of Conflicting Interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Funding

The author(s) disclosed receipt of the following financial support for the research, authorship, and/or publication of this article: This study was supported by an anonymous gift, the Community Science and Innovation for Environmental Justice (CSI EJ) Initiative at the Johns Hopkins Center for a Livable Future, the JHU COVID-19 Research and Response Program, the FIA Foundation, NIAID R21 AI139784, and a NIOSH POE Total Worker Health Center pilot project grant (U19 OH012297). Carolyn Gigot, Zachary Smith, Kirsten Koehler, and Christopher D. Heaney were supported by NIOSH ERC (T42 OH0008428). Kirsten Koehler was also supported by the NIOSH POE Center (U19 OH012297). Christopher D. Heaney was additionally supported by an anonymous gift, the CSI EJ Initiative, the JHU COVID-19 Research and Response Program, the FIA Foundation, NIEHS (R01 ES026973), NIAID (R43 AI141265, R01 AI130066, R01 ES026973), and NIH (U24 OD023382).

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Supplemental Material

Supplemental material for this article is available online.

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