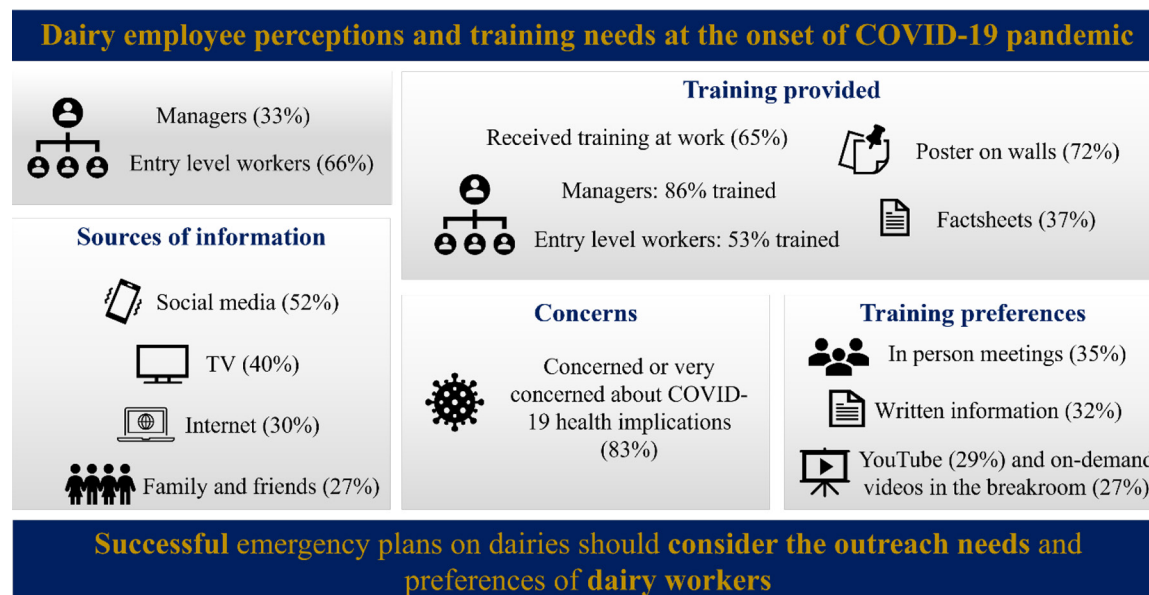


# Perspectives of dairy employees at the beginning of the COVID-19 pandemic: A survey of health risks and educational needs

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## Graphical Abstract

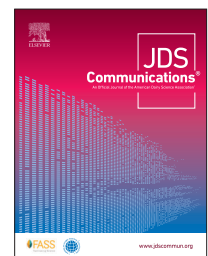


## Summary

We surveyed dairy employees to understand their perceptions and educational needs at the onset of the COVID-19 pandemic. Survey results highlighted that most respondents were somewhat concerned or very concerned about the COVID-19 pandemic. Social media was the main source of information for farm workers. A greater percentage of farm managers received formal training on COVID-19 mitigation than entry-level workers, and training was mostly limited to information on posters. However, the preferred form of training delivery was in-person meetings, and in the absence of these, video training (YouTube and break-room videos).

## Highlights

- At the onset of the COVID-19 pandemic, most dairy workers were concerned about their health
- COVID-19 safety trainings were mostly limited to posters on walls
- Dairy managers received more COVID-19 safety training than did entry-level workers
- Social media was dairy employees' main source of COVID-19 information
- Successful emergency plans on dairies should consider dairy workers' learning preferences



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# Perspectives of dairy employees at the beginning of the COVID-19 pandemic: A survey of health risks and educational needs

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**Abstract:** Our objective was to understand dairy employees' perceptions and educational needs at the onset of the COVID-19 pandemic. A bilingual (English and Spanish), anonymous survey targeted at dairy employees was circulated nationwide via university and allied industry media outlets. Responses (n = 63) from 11 states were received (May–Sep. 2020). Respondents worked in herds ranging from 50 to 40,000 animals in size. Dairy managers (33%) responded mostly to the English survey (52%), whereas entry-level workers (67%) chose the Spanish format (76%). Survey results highlighted different perspectives, educational needs, and preferred sources of information between English- and Spanish-speaking dairy workers. Overall, 83% of the respondents were somewhat concerned or very concerned about the COVID-19 pandemic. Respondents (51%) indicated that their main concern was “to bring the virus from work to home and make my family sick.” Most dairy employees (83%) perceived that their employers were somewhat or very concerned about the pandemic. Respondents (65%) indicated that COVID-19 informative training was provided at the workplace, but training was more frequently undertaken among dairy managers (86%) than entry-level workers (53%). Most trainings (72%) were limited to posters on walls. The preferred means of information delivery was through in-person meetings at work (35%), with YouTube (29%) and on-demand videos (27%) as second and third options. The main source of information regarding the pandemic was social media (52%). Frequent handwashing (81%), limiting on-farm visits (70%), limiting agglomeration in break rooms (65%), hand sanitizer use (60%), and social distancing (60%) were the most common safety measures implemented at the workplace among the options given to respondents. Few respondents (38%) indicated that face-covering was required at work. Successful emergency plans on dairies should consider the outreach needs and preferences of dairy workers.

In December 2019, the world watched the emergence of a pandemic caused by the SARS-CoV-2 virus (COVID-19). Worldwide, agricultural operations struggled to navigate the COVID-19 health and economic crisis (Wang et al., 2020; Weersink et al., 2021; Hambarzumyan and Gevorgyan, 2022). In March 2020, the US administration declared nationwide emergency (CDC, 2022). During the first months of the pandemic, significant disruptions in food supply chain and international market led to an almost 50% drop in milk prices (CME Group, 2020). In the midst of this crisis, dairy farmers were responsible for ensuring the safety and health of over 150,000 essential dairy workers, half of them of Latino ethnicity (Adcock et al., 2015; Malone et al., 2021).

The high risk of occupational hazards among agricultural workers has been a long-standing issue and has disproportionately affected immigrant workers (Harrison and Getz, 2015; Reyes et al., 2016; Liebman et al., 2018; Panikkar and Barrett, 2021). Several factors explain the vulnerability of dairy workers to occupational hazards, such as language and literacy barriers, poverty, undesirable housing conditions, and limited access to health care (Schenker and Gunderson, 2013; Panikkar and Barrett, 2021). It is known that training improves the health and safety of dairy work-

ers and benefits dairy producers by enhancing employee retention and farm profitability (Billikopf and González, 2012; Durst et al., 2018). However, occupational health and safety risk training for dairy workers remains inadequate or insufficient (Hadley et al., 2002; Kolstrup and Hultgren, 2011; Liebman et al., 2016; Durst et al., 2018; Panikkar and Barrett, 2021). Some challenges identified when training dairy employees include lack of basic education, low English proficiency, and cultural and socioeconomic factors (Sanders-Smith, 2007; Erskine et al., 2015). In addition, farmers often lack the formal training or time to properly train workers (Bitsch et al., 2006; NCFH, 2014), and very few dairies have an ongoing training program at the workplace (Benson and Rollin, 2008; Mills et al., 2021).

Understanding dairy workers' concerns regarding the health risks and business impacts of the pandemic, the adequacy of the training received, their preferred sources of information, and their perception on the safety measures adopted at the farm will inform and guide not only COVID-19 outreach efforts for an underserved and vulnerable sector, but will also influence preparedness and response if future hazards arise. Thus, the objective of the present study was to document dairy workers' (managers and entry-level

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employees) health concerns, safety training received, preferences in training methods, and perceptions of safety measures adopted at their workplaces at the onset of the COVID-19 pandemic.

An exemption was acquired from the Washington State University (Pullman, WA), Institutional Review Board before conducting the survey. A bilingual (English and Spanish) survey questionnaire was designed to collect information on employee perceptions about the risk that the COVID-19 pandemic posed to their health and the farm business, as well as information about the training received and preferences for training on COVID-19 at the beginning of the pandemic (available upon request). The survey questionnaire included a total of 26 questions designed as closed- (multiple choice) and open-ended questions using Qualtrics XM (Qualtrics International Inc.). Whenever Likert scales were used, to improve interpretation of the options, we opted for a 3-point Likert scale (Lehmann and Hulbert, 1972). The survey was advertised nationwide via university and allied industry media outlets in April and May 2020. To increase responses from dairy farm workers, online links to surveys were distributed via dairy workers Facebook groups, by radio stations, and through direct contact of investigators with dairy farm workers. Respondents had the choice of language (English or Spanish) and were allowed to skip questions. Spanish answers were translated by a bilingual co-author to English before data analysis. Data were transferred into a spreadsheet (Excel 2010, Microsoft Corp.) for analysis.

Reported percentages were rounded to the nearest decimal point. Percentages for responses conditional to previous questions were calculated based on the answer to the previous question. In some cases, fewer answers were provided to the conditional compared with the initial question; in those cases, percentages do not add up to 100. For questions with the option of multiple responses, percentages do not add up to 100% as well. The language chosen by respondents (English vs. Spanish) and their job title (manager vs. entry-level worker) were considered variables of interest. Descriptive statistics were generated with SAS (version 9.4, SAS Institute Inc.) using the MEANS procedure. When comparisons were made between groups, differences were evaluated with inference statistics using the chi-squared statistics test of the FREQ procedure of SAS, which does not require equality of variance among groups or even groups. Only significant ( $P \leq 0.05$ ) differences are reported.

A total of 105 respondents started the survey, but 42 (40%) never passed the language choice question, and their responses were excluded. A total of 63 dairy employees completed the survey from May to September 2020 (first wave of COVID-19), and most responses were received in May 2020 (92%). The median time taken to complete the survey was 12 min (English respondents median = 9 min; Spanish respondents = 13 min). Dairy employees' responses were obtained from 11 states (California = 4, Georgia = 1, Idaho = 17, Indiana = 1, Iowa = 1, Minnesota = 6, Ohio = 1, Pennsylvania = 1, South Dakota = 26, Washington = 3, Wisconsin = 1, not reported = 1), but the majority of respondents were from 2 states: South Dakota (41.9%) and Idaho (27.4%). Respondents were farm managers ( $n = 21$ ; English survey: 52.0%, Spanish survey: 24.0%) or entry-level workers ( $n = 42$ ; English survey: 48.0%, Spanish survey: 76.0%). Their work responsibilities involved the entire herd (17.4%,  $n = 11$ ), the milking parlor (27.0%,  $n = 17$ ), the fresh cow or maternity or hospital pens (19.0%,  $n = 12$ ), the calf or heifer areas (14.3%,  $n = 9$ ), and the cow feeding area (7.9%,  $n = 5$ ). Other

work responsibilities included maintenance (6.4%,  $n = 4$ ), reproduction (3.2%,  $n = 2$ ), milk hauling (1.6%,  $n = 1$ ), cafeteria (1.6%,  $n = 1$ ), and personnel (1.6%,  $n = 1$ ). Respondents worked in herd sizes varying from 50 to 40,000 cows [16.7% small, <500 cows ( $n = 7/42$ ); 7.1% medium farms, 500–1,000 cows ( $n = 3/42$ ); 76.2% large, >1,000 cows ( $n = 32/42$ )]. Regarding access to healthcare, overall, dairy employees reported a visit to a doctor <1 yr ago (36.5%,  $n = 19/52$ ), 1 to 3 yr ago (30.8%;  $n = 16/52$ ), 3 to 6 yr ago (19.2%;  $n = 10/52$ ), and >6 yr ago (13.5%; 7/52).

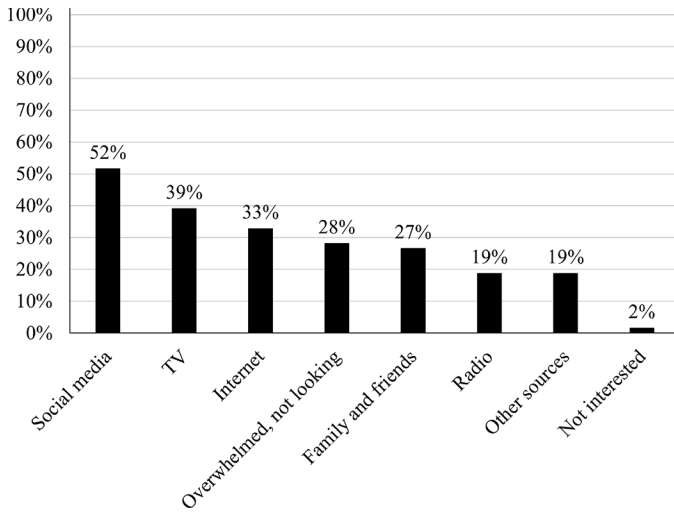
Survey respondents were very concerned (33.3%;  $n = 21$ ), somewhat concerned (49.2%;  $n = 31$ ), or not concerned at all (17.5%;  $n = 11$ ) about the health implications of COVID-19. A greater percentage of respondents using the Spanish versus the English version reported being very concerned about the COVID-19 pandemic (43.0% vs. 14.3%,  $P = 0.017$ ). Overall, the respondents' main concerns were bringing the virus from work to home and getting their families sick (51.3%,  $n = 20/39$ ) and bringing the virus from their communities to work (38.5%,  $n = 15/39$ ).

Most respondents were very concerned (51.0%,  $n = 26/51$ ) or somewhat concerned (41.2%,  $n = 21/51$ ) about the negative consequences of the pandemic on the dairy farm where they worked. Respondents perceived that the owners of the dairies where they worked had to face problems related to the risk of employees getting sick (22.2%,  $n = 14/63$ ), milk having to be dumped (19.0%,  $n = 12/63$ ), or availability of supplies (15.9%,  $n = 10/63$ ). However, 28.6% of respondents were unaware of major problems in their dairies ( $n = 18/63$ ). Respondents reported that they perceived their employer as very concerned (46.6%;  $n = 27/58$ ), somewhat concerned (36.2%;  $n = 31/58$ ), or not concerned at all (17.2%;  $n = 10/58$ ).

The main sources of information for respondents were social media (52.4%,  $n = 33/63$ ), television (39.7%,  $n = 25/63$ ), the internet (30.0%,  $n = 21/63$ ), family and friends (27.0%,  $n = 17/63$ ), and radio (19.0%,  $n = 12/63$ ), and 28.6% ( $n = 18/63$ ) said they got overwhelmed and stopped looking for information (Figure 1). Among the respondents who reported obtaining information from other sources (19.0%,  $n = 12/63$ ), posters from private companies in the workplace were the most cited source of information (83.3%,  $n = 5/6$ ). Most respondents reported being familiar with COVID-19 symptoms (76.9%;  $n = 40/52$ ), whereas some reported being somewhat familiar but unsure (19.2%;  $n = 10/52$ ) or not clear (3.8%;  $n = 2/52$ ). Respondents receiving training at work tended to be more familiar with COVID-19 symptoms (85.3%,  $n = 29/34$ ) than those who had not received training yet (67%,  $n = 12/18$ ;  $P = 0.063$ ).

Most survey respondents (64.9%;  $n = 37/57$ ) reported having received training on the COVID-19 pandemic at work. Among our responses, the most common tool used for training was posters on walls (71.9%,  $n = 23/32$ ), followed by fact sheets given to employees (37.5%,  $n = 12/32$ ), and meetings at work by someone from the dairy (37.5%,  $n = 12/32$ ). All respondents who chose the Spanish version reported receiving the training in Spanish (100%,  $n = 36/36$ ). However, a greater proportion of managers reported having received training (85.7%,  $n = 18/21$ ) than entry-level workers (52.7%,  $n = 19/36$ ;  $P = 0.011$ ).

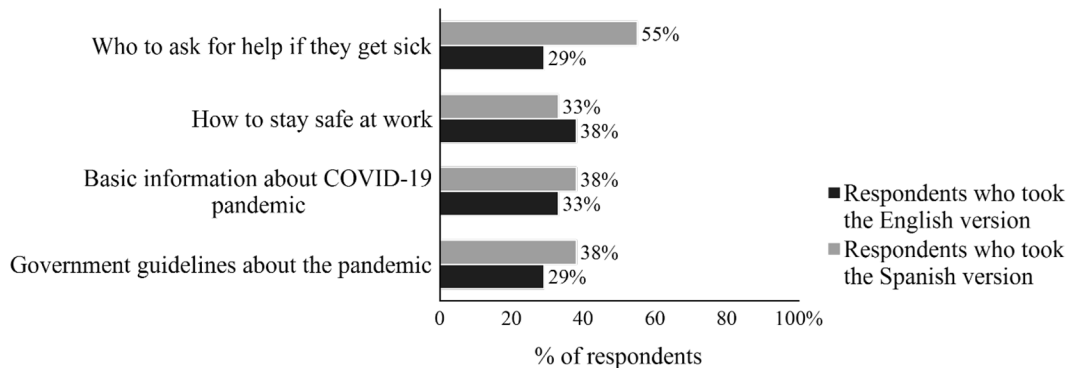
Survey respondents indicated that the most urgent questions were who to ask for help if they get sick [Spanish survey: 54.5% ( $n = 23/42$ ); English survey: 28.6% ( $n = 6/21$ )], how to stay safe at



**Figure 1.** Sources of COVID-19 information for US dairy employees (n = 63).

work [Spanish survey: 33.3% (n = 14/42); English survey: 38.1% (n = 8/21)], basic information about the COVID-19 pandemic [Spanish survey: 38.1% (n = 16/42); English survey 33.3% (n = 7/21)], and government guidelines about the pandemic [Spanish survey: 38.1% (n = 16/42); English survey: 28.6% (n = 6/21); Figure 2]. Overall, the preferred venues to receive training were in-person meetings at work (34.9%, n = 22/63), written information (31.7%, n = 20/63), YouTube videos (28.6%, n = 18/63), or on-demand videos to watch in their break room (employees would have a dedicated moment to watch informative videos during their breaks; 27.0%, n = 17/63; Figure 3).

Among the measures adopted by farmers to control the spread of COVID-19, use of hand sanitizer (60.0%; n = 30/50), increasing the frequency of handwashing (80.8%, n = 38/47), restricting the number of visitors to the farm (70.0%, n = 31/47), limiting agglomeration in break rooms (64.6%, n = 31/48), and practicing social distancing (59.6%, n = 28/47) were the most frequent measures reported by respondents. Changes in workers' schedules (27.9%; n = 12/43) and use of masks during the workday (37.5%; n = 18/48) were the least adopted measures to control the spread of the disease among the options presented.

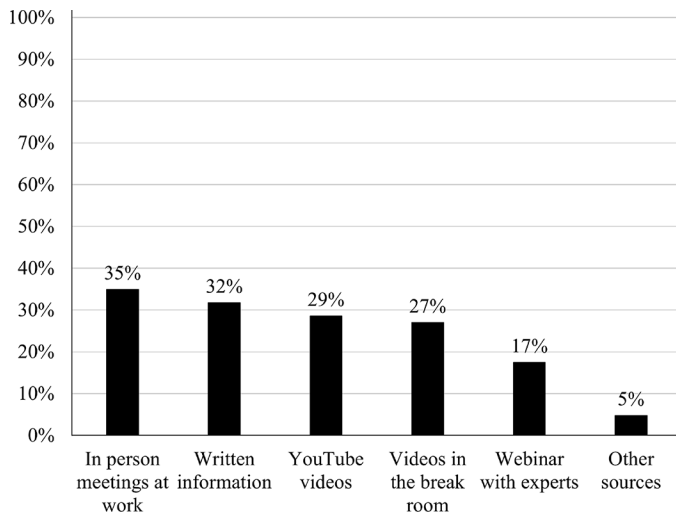


**Figure 2.** Most urgent questions regarding the COVID-19 pandemic for respondents who took the English and Spanish versions of the survey.

The results presented so far have supported the research team's effort to document the concerns and preparedness of dairy producers and dairy workers during the COVID-19 health crisis. Along with the present study, this research team conducted a similar effort targeting dairy producers; results can be found at Valldecabres et al. (2022). The present study documents dairy workers' concerns and preparedness at the onset of the COVID-19 pandemic as well as their preferences for information sources and mitigation measures adopted at their workplace. This study is relevant, as occupational hazards and safety issues have been disproportionately prominent among agricultural workers. Furthermore, dairy workers were considered essential, and dairy producers were urgently tasked with implementing strategies to ensure the health and safety of their employees while navigating economic uncertainties.

Most respondents indicated that they had received training at the workplace, but half of the dairy employees using the Spanish version reported that they had received no training on the health risks of COVID-19 at work. However, most dairy producers reported that they had provided training or they were planning to train employees during the early months of the pandemic (78% and 4%, respectively; Valldecabres et al., 2022). It is unknown whether dairy producers were focused on providing training to upper management personnel or to all dairy employees. Training was mainly limited to posters, but entry-level employees would have preferred in-person meetings and fact sheets. Videos (YouTube or to watch in the break room) were also popular, especially among Spanish respondents. Previous studies have also reported a preference to receive training through videos (Friedman et al., 2007; Rodriguez et al., 2018; Panikkar and Barrett, 2021). In our study, all respondents who used the Spanish version received COVID-19 training in Spanish. This represents a commendable effort, especially considering that language has been a consistent barrier when training non-English-speaking dairy employees (Baker and Chappelle, 2012; Hagevoort et al., 2013; Rovai et al., 2016; Durst et al., 2018; Panikkar and Barrett, 2021).

Social media was a popular source of information during the COVID-19 pandemic, especially for Spanish respondents. Some of the reasons that may make social media appealing include the opportunity to follow accounts in Spanish and its easy access through mobile phones. Accordingly, a review study indicated that social media was the platform of choice for health-related COVID-19 information dissemination and consumption (Tsao et al.,



**Figure 3.** Preferred ways to receive COVID-19 information among US dairy employees (n = 63).

2021). However, dairy farmers seemed to prefer more traditional communication channels, such as television, and online resources (Valdecabres et al., 2022).

According to CDC recommendations at the beginning of the pandemic, the most common measures adopted at the workplace to contain the spread of the disease were hand sanitizer and increasing the frequency of washing hands. This agrees with the results of our survey and reports from dairy producers (Valdecabres et al., 2022; Yung et al., 2021). Face masks were reported as being required at work by only 18% of respondents. This contradicts reports from dairy farmers (49%) who required the use of face masks in their farms (Valdecabres et al., 2022). Likely, the use of face masks was not being enforced in dairy farms, as also observed by Yung et al. (2021) in Wisconsin and Minnesota.

The concern of dairy workers about the negative health implications of COVID-19 might be partially explained by the higher incidence of COVID-19 among agricultural labor (Lusk and Chandra, 2021) and the challenges faced by this demographic to access health care. Agricultural workers, especially undocumented immigrants of Latino ethnicity, often lack health insurance or Medicaid, and their fear of immigration law enforcement and language barriers deter them from seeking health care (Liebman et al., 2016, 2018; Migrant Justice, 2019; Panikkar and Barrett, 2021). Instead, they often rely on self-medication or depend on their employer for care (Wolcott-MacCausland, 2014; Panikkar and Barrett, 2021). Furthermore, during the pandemic, dairy workers may have found it difficult to isolate at home if needed, as living in overcrowded homes with inadequate personal space is an issue previously reported (Migrant Justice, 2019).

Concerns with COVID-19 might have extended beyond health care; missing wages due to sick leave or losing their jobs were likely issues of apprehension (Schenker and Gunderson, 2013). Some comments captured in our survey, especially among respondents using the Spanish version, included the fear of getting sick and losing their jobs, lack of income while in quarantine, and inability to provide for their family. The health implications of the pandemic also concerned dairy producers, especially the large

dairy farms that relied on hired labor (Valdecabres et al., 2022; Yung et al., 2021). However, most dairy producers perceived that their employees had minimal concerns about the health implications of COVID-19 (Valdecabres et al., 2022). Dairy workers in management positions reported being less concerned about the health implications of COVID-19 than entry-level employees; likely cultural differences, communication gaps, or access to trainings explain the differences observed among job titles.

Our study used a nonrandom sample of respondents, and results should be interpreted carefully. Although the survey was advertised across the US in local and national media outlets, reaching out to dairy workers was a challenge. We relied on personal relationships and on acquaintances from previous collaborations to disseminate our survey. Researchers from Idaho and South Dakota were more successful at recruiting survey participants, reinforcing the importance of personal relationships. We acknowledge that the main dairy states in the US are underrepresented. Moreover, we did not have information regarding participants' age, gender, and scholarly level, which could help reveal further bias in our sample. Nonetheless, the issues raised by our study have been reported elsewhere, such as the need to provide training programs to dairy employees that consider their learning preferences (Rovai et al., 2016; Valdecabres et al., 2022). The survey was available both in English and Spanish, but most respondents used the Spanish version. This was not surprising as, in US dairies, half of hired labor are immigrants of Latino origin (Adcock et al., 2015).

Our survey was simple and designed to be short (Revilla and Hohne, 2020). Respondents took approximately 12 min to complete it (median), but it is possible that, if using their phones and having to go through multiple pages, respondents may have felt discouraged from completing it. We noted that 40% of respondents quit after the language question was asked; this could be due to lack of clarity in how the survey was presented, as they had to click an arrow at the bottom of the page to continue with the survey. We also noticed that questions with long answers as options were more frequently skipped. The online format was chosen because it could be easily and quickly disseminated across the US, but we acknowledge that a written format mailed to dairies may have increased the response rate. Additionally, the survey was conducted during the early months of the COVID-19 pandemic. Given the trajectory of the global pandemic, reassessment of health concerns and the adequacy of training is warranted to inform agencies involved in response to a future pandemic.

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