Rapid Community Assessment of H5N1 Avian Influenza Knowledge, Attitudes, and Practices among Dairy Workers in California, Colorado, Minnesota, New York, Vermont, and Washington

FEBRUARY 2026

TABLE OF CONTENTS

ACKNOWLEDGEMENTS

We are deeply grateful to the local community data collectors who assisted NCFH in reaching and speaking with dairy workers. We are especially thankful to the local experts who took the time to help us understand the regional challenges and strengths, and to the dairy workers who generously shared their time, knowledge, and insights for this assessment.

INTRODUCTION

Beginning in late 2023 or early 2024, the H5N1 strain of highly pathogenic avian influenza, which originated in wild birds or poultry, spread rapidly through dairy herds in multiple states, infecting dairy cattle in north Texas.[1] As of September 11, 2025, H5N1 has been detected in 1,079 dairy herds in 17 different states.[2] Evidence points to local and interstate movement of cattle, products, equipment, and people that have been in contact with infected cows.[3] While the risk to the general public is low, the risk of infection to dairy workers working with infected cattle is much higher. A total of 70 human cases were identified in 13 states between 2024 and 2025, with 65 of these cases occurring in individuals working on poultry or dairy farms.[4] However, this likely underestimates infections among dairy workers. A study conducted by the Centers for Disease Control and Prevention in collaboration with the Michigan Department of Health and Human Services and the Colorado Department of Public Health and Environment found that 7% of exposed dairy workers in the study had a positive seroprevalence result to the H5N1 virus.5 One major barrier is the short window for confirming infection. Testing must occur quickly, which is often not feasible for dairy workers. Reported barriers include health departments running out of testing kits or local providers not knowing how to collect and submit samples to state public health laboratories.[6–8] Another barrier is the limited access to general healthcare experienced by many dairy workers. Given their long work shifts and limited days off, this population may not have the time to seek healthcare and face other barriers, such as a lack of interpreters who speak their preferred language.[9-12]

Although there is limited national knowledge about the demographics of dairy workers, several studies have provided some insights. There are an estimated 90,000 dairy workers in the U.S.[13] Published studies indicate that dairy workers are primarily single Latino males born outside the U.S., although the proportion of workers with families has been increasing in recent years.[12] Most dairy workers have emigrated to the U.S. from rural communities in southern Mexico, with an increasing number coming from Guatemala, Nicaragua, and Honduras. Dairy workers tend to have lower educational attainment, as a study in Wisconsin revealed that the majority of workers had a middle school education or less. There has also been an increase in Indigenous peoples working in the U.S. dairy industry, including Mixtecan, Zapotecan, and K'iche' Maya peoples.[8,20,21]

Zoonotic disease transmission from cattle to humans is not uncommon. Research indicates that increased agricultural productivity and the concentration of animals on farms lead to a higher incidence of diseases in dairy cattle, and some of these pathogens can infect and cause disease in humans.[22] As a result, dairy workers are exposed to a range of pathogens, and infections of E coli, salmonellosis, and brucellosis have been documented among dairy workers in the U.S.[23,24] The most widely documented zoonotic disease among U.S. dairy workers is bovine tuberculosis.[25,26] Transmission of zoonotic diseases among dairy workers is likely underreported to public health systems due to structural and occupational barriers, such as a lack of access to health care or paid sick leave.

This project builds on and adapts the National Center for Farmworker Health's (NCFH) Rapid Community Assessment (RCA) methodology, developed in collaboration with a national advisory council and the Centers for Disease Control and Prevention (CDC), to assess farmworkers' COVID-19 knowledge, attitudes, and practices during the pandemic. This project employs a convergent mixed-methods design to assess H5N1 knowledge, attitudes, and behaviors among dairy workers, as well as One Health-focused knowledge, including their familiarity with illnesses among cattle and general infectious disease transmission from cattle to humans. Since limited information is available about dairy workers in the U.S., this assessment will also aim to describe the key demographic characteristics of dairy workers and their general access to healthcare and health information.

METHODOLOGY

This convergent mixed-methods assessment adapts and refines the Rapid Community Assessment (RCA) methods developed by the Centers for Disease Control and Prevention to assess vaccination rates and identify solutions to increase vaccine uptake in communities.[27]

Human subjects protection

This RCA poses minimal risk because it does not collect personal identifiable information or any information about the company where the participants work. No photos, videos, or audio recordings were taken. Staff obtained oral informed consent and informed participants that they could skip any question and still receive the incentive. Survey participants received a $30 gift card, and interview participants received a $40 gift card. The research protocol was reviewed by the CDC and determined to be non-research.

Site selection

We planned for the project to take place in 12 counties across six states (two counties per state) targeting a total of 700 survey participants and 20 interview participants. We selected states based on two criteria: (1) having at least 100,000 dairy cattle or more, as reported in the 2023 National Agricultural Statistics Service Cattle Inventory Survey, and (2) the feasibility of conducting in-person surveys, which relied on our ability to identify a local partner familiar with dairy workers.[28] Additionally, we wanted to include at least two states with no H5N1 detections among dairy cattle to allow for comparison. A total of 19 states has 100,000 dairy cattle or more (Arizona, California, Colorado, Idaho, Indiana, Iowa, Kansas, Michigan, Minnesota, New Mexico, New York, Ohio, Oregon, Pennsylvania, South Dakota, Texas, Vermont, Washington, Wisconsin). From these states, we selected California, Colorado, and Minnesota as states affected by H5N1, and New York, Vermont, and Washington as non-affected states. We generated a sampling list of counties with at least 30,000 dairy cattle and randomly selected two per state. The research team then verified whether a local partner familiar with the dairy industry was available in each county. All randomly selected counties were included, except for three counties in California, Minnesota, and New York, due to a lack of partners familiar with dairy workers in those areas. In those instances, partners recommended a second county in those states. Table 2.1 shows the estimated number of dairy workers in each of the selected counties, assuming that there is one dairy worker for every 100 dairy cows in the county. The 1:100 ratio is based on national industry estimates, though this can vary depending on how mechanized dairies are in the region.[29,30]

Table 2.1: H5N1 RCA estimated number of farmworkers and dairy workers in selected counties.

State	County	Estimated total number of farmworkers (crop and animal production)	Estimated number of dairy workers (1:100 ratio)	Number of dairy cattle
CA	Kern	41,765	1,300	130,000
CA	Tulare	42,806	4,900	490,000
CO	Morgan	1,507	385	38,500
CO	Weld	6,374	1,350	135,000
MN	Morrison	1,943	195	19,500
MN	Stearns	3,434	570	57,000
NY	Cayuga	1,350	490	49,000
NY	Wyoming	1,510	485	48,500
VT	Addison	1,348	350	35,000
VT	Franklin	1,223	305	30,500
WA	Whatcom	7,661	330	33,000
WA	Yakima	64,205	1,000	100,000

Source: National Center for Farmworker Health Farm Labor Data Dashboard(13); National Agricultural Statistics Service Cattle Inventory Survey 2023 (28)

Survey participant eligibility and recruitment

The eligibility criteria for survey participants were as follows:

- 18 years of age or older at the time of the intercept survey
- Worked in the dairy industry for at least 30 days since January 1, 2024 (NAICS code 112120)
- Worked or resided in the selected counties at the time of the survey
- Speaks English, Spanish, or other languages spoken by dairy workers in selected counties based on stakeholder feedback

We identified survey participants through pre-scheduled appointments with local partners, referrals from participating workers, and on-site recruitment at community locations. Survey staff were permitted to visit dairy farm offices in states without H5N1 detections in dairy herds. They were trained to seek permission from the dairy farm owner to speak with dairy farm employees at a convenient time (or, if the owner was not present, from the person in charge, such as a shift supervisor). A list of community sites was developed based on local stakeholder input, past farmworker vaccination clinic locations, and locations of grocery stores, check cashing stores, and laundromats near areas with a high concentration of dairy farms in selected counties.

Dairy worker participants were recruited immediately at selected sites or during appointments. Data collectors informed the potential participant about the purpose of the survey and verbally shared the informed consent information before administering the survey. Participants received a $30 gift card to a local grocery store in the area. All surveys were administered verbally by trained NCFH staff and local contractors, and responses were recorded electronically using Kobo Toolbox forms on secure devices. Staff uploaded all data to a secure online storage system on a daily basis. The electronic survey could not be submitted unless all fields were completed, which reduced missing or incorrectly entered entries. We administered the surveys in English, Spanish, and other Indigenous languages or languages spoken by dairy workers in the selected community. Due to the demographic characteristics of the community, surveys were administered in Zapoteco by trained, multilingual data collectors in Minnesota, and in Awakateko through ad hoc interpreters in Washington.

Interview participant eligibility and recruitment

Interview eligibility criteria:

- 18 years of age or older at the time of the interview
- Speaks English or Spanish
- Worked in a state with at least 100,000 dairy cattle or in a state with H5N1 infections in dairy cattle
- For local industry experts: individuals who owned or operated a dairy farm, or who worked in veterinary care, research, or disease surveillance on dairy farms before January 1, 2024
- For farmworker-serving organization staff: Worked in an organization serving dairy workers on or before January 1, 2024
- For dairy workers: Worked in the dairy industry for at least 2 years

Qualitative interview participants were drawn from states selected for the dairy worker surveys, as well as from H5N1-affected states not included in the dairy worker surveys. However, at least one interview was conducted in each of the counties selected for dairy worker surveys. The three types of participants included 1) local dairy industry experts, 2) farmworker-serving organization staff, and 3) dairy workers. Local dairy industry experts may include veterinarians, staff from industry associations, producers, or industry researchers. The farmworker-serving organization staff interviews consisted of NCFH's partner organizations or organizations identified through literature reviews. We conducted interviews with dairy workers identified during data collection, as well as with dairy workers considered leaders in their communities, based on their involvement in the community and/or the number of years they had worked in the dairy industry. NCFH staff reached out to the interview candidates through in-person meetings, phone calls, or email to invite them to participate in the interview.

We developed three distinct interview guides tailored to the three types of interviewees, incorporating feedback from CDC staff. Each interview lasted between 30 and 60 minutes. Participants received a $40 gift-card incentive. Interviews were conducted in person, virtually via Zoom, or by phone, in either English or Spanish. Interviewers reviewed the informed consent with participants before administering questions. Two trained interviewers conducted recorded interviews and subsequently transcribed them electronically. One interviewer facilitated the conversation while a second interviewer took notes. We did not translate Spanish-language interviews into English. We did not use or record any personal identifying information about the participant during the interview.

Data analysis

We analyzed the quantitative surveys using R version 4.2.2. Post-sampling weights to adjust for the estimated size of the dairy labor force for each county were created using the following formula:

$$\frac{\textit{Population proportion (Estimate of dairy workers in county/sum of dairy workers in all selected counties)}}{\textit{Sample proportion (Number of dairy workers surveyed in county/sum of dairy workers surveyed in all counties)}}$$

We applied county weights to all findings presented below, including descriptive statistics. We used Pearson's chi-square analysis with the Rao-Scott correction to compare findings between states that reported H5N1 infections in dairy cattle (CA, CO, and MN; referred to as affected states in this report) to states that did not report H5N1 infections in dairy cattle (NY, VT, and WA; referred to as unaffected states) based on the U.S. Department of Agriculture Animal and Plant Health Inspection Service data.[2] State comparisons should be interpreted cautiously because sampling frames differed across states, and access to dairy workers was uneven due to H5N1-associated farm restrictions and immigration enforcement.

We conducted a thematic analysis using a card-sorting approach to group statements and identifying major themes. Card Sorting methodology creates a major thematic architecture of qualitative data. We analyzed qualitative data by interview type. Two NCFH-trained staff members conducted thematic analysis together, and a third NCFH staff member reviewed the thematic analysis.

RESULTS

A total of 708 dairy worker surveys were completed in-person and over the phone in Kern and Tulare Counties, CA; Morgan and Weld Counties, CO; Morrison and Stearns Counties, MN; Cayuga and Wyoming Counties, NY; Addison and Franklin Counties, VT; Whatcom and Yakima Counties, WA, with a 92% participation rate. Data collection took place between March and September 2025. We conducted 20 qualitative interviews, comprising seven with dairy workers, eight with farmworker-serving organization staff, and five with local industry experts.

We present the results below in three areas: dairy workers, the farm systems they work in, and the governmental and public health system that shapes their access to information and care.

Dairy worker traits, knowledge, and practices

Demographics

Table 3.1: Demographics of dairy worker participants (N = 708)

Variable	Total n=708	Unaffected states (NY, VT, WA) n = 180	Affected states (CA, CO, MN) n = 528	p-value[1]
Sex				0.2
Male	607 (86%)	153 (85%)	454 (86%)	
Female	90 (21%)	21 (11%)	69 (13%)	
Age Group				<0.001
18-25	117 (17%)	45 (25%)	72 (14%)	
26-54	466 (66%)	117 (65%)	349 (66%)	
55+	60 (8%)	13 (7%)	47 (9%)	
No answer/Don't know	64 (9%)	4 (2%)	60 (11%)	
Race				0.045
Hispanic or Latino	605 (85%)	137 (76%)	468 (89%)	
American Indian/Alaskan Native/Indigenous	39 (6%)	17 (9%)	22 (4%)	
Other	18 (3%)	6 (3%)	12 (2%)	
No answer/Don't know	46 (6%)	20 (11%)	26 (5%)	
Racially or linguistically Indigenous[2]	103 (15%)	39 (22%)	64 (12%)	<0.001
Country of Birth				<0.001
Mexico	562 (79%)	134 (75%)	428 (81%)	
Guatemala	57 (8%)	37 (21%)	20 (4%)	
United States	51 (7%)	5 (3%)	46 (9%)	
Other	28 (4%)	0 (0%)	28 (5%)	
Marital Status				0.004
Married	367 (52%)	85 (47%)	282 (53%)	
Single	220 (31%)	55 (30%)	165 (31%)	
Civil union/Domestic partnership	76 (11%)	34 (19%)	42 (8%)	
Other	33 (5%)	3 (2%)	30 (6%)	
Average number of years of education completed	8.6	8.7	8.6	>0.9
Average years working in the U.S.	8.3	8.5	8.2	0.6

Percentages are rounded and may not sum to 100%." Don't know" and "No answers" totaling under 5% of participants were omitted.

[1] Pearson's chi-square with Rao-Scott correction, Design-based Kruskal-Wallis test

[2] Participants were classified as being linguistically or racially Indigenous based on the National Agricultural Workers Survey metric on whether the individual spoke an Indigenous language as a child, and/or currently speaks an Indigenous language, and/or identifies racially as Indigenous.31

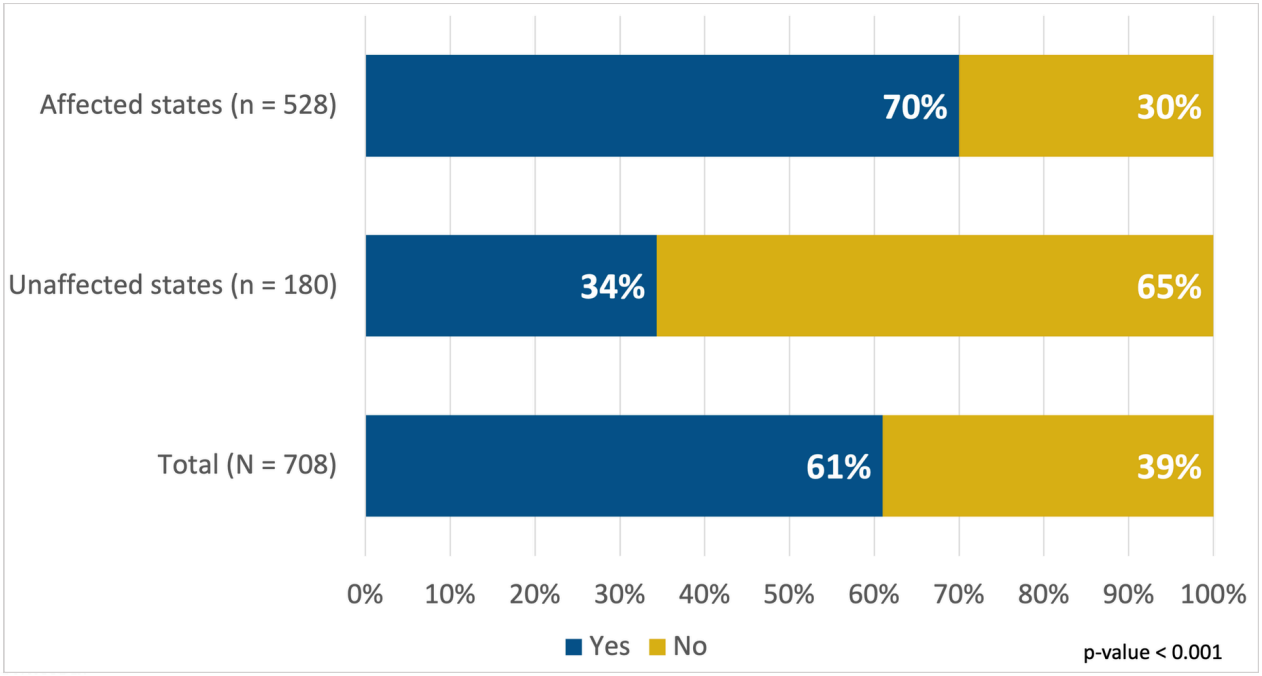
The majority of survey participants were male (86%), aged 26-54 (66%), and born in Mexico (79%). The second highest country of birth was Guatemala (8%). Eighty-five percent (85%) of participants identified as Hispanic or Latino. These patterns were consistent in both affected and unaffected states. Using the National Agricultural Workers Survey's Indigenous Composite Metric,[31] 15% of dairy workers identified as racially or linguistically Indigenous. There was a significant difference (p-value < 0.01) between participants in affected states (12%) and unaffected states (22%) who were racially or linguistically Indigenous. The average years of education completed by survey participants was 8.6, with no significant difference between affected and unaffected states. Participants had worked an average of 8.3 years in the U.S., with no difference between affected and unaffected groups.

Qualitative interview participants corroborated the survey findings regarding dairy worker demographics. They noted that the majority of dairy workers were male, middle-aged, and born in Mexico. Interviewees noted several demographic shifts over time. Multiple farmworker-serving organization staff and local industry experts, who participated in qualitative interviews, noted an increase in Indigenous dairy workers in their respective regions. This was most reported in the northeast states of New York and Vermont. These participants said that the rise in Indigenous workers from Mexico and Guatemala was in response to a decrease in workers from Jamaica, Haiti, Germany, and Puerto Rico. One dairy worker interviewee reported a recent increase in hiring women. An underlying theme across several interviews was that interviewees perceived dairy employers valued stability and reliability among their employees, and that some employers may see women and Indigenous workers as more stable. A farmworker-serving organization staff interviewee mentioned that Indigenous workers were more likely to keep their jobs because they were responsible and did not engage in "partying", and the dairy worker interviewee mentioned that women were more responsible and thus preferred by some employers.

> *"Pues muchos dicen que porque son más responsables [mujeres], otros que porque son más rápidas. Pues si rápidas para el trabajo. Y pues también las mujeres miraron que en las lecherías, pues se ganaban más que en "field". O se ganaba más que andar limpiando casas, "house-keeping"".*
>
> Translation: ""I mean, many say that it's because they [women], and others that they are quicker. And well, the women also saw that in dairies you earn more than in field work. Or you earn more than cleaning houses, "housekeeping".
>
> *— Dairy worker interview participant*

Worker knowledge of H5N1

Figure 3.1: H5N1 dairy worker knowledge of H5N1 or avian influenza (N = 708)[1]



[1] Pearson's chi-square with Rao-Scott correction; Design-based Kruskal-Wallis test

Overall, (61%) of survey participants had heard of H5N1 or avian influenza. However, these results were different between affected and unaffected states. Awareness was higher in affected states (70%) than in unaffected states (34%). Based on qualitative interviews, it was evident that knowledge of H5N1 varied by farm and region. The level of H5N1 knowledge among dairy workers reportedly depended on farm size, access to outreach organizations, and individual dairy workers' experience. The majority of interviewees reported a lack of knowledge among dairy workers about what to do if they contracted H5N1. No consistent education about H5N1 was provided to dairy workers, particularly regarding how to protect themselves. Due to the lack of information provided on farms, dairy worker interviewees mentioned several strategies they used to supplement this information gap. Multiple dairy worker interviewees mentioned that they had sought information about H5N1 on their own through the internet. Dairy worker interviewees mentioned that they drew on their prior experience navigating the COVID-19 pandemic and other basic agricultural hygiene practices to inform strategies for protecting themselves. One such strategy mentioned by a participant was washing their work clothes immediately upon arriving home from work, which reflects early pandemic practices and standard practices among crop workers to prevent pesticides from entering the home.

Risk and severity perception of H5N1

Table 3.3: H5N1 severity perception among dairy worker participants who had heard of H5N1 or avian influenza (n = 430)

Characteristic	Total n = 430	Unaffected states (NY, VT, WA) n = 180	Affected states (CA, CO, MN) n = 528	p-value[1]
Risk perception of H5N1 severity in humans				<0.001
The virus can cause severe sickness among humans, potentially leading to death	170 (40%)	19 (31%)	151 (41%)	
The virus can cause moderate sickness among humans	79 (18%)	8 (13%)	71 (19%)	
The virus can cause mild sickness among humans	44 (10%)	6 (10%)	38 (10%)	
I have not heard anything about the health consequences of H5N1 (bird flu) among humans	43 (10%)	4 (7%)	39 (11%)	
No answer/Don't know	94 (22%)	24 (39%)	70 (19%)	

Percentages are rounded and may not sum to 100%.
[1] Pearson's chi-square with Rao-Scott correction; Design-based Kruskal-Wallis test

Participants who had heard of H5N1 were asked about how severe they believed the illness could be in humans. Of these participants, 40% answered that the H5N1 virus could cause severe sickness in humans, potentially leading to death. A higher proportion of participants from affected states (41%) answered that H5N1 could cause severe illness in humans compared to participants from unaffected states (31%). Additionally, there was also a difference between affected and unaffected states in terms of not knowing or wanting to answer the questions. Only 19% of participants from affected states didn't know or respond to the question compared to 39% of participants from unaffected states.

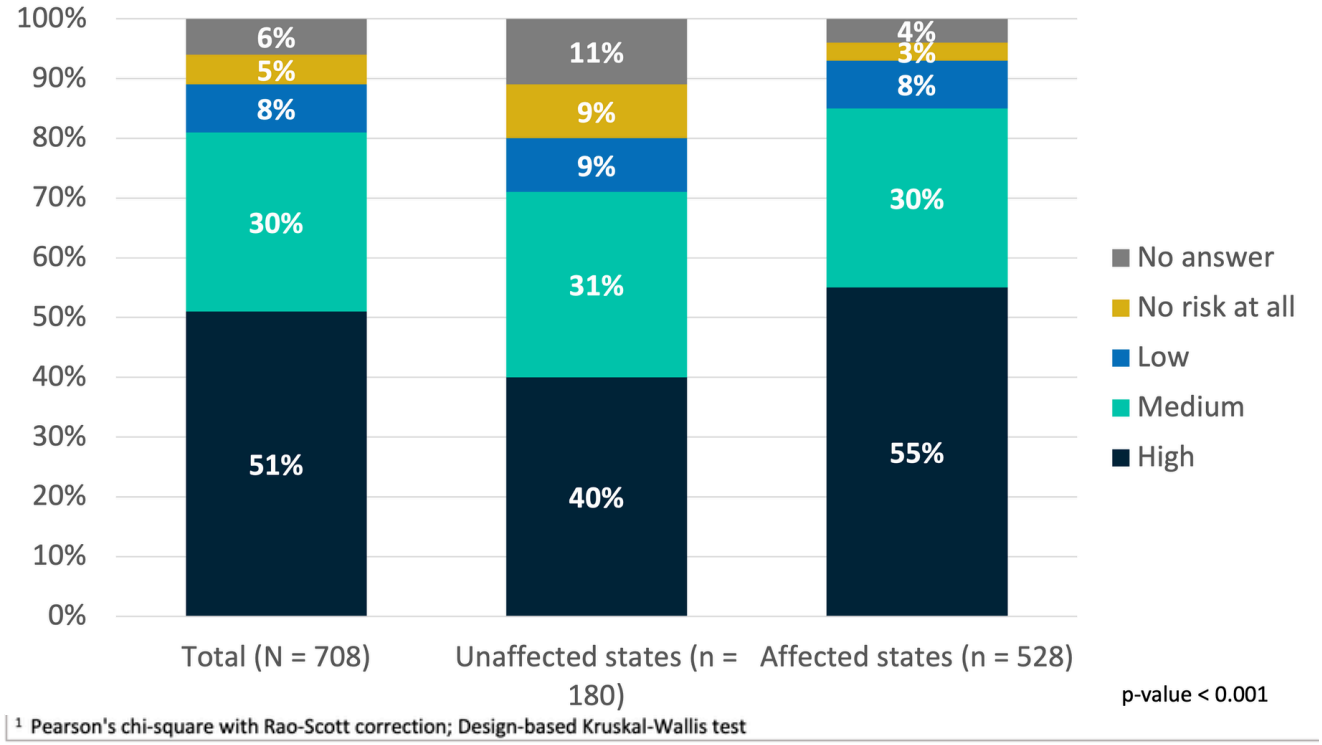
"Tal vez para saber más a lo mejor, este, información sobre eso [H5N1]. Pero la verdad no tengo la menor idea. Pero a lo mejor, es decir, se necesita como información para esto [H5N1]."

Translation: "Maybe to know more, well, information about that [H5N1]. But truthfully, I have no idea. But maybe, I mean, there needs to be information for this [H5N1]."
— Dairy worker participant

"¿H5[N1] ese cuál es? ¿Cómo es?"

Translation: "H5[N1], which one is that? How is it?"
— Dairy worker participant

Figure 3.2: H5N1 risk perception from milking cows (N = 708)[1]



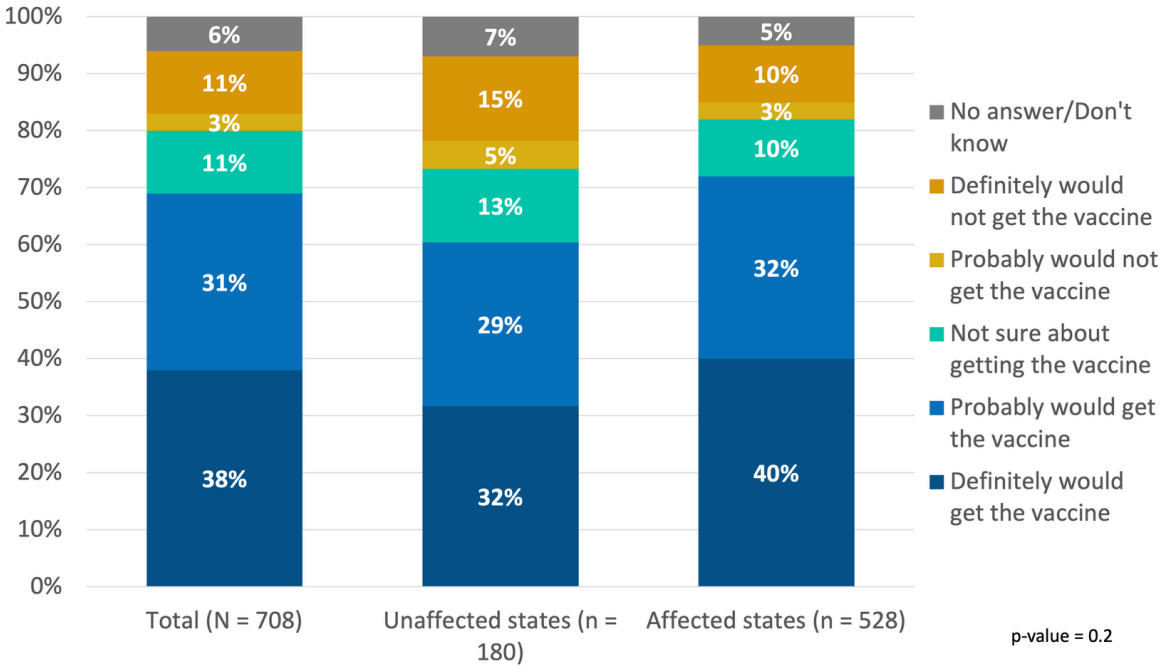
[1] Pearson's chi-square with Rao-Scott correction; Design-based Kruskal-Wallis test

All survey participants were asked to what extent they perceived the risk a worker has of contracting H5N1 from milking an infected cow if the worker did not use personal protective equipment (PPE). This question was included because milk from infected cows contains high levels of virus, making milking a high-risk activity.32 Overall, 51% of survey participants said the risk of a worker contracting H5N1 from milking an infected cow without PPE was high, while 30% answered there was a medium risk. Only 5% believed there was no risk. A similar pattern was observed in both affected and unaffected states, with a greater proportion of workers in affected states perceiving a higher level of risk associated with this task. Among participants from affected states, 55% reported a high risk, 30% a medium risk, and only 3% stated there was no risk. Among participants from unaffected states, 40% reported a high risk, 31% a medium risk, and 9% no risk.

"Andal exacto, osea, el contacto es or medio de la leche. Entonces, pues como, por ejemplo en la granja, pues es totalmente lechera, entonces ahí es donde se puede contagiar el virus hacia el ser humano"

Translation: "Yes, exactly, I mean, the contact is through milk. So, will like, for example, at the farm, well, it's a dairy farm, so that's where the virus can infect humans."
– Dairy worker interview participant

Figure 3.3: H5N1 vaccine receptivity among dairy worker participants (N = 708)[1]



[1] Pearson's chi-square with Rao-Scott correction; Design-based Kruskal-Wallis test

Survey participants were asked how likely they would be to get an H5N1 vaccine if it became available to dairy workers in the future. The overall willingness to receive an H5N1 vaccine was high. Among survey participants, 69% indicatedthey would definitely or probably get an H5N1 vaccine if it were available. By comparison, only 15% of survey participants said they definitely or probably wouldn't get an H5N1 vaccine if available. Eleven percent of survey participants reported being unsure whether they would receive an H5N1 vaccine if it were available. This trend was similar among participants from both affected and unaffected states, even though many participants in unaffected states had never heard of H5N1, indicating that general vaccine receptivity is high in this population.

Qualitative interview participants from all three groups expressed some concerns about the effectiveness of an H5N1 vaccine. A significant theme among all interviewees was the importance of providing information on the vaccine's side effects and efficacy, and the need to be vaccinated during an H5N1 vaccine rollout. Some dairy workers said they would only receive an H5N1 vaccine if it were proven effective. All three groups noted that these were issues they saw during the COVID-19 vaccine rollout, so an effective campaign for an H5N1 vaccine would address these informational gaps. Some participants also mentioned that during COVID-19 vaccine distribution, some workers became ill from vaccine side effects, which may have increased hesitancy to get vaccinated. All three groups noted that current low concern about H5N1 may reduce future vaccine uptake.

"But often their [dairy workers] barriers are not like cultural, religious, or philosophical to vaccination. They're financial, transportation, language, or just access. 'I work too much. I have to work so much to keep my family fed and housed and clothed that I don't have time to go to the doctor.' So what I've found is that with populations like this, if you can make vaccination very convenient and easy, many people will take you up on it."
— Dairy expert interview participant

Farm systems

Survey participants were asked to report the total number of part-time and full-time employees, including themselves, who worked at their current dairy farm or the dairy farm where they were most recently employed. The average number of employees reported at dairy farms was 37, with no significant difference between unaffected and affected states.

Table 4.1: Reported average number of workers at dairy farms (N = 708)

Characteristic	**Total** n = 708	**Unaffected states (NY, VT, WA)** n = 180	**Affected states (CA, CO, MN)** n = 528	**p-value**[1]
Average number of employees on dairy farm reported by survey participants	20 IQR (9 –4 8.8)	20 IQR (10 – 50)	20 IQR (7 - 80)	0.6

[1] Pearson's chi-square with Rao-Scott correction; Design-based Kruskal-Wallis test

PPE access, provision, and current usage

Table 4.2: PPE use and access among dairy worker participants (N = 708)

Characteristic	Total N = 708	Unaffected states (NY, VT, WA) n = 180	Affected states (CA, CO, MN) n = 528	p-value[1]
Current use of PPE[2]				
Gloves	611 (86%)	166 (92%)	445 (84%)	0.006
Rubber boots	569 (80%)	161 (89%)	408 (77%)	<0.001
Aprons	407 (57%)	104 (58%)	303 (57%)	0.9
Goggles	366 (52%)	64 (36%)	302 (57%)	<0.001
N95 respirators	222 (31%)	36 (20%)	186 (35%)	<0.001
Face shields	158 (22%)	15 (8%)	143 (27%)	<0.001
Head covers	149 (21%)	26 (15%)	126 (24%)	0.014
Boot/shoe coverings	66 (9%)	9 (5%)	57 (11%)	0.028
None	13 (2%)	1 (1%)	12 (2%)	0.12
PPE provided by employer[2]				
Gloves	546 (77%)	158 (88%)	388 (74%)	<0.001
Goggles	306 (43%)	52 (29%)	254 (48%)	<0.001
Aprons	306 (43%)	82 (46%)	224 (42%)	0.5
Rubber boots	223 (31%)	29 (16%)	194 (37%)	<0.001
N95 respirators	208 (29%)	38 (21%)	170 (32%)	0.007
Face shields	152 (21%)	16 (9%)	136 (26%)	<0.001
Head covers	117 (17%)	21 (12%)	96 (18%)	0.063
Boot/shoe coverings	48 (7%)	3 (1%)	45 (9%)	0.002
None	82 (12%)	13 (7%)	69 (13%)	0.047
PPE purchased by dairy worker[2]				
Rubber boots	409 (58%)	136 (76%)	273 (52%)	<0.001
Aprons	107 (15%)	21 (12%)	86 (16%)	0.2
Goggles	83 (12%)	14 (8%)	69 (13%)	0.056
Gloves	63 (9%)	11 (6%)	52 (10%)	0.14
N95 respirators	32 (5%)	3 (1%)	29 (6%)	0.013
Face shields	31 (4%)	1 (1%)	30 (6%)	0.005
Head covers	30 (4%)	4 (2%)	26 (5%)	0.057
Boot/shoe coverings	15 (2%)	3 (1%)	12 (2%)	0.4
None	240 (34%)	33 (19%)	207 (39%)	<0.001

[1] Pearson's chi-square with Rao-Scott correction; Design-based Kruskal-Wallis test
[2] Percentages do not add to 100%, the question was a "select all that apply"

Survey participants were asked a series of questions to assess their current use and access to PPE while working. The PPE items listed in the survey are presented in Table 4.2 and reflect the CDC and the National Institute for Occupational Safety and Health (NIOSH) recommendations for animal production workers to protect themselves from H5N1 transmission.33 Overall, the majority of participants reported regularly using gloves (86%) and rubber boots (80%) while working. Over half of the participants also reported regularly using aprons (57%) and goggles (52%). Only 2% of participants reported never using any PPE while working. However, there was a significant difference between affected and unaffected states (p-value > 0.05) in the use of gloves, rubber boots, goggles, masks, and face shields (see Table 4.2).

Survey participants were then asked to identify the PPE items provided by their employer. The majority of participants reported that gloves (77%) were provided by employers, followed by goggles and aprons (43% each). Slightly over 10% of participants answered that their employer did not provide any PPE. There was a significant difference between participants whose employers provided gloves, googles, rubber boots, masks, face shields, and shoe coverings between affected and unaffected states, with a higher proportion of participants in affected states reporting their employer provided all PPE items, except for aprons.

Survey participants were also asked to report the PPE items they had to purchase themselves. Fifty-eight percent of participants answered that they had to buy their own rubber boots, the most common item participants had to purchase on their own. Over a third (34%) of participants reported not having to buy any PPE they regularly used while working. For all other PPE items mentioned, 15% or fewer participants reported having to purchase them themselves. Some PPE items had to be bought by both employers and workers, reflecting situations such as the employer providing a limited number of items at the start of employment or on a monthly or weekly basis, or when workers were not satisfied with the quality or usability of the items provided.

Qualitative interviews provided additional details regarding PPE use and access among dairy workers. All three groups of interview participants confirmed that the most commonly used PPE by dairy workers was gloves and rubber boots. Some added that aprons were often worn by dairy workers, but only by those who milked the cows. Some of the dairy worker interview participants also stated that they had to buy their own rubber boots. They mentioned that one of the main recommendations they had for dairy farms was to provide more readily accessible PPE.

Interview participants from all groups also mentioned barriers to the use of PPE. Many noted that the environmental conditions in parlors and other areas of a dairy farm made the use of PPE challenging and raised safety concerns. For example, dairy worker interview participants who worked in the milking parlor reported that the high heat and humidity inside made wearing gloves uncomfortable, and that the goggles would fog up. One dairy industry expert even mentioned that in some cases, there is concern about experiencing heat stress from wearing PPE. Some staff at farmworker-serving organizations recognized that education played a role in increasing PPE use. Some of these staff members mentioned that dairy workers would often tell them that PPE was "of no use".

"También hay personas [dairy workers] que dicen, 'Pero es que no nos están dando nada'. Y tienen ahí los botes de desinfectantes o los guantes, o lo que deben de usar. [Pero dicen] '¿Para qué? Si eso no sirve para nada'. Es dependiendo del de la persona."

Translation: "There are also people [dairy workers] who say, 'But they are not providing us with anything'. But they also have their bottles of disinfectant, or the gloves, or what they should use. [But they say] 'What for? It doesn't help anything. It all depends on the person."

— Farmworker-serving organization staff interview participant

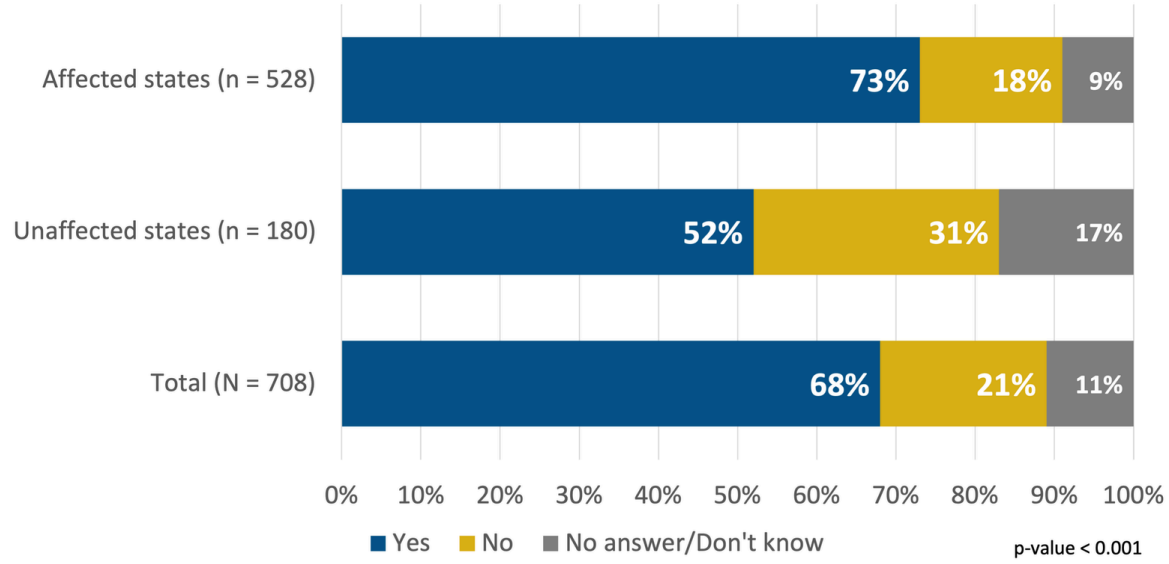
Farm labor policies

Table 4.3: Workers' compensation, health insurance, and paid sick leave among dairy worker participants (N = 708)

Characteristic	Total N =708	Unaffected states (NY, VT, WA) n = 180	Affected states (CA, CO, MN) n = 528	p-value[1]
Has workers' compensation insurance				<0.001
Yes	482 (68%)	94 (52%)	388 (73%)	
No	149 (21%)	55 (31%)	94 (18%)	
No answer/Don't know	78 (11%)	31 (17%)	47 (9%)	
Has health insurance				<0.001
Yes	327 (46%)	45 (25%)	282 (53%)	
No	347 (49%)	126 (70%)	221 (42%)	
No answer/Don't know	34 (5%)	9 (5%)	25 (5%)	
Type of health insurance[2]	*n = 327*	*n = 45*	*n = 282*	*<0.001*
Private health insurance	*118 (36%)*	*29 (64%)*	*89 (32%)*	
State-sponsored plan	*105 (32%)*	*2 (5%)*	*103 (36%)*	
Medicaid	*24 (7%)*	*5 (10%)*	*19 (7%)*	
Medicare	*26 (8%)*	*1 (3%)*	*25 (9%)*	
Other	*10 (3%)*	*1 (2%)*	*9 (3%)*	
No answer/Don't know	*44 (13%)*	*7 (16%)*	*37 (13%)*	
Has paid sick leave time				<0.001
Yes	464 (66%)	91 (51%)	373 (71%)	
No	200 (28%)	71 (40%)	129 (24%)	
No answer/Don't know	44 (6%)	18 (10%)	26 (5%)	
Has worked while sick				0.077
Yes	257 (36%)	73 (41%)	184 (35%)	
No	442 (62%)	104 (58%)	338 (64%)	

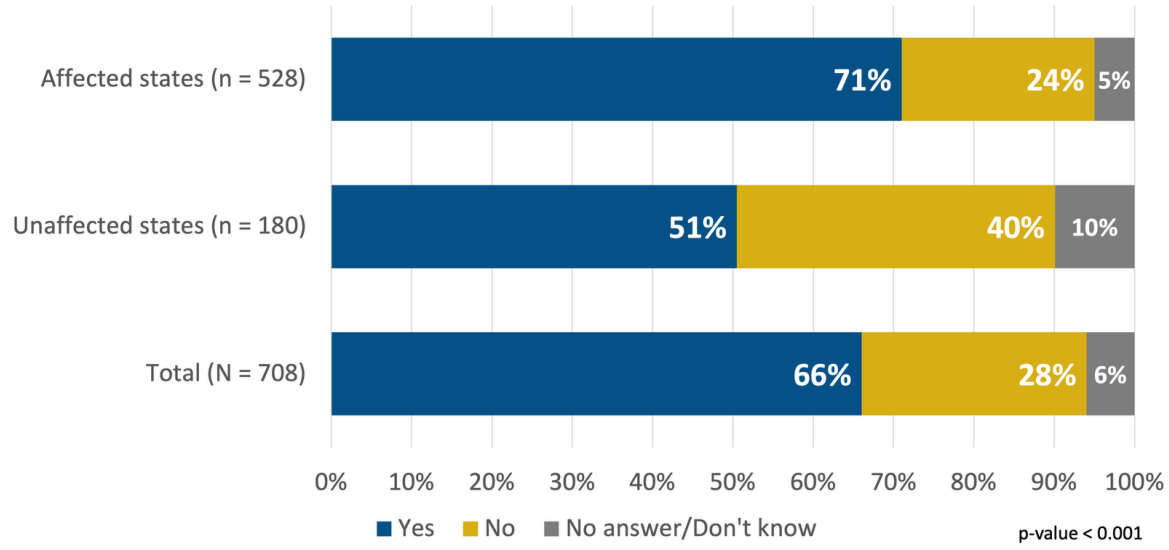
Percentages are rounded and may not sum to 100%. "Don't know" and "No answers," totaling under 5% of participants, were omitted.
[1] Pearson's chi-square with Rao-Scott correction; Design-based Kruskal-Wallis test
[2] Percentages do not add to 100%, the question was a "select all that apply"

Figure 4.1: Workers' compensation insurance among dairy worker participants (N = 708)[1]



[1] Pearson's chi-square with Rao-Scott correction; Design-based Kruskal-Wallis test

Figure 4.2: Workers' paid sick leave among dairy worker participants (N = 708)[1]



[1] Pearson's chi-square with Rao-Scott correction; Design-based Kruskal-Wallis test

Survey participants were asked a series of questions to assess the type of insurance they have access to. They were first asked whether their current or last dairy worker employer provided workers' compensation insurance, and the majority (68%) answered that their employer did. However, 11% of participants reported being unsure whether they had responded to the question. There was a significant difference (p-value < 0.05) in the offer of workers' compensation insurance between survey participants from unaffected and affected states. Only about half of survey participants from unaffected states (52%) reported that their employer offered workers' compensation insurance, compared with 73% in affected states. There was also a difference in the proportion of participants who didn't know or didn't answer whether their employer offered compensation insurance, with 17% of participants from unaffected states answering they didn't know or didn't want to answer, compared to 9% of participants from affected states.

Survey participants were also asked if they had health insurance coverage. Slightly less than half of the participants reported having health insurance (46%). However, there was a significant difference in health insurance coverage between participants from unaffected and affected states (p-value < 0.05). Only one-fourth (25%) of participants from unaffected states reported having health insurance, compared with half (53%) of participants from affected states who reported having health insurance. A little over a third (36%) of participants with health insurance coverage reported being covered by private insurance, while a little under a third (32%) of these same participants stated they were covered through a state-sponsored health plan, such as Medi-Cal in California. Private insurance can include employer-provided coverage or coverage that the participant has purchased independently. Fifteen percent (15%) of participants reported that their health insurance was provided through Medicaid (7%) or Medicare (8%).

Participants were also asked if their employer offered paid sick leave. Two-thirds (66%) of all survey participants reported that their employer offered paid sick leave, while 28% stated that their employer did not. There was a significant difference between participants from affected and unaffected states regarding access to paid sick leave (p < 0.05). Seventy-one percent (71%) of participants from affected states reported that their employer offered paid sick leave, compared to 51% of participants from unaffected states. In all six states, businesses with one or more employees are required to provide some paid sick leave (the amount varies by state), so all participants should have access to it. Slightly over a third (34%) of participants reported working while ill, a proportion strikingly similar to the proportion who did not have paid sick leave.

H5N1 impact on farms

Qualitative interview participants mentioned several changes farms underwent due to H5N1. Some of these changes were already underway in the industry, and the emergence of H5N1 accelerated or exacerbated them. Several participants described how dairy farmers further restricted access to outside organizations after H5N1 infections occurred in the area. While access to dairy farms was already limited, H5N1 has made it even more challenging. Restricting access is a practical biosecurity measure; however, it also raises concerns among farmworker-serving organizations that workers may not be receiving the education, training, or PPE they need on some farms.

Because H5N1 infections caused reduced production, illness, and some deaths among cattle, some local dairy industry experts and dairy worker participants mentioned that H5N1 led to some dairy farms downsizing or relocating. They also noted that, while the dairy industry had been consolidating, H5N1 seemed to accelerate that consolidation. One dairy worker interviewee described how his dairy farm was closed after cows died due to the H5N1 outbreak. He went on to explain that his farm was not the only one, as he was aware of other dairy workers whose farms had been sold or closed. However, this was not the case in all areas; some dairy worker participants reiterated that H5N1 had no significant effect on the dairy farms they worked in or their local area.

> *"Pues a muchos patrones se le murieron bastantes vacas. Muchas lecherías chicas se quebraron, se declararon en bancarrota porque así pues sí, se les murieron bastantes animales. Yo pienso que porque no detectaron [H5N1] a tiempo o fue muy tarde cuando empezaron a decir que había un problema con, por la gripe aviar les afectó a las vacas."*
>
> *"Well, a lot of cows died for a lot of employers. A lot of small dairy farms went broke; they declared bankruptcy because, well, a lot of their animal died. I think that because they didn't detect [H5N1] on time, or it was late when they started to say they had a problem with it, due to the effect of the bird flu on the cows."*
> *— Dairy worker interview participant*

In addition to these changes, dairy farms made a few protocol adjustments, as mentioned by interview participants. Some dairy workers mentioned that all they were told was to be "more careful" and use PPE, but no additional information was provided or other changes mentioned. Some dairy industry experts went further to explain that business practices and protecting the business during these times were difficult. They noted that these practices may conflict with the protection of workers and their well-being. One such practice mentioned was their unwillingness to participate in testing due to concerns about the potential impact on their business if they were known to have avian flu cases on their farm. While that would be best for public health and workers' safety, it could hurt their business. They stated that the impact of H5N1 on the dairy industry is broader than changes in safety and biosecurity protocols – it has put the dairy supply chain in jeopardy, affecting farmers' and workers' health and livelihoods.

Governmental and public health systems

General community access to healthcare

Table 5.1: Healthcare access and practices among dairy worker participants (N = 708)

Characteristic	Total N = 708	Unaffected states (NY, VT, WA) n = 180	Affected states (CA, CO, MN) n = 528	p-value[1]
Reasons for seeking care in the last 12 months[2]				
For routine/preventative care	122 (17%)	30 (17%)	92 (17%)	0.8
For illness	94 (13%)	23 (13%)	71 (13%)	0.8
For routine dental care	62 (9%)	14 (8%)	48 (9%)	0.5
For injury	44 (6%)	13 (7%)	31 (6%)	0.5
For dental treatments	38 (5%)	11 (6%)	27 (5%)	0.6
Needed care but never received it	28 (4%)	8 (4%)	20 (4%)	0.8
Did not need care in the past 12 months	387 (55%)	97 (54%)	290 (55%)	0.8
Where dairy workers would seek care if seriously ill				<0.001
Hospital/ Emergency Room	366 (52%)	68 (38%)	298 (57%)	
Community Health Center	224 (32%)	66 (37%)	158 (30%)	
Would not seek care	10 (1%)	3 (2%)	7 (1%)	
Other	64 (9%)	25 (14%)	39 (6%)	
No answer/Don't know	40 (6%)	18 (10%)	22 (4%)	
Available transportation for care				<0.001
Own car	536 (76%)	96 (53%)	440 (83%)	
Ride from a relative, coworker, or friend	73 (10%)	31 (18%)	42 (8%)	
Raitero	66 (9%)	36 (20%)	30 (6%)	
Other	21 (3%)	14 (7%)	7 (1%)	

Percentages are rounded and may not sum to 100%. "Don't know" and "No answers," totaling under 5% of participants, were omitted.
[1] Pearson's chi-square with Rao-Scott correction; Design-based Kruskal-Wallis test
[2] Percentages do not add to 100%, the question was a "select all that apply"

Survey participants were asked if they had needed and received health care in the last 12 months. Fifty-five (55%) of participants answered that they had not needed care in the previous 12 months. Less than half (41%) of participants reported needing and having received healthcare, and 4% needed it but never received it. The top reasons participants received healthcare were for routine and preventive care (17%) and illness (13%). A small proportion of participants reported needing healthcare in the last 12 months but not receiving the care they required. There was no significant difference in the healthcare needed and received by participants from affected and unaffected states.

Participants were also asked where they would seek care in the event of a serious illness. Slightly over half (52%) of all participants said they would go to a hospital or emergency room if they became seriously sick to get care. The second most common source of healthcare reported was a community health center. There was a significant difference between participants from affected and unaffected states regarding where they would seek care if they were sick. Close to three in five (57%) participants from affected states reported that they would seek care at a hospital or emergency room if they fell ill, compared to nearly two in five (48%) participants from unaffected states.

Participants were also asked about the type of transportation they had access to. Three-fourths (76%) of all participants reported having their own personal car. There was a significant difference (p-value < 0.05) in the transportation mode used by participants from affected and unaffected states. In both groups, the top transportation participants had to seek care in their own car. However, the majority (83%) of participants from affected states had access to their own vehicle to reach care, compared with only slightly over half (53%) of participants from unaffected states. Twenty percent (20%) of participants from unaffected states said they would rely on a 'raitero' to get to care, with a similar proportion of these participants answering that they would get a ride from a relative, friend, or coworker. A 'raitero' is a person who charges individuals to provide transportation.

Dairy workers and farmworker-serving organization staff interview participants were asked about healthcare access for dairy workers in their communities. Through these interviews, some barriers and facilitators for access were identified. Both groups mentioned that transportation was a barrier for dairy workers' access to healthcare, although only one dairy worker interviewee did so. A more common barrier cited by both groups was the cost associated with seeking care. Dairy workers went further and explained that the cost of healthcare increased their mental and financial stress. Both dairy workers and farmworker-serving organization staff added that part of the reason healthcare access was an issue was a lack of health insurance. Both groups also mentioned that the lack of time off work and limited clinic hours were barriers. One dairy worker specifically mentioned they feared requesting time off due to illness because they were worried about getting fired. Other dairy workers added to this, saying they didn't want to take time off because their shifts would have to be covered by other coworkers, who would then have to work double shifts or take on extra tasks. However, one dairy worker participant appreciated his workplace because management ensured there were enough workers to cover for when someone became ill without anyone having to take on extra shifts.

> *"Potentially why they also wait till they can't anymore to get care, because they don't have that health insurance, so that becomes harder for folks."*
> *— Farmworker-serving organization staff interview participant*

"Even if people have paid sick time, sometimes they're reluctant to use it. They're reluctant to push for it. They don't want to make a stink. They don't want to make a scene, and chiefly, you know, dairy farms are keeping their workforces as small as they can to cut labor costs, which means, if one guy is going to the doctor, he knows his 'compa' [comrade] is having to do an extra shift. So workers are kind of in solidarity with each other, and are reluctant to pass on that burden to their coworkers. "
– Farmworker-serving organization staff interview participant

While qualitative interview participants discussed barriers, they also mentioned some facilitators that enabled dairy workers to receive care. One key facilitator was general outreach practices by local community-based organizations. Some mentioned offices extending hours in the evenings and on weekends to enable access to care for workers with long work hours. Another common practice was for clinics to provide care directly on the farm or at community spaces and events. Interview participants also mentioned that some dairy workers did have access to health insurance. Dairy workers mentioned that their employers offered private health insurance; however, this was typically available only on larger farms. Some farmworker-serving organization staff mentioned that dairy workers could use specific state insurance plans, such as Medi-Cal in California. However, in some cases, such as in Minnesota, access to state-sponsored plans will end in 2026, according to interview participants, due to changing eligibility requirements. Both groups also mentioned that one way dairy workers address their lack of access to healthcare is by using over-the-counter medication, which is more easily accessible in terms of both location and cost.

"Si no calificaran [trabajadores lecheros], por ejemplo, para el Medicaid que nosotros ofrecemos, les dan un 'sliding fee' o este sí toman [clinics] en cuenta situaciones."

"If they [dairy workers] don't qualify, for example, for Medicaid we offer, they give them a sliding fee or they [clinics] do take into account situations."
– Farmworker-serving organization staff interview participant

H5N1 symptoms and testing

Table 5.2: H5N1 symptoms among dairy worker participants (N = 708)

Characteristic	Total N = 708	Unaffected states (NY, VT, WA) n = 180	Affected states (CA, CO, MN) n = 528	p-value[1]
Experienced H5N1-like symptoms since January 1, 2024[2]				
Has had at least one symptom	*365 (52%)*	*81 (45%)*	*284 (48%)*	
Sore throat	176 (25%)	45 (25%)	131 (25%)	>0.9
Headache	170 (24%)	36 (20%)	134 (25%)	0.2
Cough	169 (24%)	40 (22%)	129 (24%)	0.6
Fever	139 (19%)	34 (19%)	105 (20%)	0.8
Muscle or body aches	135 (19%)	31 (17%)	104 (20%)	0.5
Nasal drip or congestion	126 (18%)	29 (16%)	97 (18%)	0.5
Chills	120 (17%)	26 (14%)	94 (18%)	0.3
Conjunctivitis	100 (14%)	17 (9%)	83 (16%)	0.047
Difficulty breathing	61 (9%)	11 (6%)	50 (10%)	0.2
Diarrhea	54 (8%)	4 (2%)	50 (9%)	<0.001
No symptoms reported	302 (43%)	89 (49%)	213 (40%)	0.055
Symptoms occurred within a month of working with cattle that tested positive for H5N1 or had symptoms of H5N1[3]	*n = 365*	*n = 81*	*n = 284*	*<0.001*
Yes	*116 (32%)*	*3 (4%)*	*113 (40%)*	
No	*201 (55%)*	*62 (76%)*	*139 (49%)*	
No answer/ Don't know	*48 (13%)*	*16 (20%)*	*32 (11%)*	

Percentages are rounded and may not sum to 100%. "Don't know" and "No answers," totaling under 5% of participants, were omitted.
[1] Pearson's chi-square with Rao-Scott correction; Design-based Kruskal-Wallis test
[2] Percentages do not add to 100%, the question was a "select all that apply"
[3] Cattle symptoms of H5N1 described to participants were 1) low appetite, 2) low milk production, and 3) abnormal milk appearance

Survey participants were asked if they experienced a series of H5N1 symptoms since January 1, 2024. The five most common H5N1 symptoms experienced by participants were sore throat (25%), headache (24%), cough (24%), fever (19%), and muscle and body aches (19%). Only 14% of participants reported experiencing conjunctivitis. Slightly over half (52%) of all participants experienced at least one H5N1 symptom. These participants were then asked if they had symptoms within one month of being exposed to cattle that either had tested positive for H5N1 or had symptoms of H5N1 infection (reduced milk production, abnormal milk appearance, or reduced appetite). About one-third (32%) reported that their symptoms coincided with cattle being ill or positive for H5N1. A significant difference (p-value < 0.05) was observed between affected and unaffected states. Only 4% of participants from unaffected states reported that their H5N1-like symptoms coincided with cows being sick or positive, compared with 40% in affected states.

Figure 5.1: Dairy worker participants with at least one H5N1 symptoms since January 1st, 2024 (N = 708)

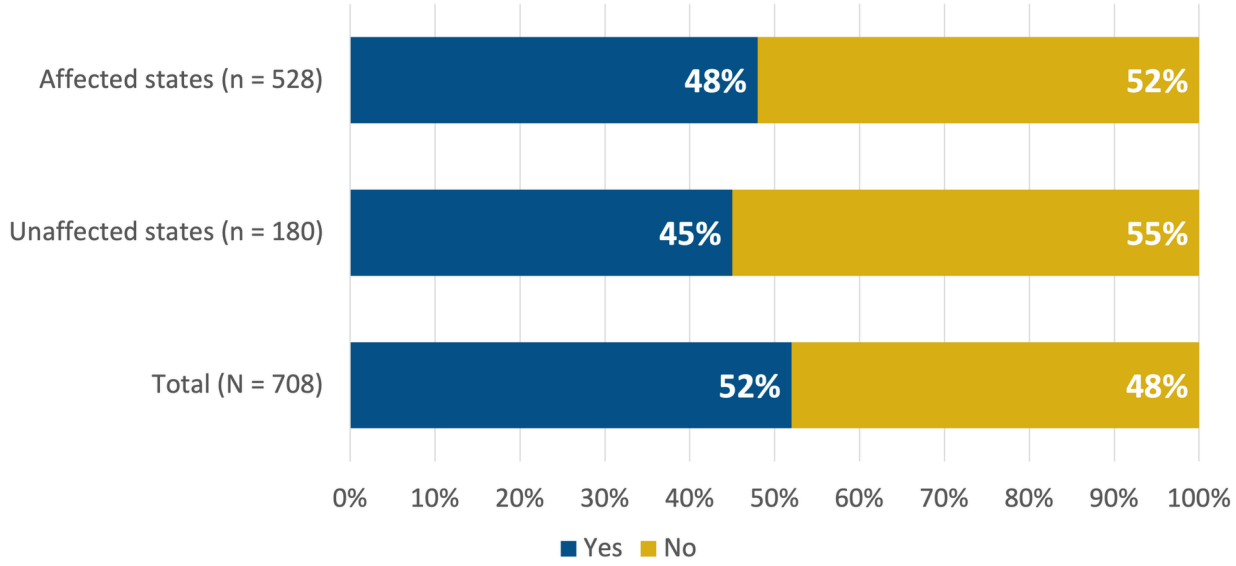
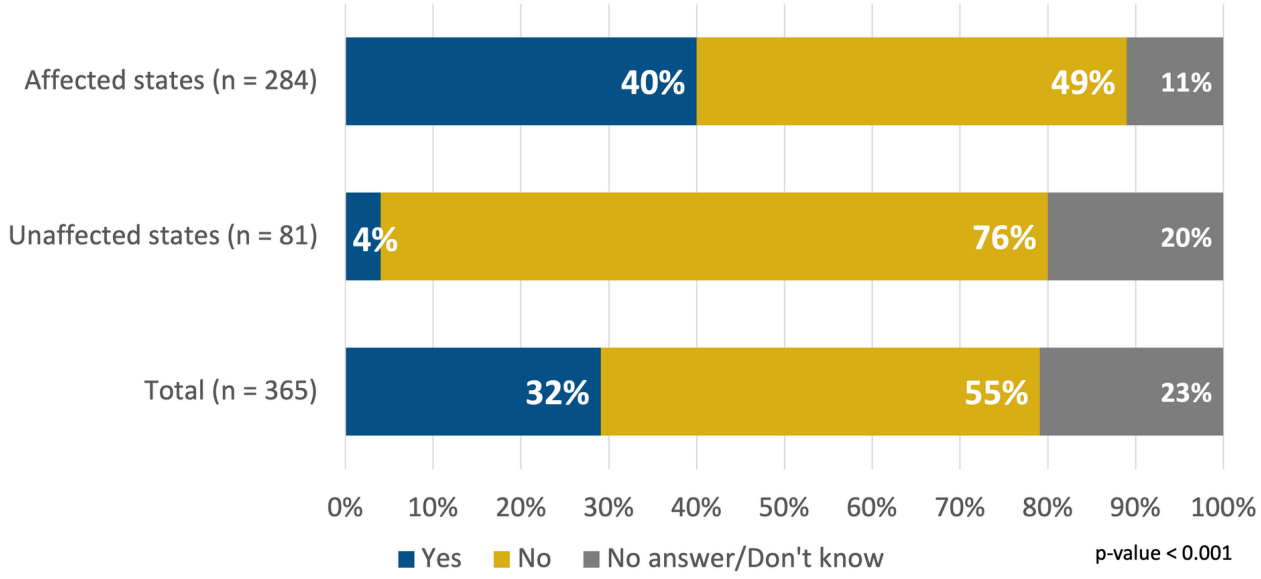


Figure 5.2: H5N1 symptoms among dairy worker participants occurring within a month of working with a cattle that tested positive for H5N1 or had symptoms of H5N1 (n = 365)[1]



[1] Pearson's chi-square with Rao-Scott correction; Design-based Kruskal-Wallis test

Table 5.3: H5N1 testing among dairy worker participants who reported experiencing at least one symptom of H5N1 (N = 365)

Characteristic	Total N = 365	Unaffected states (NY, VT, WA) n = 81	Affected states (CA, CO, MN) n = 284	p-value[1]
Has ever tested for H5N1				<0.001
Yes	32 (9%)	0 (0%)	32 (11%)	
No	441 (89%)	78 (96%)	247 (87%)	

Percentages are rounded and may not sum to 100%. "Don't know" and "No answers," totaling under 5% of participants, were omitted.
[1] Pearson's chi-square with Rao-Scott correction; Design-based Kruskal-Wallis test

Survey participants who reported experiencing at least one H5N1 symptom were asked if they had ever been tested for H5N1. Among these participants, the majority (89%) reported never being tested for H5N1. Only 9% reported being tested. There was a significant difference (p-value < 0.05) between participants from affected and unaffected states regarding whether they had been tested for H5N1. All participants who had been tested for H5N1 were in affected states, where 11% of participants with one more symptoms were tested.

Qualitative interviews provided additional details about H5N1 testing. Only one of the dairy worker interview participants was aware of testing being available. They did not know about the process for testing for H5N1 or where to get tested. There were only two dairy workers who participated in the interviews and learned about H5N1 testing, both of whom were in California. Organization staff interviewees also corroborated the lack of information on testing. They also mentioned that, in addition to a lack of information, the test's availability was low. These interviewees mentioned that H5N1 testing was not available at local clinics; instead, testing was only available from health departments, which dairy workers may not be familiar with in some communities. A dairy worker interview participant mentioned that they wished H5N1 testing were available in a similar manner to COVID-19 testing. Two dairy industry expert participants stated that even when testing was made available, other concerns would affect uptake. One mentioned the fear workers had of participating in testing due to concerns about losing their jobs or immigration status.

Participants who experienced H5N1-like symptoms were asked if they had been tested for H5N1. A total of 32 participants reported being tested for H5N1, and 3 tested positive. All three of these individuals were in California.

Seasonal flu vaccine uptake and distribution

Table 5.4: Seasonal influenza vaccine uptake among dairy worker participants (N = 708)

Characteristic	Total N = 708	Unaffected states (NY, VT, WA) n = 180	Affected states (CA, CO, MN) n = 528	p-value[1]
Has received the flu vaccine in the last 12 months				0.4
Yes	300 (42%)	77 (43%)	223 (42%)	
No	390 (55%)	95 (53%)	295 (56%)	
Reasons for not getting flu vaccine[2,3]	*n = 390*	*n = 95*	*n = 295*	
Don't need it/Haven't had flu	*131 (34%)*	*25 (27%)*	*106 (36%)*	*0.11*
Worried about side effects	*55 (14%)*	*11 (11%)*	*44 (15%)*	*0.4*
No vaccine campaign	*40 (10%)*	*8 (9%)*	*32 (11%)*	*0.6*
No time or transportation	*30 (8%)*	*5 (5%)*	*25 (8%)*	*0.2*
Doesn't know the vaccine site	*29 (7%)*	*7 (7%)*	*22 (8%)*	*>0.9*
Not enough information about the vaccine	*27 (7%)*	*4 (4%)*	*23 (8%)*	*0.2*
Not worried about the flu	*20 (5%)*	*5 (6%)*	*15 (5%)*	*0.9*
Other	*16 (4%)*	*6 (6%)*	*10 (3%)*	*0.5*

Percentages are rounded and may not sum to 100%. "Don't know" and "No answers," totaling under 5% of participants, were omitted.
[1] Pearson's chi-square with Rao-Scott correction; Design-based Kruskal-Wallis test
[2] Question only asked to participants who responded "No" to getting the flu vaccine in the last 12 months.
[3] Percentages do not add to 100%, the question was a "select all that apply"

Survey participants were asked if they had received the flu vaccine in the last 12 months. Slightly over half of participants (55%) reported not having received the flu vaccine in the previous 12 months, compared with 42% who had received it. A similar trend was observed in participants from both unaffected and affected states, with no significant difference between the two groups (p-value > 0.05). Participants who had not received the flu vaccine were asked about the main reason for not receiving it; the most commonly cited reason was that they thought they didn't need it and hadn't had the flu (34%). Other top reasons cited for not receiving the flu vaccine in the past 12 months were concerns about side effects (14%) and the absence of a flu vaccination campaign in their community (10%).

Farmworker-serving organization staff and local dairy industry experts were interviewed to gather information about strategies and efforts related to flu vaccinations in their communities. Only participants from NM, NY, and UT had experience and knowledge about vaccination efforts in their states and provided some insights. Interviewees in New Mexico, New York, and Utah specifically mentioned that seasonal influenza campaigns in their states were promoted as a way for dairy workers to have some protection against H5N1; however, these campaigns faced several challenges and reportedly had low uptake among dairy and poultry workers. One interviewee from a community health center described how the influenza vaccine campaign was stressful, as their collaboration with a health department required them to reach specific quotas for farmworker vaccinations, which proved challenging to meet. Another interviewee stated that their community did not conduct an influenza vaccine campaign for dairy or poultry workers because they believed it was disingenuous, given the limited evidence available about how effective the flu vaccine would be in protecting exposed workers from H5N1.

Impact of immigration enforcement

Qualitative interview participants from all groups identified federal immigration policies as a critical issue for the dairy industry. The current political landscape, characterized by indiscriminate law enforcement and immigration raids, has made dairy farms even more challenging to access and work with. On the industry side, both farmworker-serving organization staff and dairy industry experts mentioned how, even before the current landscape, relationships and partnerships with dairy farms were fragile. They noted that, with increased immigration enforcement activity, dairy farm owners are now even more hesitant about partnering and opening their doors to local organizations or public health agencies. Dairy farmers rely on skilled, trained workers, and some have restricted access to their farms to help protect their labor force from potential immigration raids. Some interviewees mentioned that dairy producers had been purchasing groceries for their employees so they would not have to drive and risk being pulled over by police or immigration enforcement agents.

> *"He tenido problemas con citas médicas que ellos [trabajadores lecheros] ya no quieren ir. Prefieren ya no seguir su tratamiento, ya sea de diabetes, digamos."*
>
> "I have had problems with medical visits that they [dairy workers] no longer want to go to. They prefer not to continue with their treatment, such as diabetes, let's say."
> – Farmworker-serving organization staff interview participant

All three groups noted that recent changes in immigration policy and enforcement have affected dairy workers. They all stated the additional stress and anxiety workers have been experiencing. Organization staff interviewees all noted that dairy workers and the agricultural worker community in general have been protecting themselves by avoiding public outings, and as a result, many do not receive the care they need. An interview participant mentioned that clinic visits have decreased recently, even for workers with chronic conditions. One interviewee described a situation in which a dairy worker stayed at the farm for hours after their shift ended before going home because they wanted to drive at a time they considered safer for avoiding immigration agents.

> *"Y lo compartimos con los trabajadores que miramos que lo necesitan [Conozca Tus Derechos] y nos dieron una hoja de cómo calmarte en una situación de estrés extremo. "*
>
> "And we share it with workers that we see need it [Know Your Rights information], and they gave us a sheet on how to calm yourself in cases of extreme stress."
> – Farmworker-serving organization staff interview participant

Shifts in outreach practices

All organization staff interview participants mentioned changes their organization had to implement to adapt to H5N1. Many of these changes primarily affected their outreach practices. All participants noted that they changed their protocols for farm outreach. Some changes included wearing additional PPE and implementing increased sanitation practices upon arrival and departure from farms for biosecurity purposes. Even for participants from states without reported H5N1 cases in dairy cattle, they developed safety protocols in case H5N1 appeared in their community or state. Several participants noted that they had to stop visiting farms in person due to biosecurity issues, so they had to utilize other outreach strategies, including calling workers over the phone or using telehealth services rather than in-person clinic visits.

> *"We had one farm that ended up doing most of the work through telehealth, because they [dairy workers] just were so scared, and their farm owner was scared. I don't know if that fear was coming from the farm owner or from them. Granted, they were on the borderlines between Canada, so their location kind of made sense."*
> – Farmworker-serving organization staff interview participant

DISCUSSION

This study has multiple limitations, including potentially biased sampling methods and biases inherent to cross-sectional surveys, such as recall bias and social desirability bias. These findings should not be interpreted as population level prevalence estimates. In past RCAs, we have been able to do rigorous randomized sampling of farmworkers, but this was not feasible for this RCA, primarily due to 1) the remoteness of dairy farms, and 2) the increase in immigration enforcement activities, especially in enforcement activities targeting immigrant farmworkers. Because dairy farms are often located far from town centers and many workers live on farms, it can be challenging to find dairy workers at places like laundromats or grocery stores. Our protocol did not allow for survey staff to enter dairy farms in states with H5N1 detections in dairy herds, limiting our ability to find and speak with dairy workers. Additionally, the increase in immigration enforcement activities on U.S. farms during late 2024 and throughout 2025 led to increased fears among farmworkers about participating in research or even speaking with outreach staff. Due to these limitations, we adopted sampling strategies that utilized both randomly selected sites to identify dairy workers and pre-coordinated contacts with local farmworker-serving organizations, as well as referrals to other dairy workers from those contacts. We can't assess how representative our sample is of the dairy worker population in the six states. Still, we believe it was reasonably representative based on key local expert knowledge and participants' responses. Because local community-based organizations referred 64% of participants, the sample may overestimate knowledge of H5N1 and healthcare access, as these workers are generally better connected to available resources. State comparisons should be interpreted cautiously because sampling frames differed across states and access to dairy workers was uneven due to H5N1-associated farm restrictions and immigration enforcement.

It is also reasonable to assume that some degree of recall or social desirability bias is present in this survey. Participants who knew they had been exposed to H5N1-infected cattle may have been more likely to seek out information about H5N1, or more likely to recall training or information provided to them by their employers, compared to workers who were not exposed to infected cattle. Because surveys were administered orally, it is also possible that some workers falsely reported that their employer was in compliance with local laws, or that workers were more likely to report that they would take a hypothetical H5N1 vaccine. However, these biases are likely minimal, based on the pattern of responses in this survey and compared to how farmworkers from various locations and diverse demographic backgrounds have responded in past RCAs. For example, in surveys conducted with dairy workers in New York, we asked participants whether they were aware of the state's paid sick leave law. Only 27% were aware of the law, so it's unlikely that a large proportion of participants reported being offered paid sick leave because they were worried about causing issues for their employer or because of some other social desirability factor.

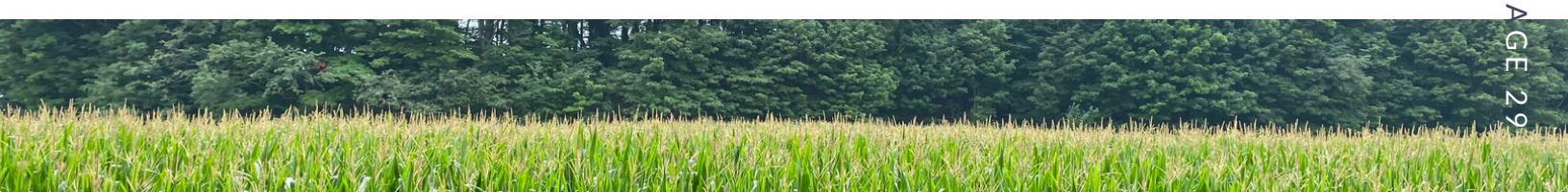
The findings from this RCA highlight both areas of strength to continue supporting and areas of improvement in the response to H5N1 from dairy workers, producers, and public health systems. One area of strength is the rapid mobilization of farmworker-serving organizations to support workers. Many community-based organizations have been building trust with dairy workers and producers for years, enabling them to quickly implement strategies to distribute information, PPE, and support to workers as H5N1 outbreaks hit dairies. As noted during multiple qualitative interviews, building trust with dairy producers is challenging due to widespread distrust in community organizations and government agencies in the industry. These relationships require continuous and sustained effort if we expect public health systems to respond to emerging disease threats in agricultural settings effectively.

Although PPE usage as reported by dairy workers was not perfect, the results were encouraging. The majority of workers reported that their employer provided them with PPE, except for rubber boots. The current use of NIOSH-recommended PPE was also higher in states with H5N1 detections in dairy herds, indicating a positive behavioral change and increased PPE use in 2025, despite most of the outbreaks in cattle reportedly occurring in 2024. In future analyses and publications, we plan to more closely examine associations with PPE use, as this could expand our understanding of where PPE may be most needed and inform future emergency response efforts.

The level of awareness about avian influenza among dairy workers was both encouraging and concerning. Data collection for this project did not begin until a full year after the initial detection of H5N1 in dairy cattle in March 2024, allowing substantial time for producers, public health agencies, and community-based organizations to inform dairy workers about this emerging issue. The majority of dairy workers (61%) had heard of H5N1, but detailed knowledge of it was minimal. Data collectors spent a significant amount of time after the survey concluded speaking with many participants about H5N1, including how it can be transmitted and how to seek testing if they were concerned about exposure. The very low level of awareness in states where H5N1 has not yet been detected in cattle suggests a potential lack of preparedness on farms that have not yet experienced an outbreak. However, excellent models for training and preparedness were identified during data collection in unaffected states. A dairy worker interviewee from New York described how his employer had multiple tailgate talks about H5N1 detections in other states, what the farm was doing to prevent it from being introduced into their herd, and how workers could protect themselves with PPE and hygiene if it were detected. He also described how his employer had a veterinarian train the staff working with ill cattle in the hospital ward on the farm to recognize the signs and symptoms of H5N1 in cattle. Comprehensive preparedness training programs like this are promising and could be identified by industry associations and milk cooperatives, then disseminated to other producers nationwide.

A critical policy issue is paid sick time. Paid time off from work to isolate due to illness or to seek medical care is a significant issue for low-wage workers.[34] In all six states, paid sick leave was required by state law for businesses with one or more full-time employees; therefore, all participants in this survey should have been provided paid sick leave.[35] Just two-thirds (66%) reported having paid sick leave, and some of these individuals stated that they were provided with less time than required by state law. Some workers reported issues with using paid sick leave, with the most common reason being concerns that their absence might require extra work from coworkers or put them at risk of losing their jobs. Paid sick leave is just one mechanism that can facilitate or prevent access to health care for farmworkers, along with the cost of care, transportation to healthcare sites, access to interpreters or bilingual staff at healthcare sites, the cost of a healthcare visit, and concerns about their privacy and safety when accessing healthcare.[36]

The majority of survey participants (55%) reported they did not require healthcare in the last 12 months, and only 4% reported needing care but not receiving it. Significant access barriers were identified in both surveys and interviews. The most commonly cited barriers to accessing healthcare, as reported in both surveys and interviews, were the lack of health insurance coverage and the high cost of care. It has been documented that a lack of health insurance is a barrier for agricultural workers in general.[37] Dairy worker interview participants mentioned that the high cost of healthcare was a significant barrier to accessing care. Slightly under half (46%) of all respondents had health insurance coverage, and only 25% of participants in New York, Vermont, and Washington reported having health insurance coverage. Dairy workers primarily relied on public insurance, such as Medicaid or Medi-Cal (22%), while private insurance was used by just 13% of participants. The employer could have provided private insurance coverage, or the worker could have obtained it on their own. This highlights an unusual situation in the U.S., where 60% of working-age adults have health insurance coverage through their employer.[38] This isn't the case for individuals in agriculture, underscoring the importance of robust public health insurance systems in ensuring access to healthcare for those in this industry.



Lastly, the findings about H5N1-like symptoms, H5N1 testing, and positive test results are intriguing, although not conclusive. We observed a substantial proportion (21%) of participants in H5N1-affected states who reported having H5N1 symptoms within a month of dairy cattle on their farm being ill or testing positive for H5N1. The likelihood that H5N1 was a driver of these self-reported infections seems to be high because it was infrequent among participants in unaffected states – just three individuals (2% of the participants in unaffected states) experienced H5N1-symptoms while working around sick cattle, indicating that other illnesses in cattle may be less likely to be associated with symptoms in dairy workers. Based on these self-reports, 113 people in H5N1-affected states were likely exposed to sick cattle and developed H5N1 symptoms, but only 32 individuals were tested for H5N1. A total of three individuals in our survey reported receiving a positive test result for H5N1. All of these individuals worked in central California, accounting for 8% of the 36 detected cases in the state. It is possible that some workers were tested for H5N1 but were unaware of the test's purpose and thus did not report being tested in our survey. However, we believe this is highly unlikely based on qualitative interviews. Workers who were tested for H5N1 noted it as a memorable and often frightening experience due to the novelty of the disease and the lack of information available about it. One dairy worker interviewee in California who experienced conjunctivitis while working with H5N1-positive cattle described a long process for being tested for H5N1. His wife had heard about H5N1 and encouraged him to seek care at a local community health center. When he arrived at the clinic and described his situation, he was immediately put into isolation and had to wait at the clinic for hours while clinicians dressed in full PPE and conducted repeated tests (all of which, he reported, came back negative). He described the process as very stressful, not knowing if he was ill with something that could be transmitted to other people, including his children. Findings from both surveys and interviews emphasize numerous issues with the implementation of H5N1 testing for farmworkers, highlighting obstacles in education, access, and security within the testing process for workers. This is an opportunity for public health systems to collaborate with agricultural communities and local organizations to better prepare for the next emerging disease threat.

CONCLUSION

This RCA provides a portrait of dairy workers and their knowledge, perceptions, and attitudes towards H5N1, as well as the work and public health systems they navigate. It provides important preliminary insights into the preparedness of this industry for emerging zoonotic disease threats to the health of the industry and public health in general. While organizations and dairy workers responded and adapted to H5N1 based on their previous experiences navigating the COVID-19 pandemic, critical gaps emerged. One of the main gaps was a lack of general education about H5N1. Even in states where H5N1 cases had been reported in cattle, 30% of the workers had not heard of H5N1. This was apparent in the lack of training and information provided by employers to dairy workers, as well as in the limitations of outreach staff in delivering this information. Education and information are among the most critical initial components of emergency preparedness for zoonotic disease threats.

This RCA makes clear that public, federal, and private partnerships need improvement if we want to address infectious disease issues quickly and comprehensively. Community trust among employers, workers, community organizations, and government agencies is essential. Interview participants noted that during emergencies, the priorities of these different players often differ, leading to conflicting interventions. While this can be the case, it is critical to highlight that previously identified best practices involved everyone coming to the "table" to strategize to ensure the well-being of the whole community. The issues identified in this RCA were pervasive but entirely solvable through trust, relationships, and collaborations.

BIBLIOGRAPHY

1. CDC. Current Situation: Bird Flu in Dairy Cows. Avian Influenza (Bird Flu). July 23, 2025. Accessed September 12, 2025. https://www.cdc.gov/bird-flu/situation-summary/mammals.html
2. USDA. HPAI Confirmed Cases in Livestock. Accessed October 8, 2024. https://www.aphis.usda.gov/livestock-poultry-disease/avian/avian-influenza/hpai-detections/hpai-confirmed-cases-livestock
3. USDA. Detections of Highly Pathogenic Avian Influenza (HPAI) in Livestock. Accessed October 25, 2024. https://www.aphis.usda.gov/livestock-poultry-disease/avian/avian-influenza/hpai-detections/livestock
4. CDC. H5 Bird Flu: Current Situation. Avian Influenza (Bird Flu). October 25, 2024. Accessed October 25, 2024. https://www.cdc.gov/bird-flu/situation-summary/index.html
5. Mellis AM, Coyle J, Marshall KE, et al. Serologic Evidence of Recent Infection with Highly Pathogenic Avian Influenza A(H5) Virus Among Dairy Workers — Michigan and Colorado, June–August 2024. Centers for Disease Control and Prevention; 2024. Accessed September 9, 2025. https://www.cdc.gov/mmwr/volumes/73/wr/mm7344a3.htm
6. Community and Labor Center. Producing Risks: Dairy Workers' Experiences and the Need for Worker-Centered Bird Flu Mitigation. UC Merced; 2025:1-10. Accessed September 9, 2025. https://clc.ucmerced.edu/sites/g/files/ufvvjh626/f/page/documents/dairy_worker_brief_1.pdf
7. Wells K. Farmworkers say they're struggling to get bird flu testing, PPE. Michigan Public. https://www.michiganpublic.org/health/2025-03-06/farmworkers-say-theyre-struggling-to-get-bird-flu-testing-ppe. March 7, 2025. Accessed September 9, 2025.
8. Hassanein N. As bird flu spreads on dairy farms, an 'abysmal' few workers are tested • Stateline. Stateline. July 2, 2024. Accessed September 12, 2025. https://stateline.org/2024/07/02/as-bird-flu-spreads-on-dairy-farms-an-abysmal-few-workers-are-tested/
9. Guifarro Rodriguez L. Assessing Dairy Farm Employees Health. Electron Theses Diss. Published online January 1, 2021. https://openprairie.sdstate.edu/etd/5216
10. New Mexico Center on Law and Poverty. Human Rights Alert: New Mexico's Invisible and Downtrodden Workers. https://media.kjzz.org/s3fs-public/field/docs/2013/07/Report-FINAL-PDF-2013-06-28_0.pdf
11. Panikkar B, Barrett MK. Precarious Essential Work, Immigrant Dairy Farmworkers, and Occupational Health Experiences in Vermont. Int J Environ Res Public Health. 2021;18(7):3675. doi:10.3390/ijerph18073675
12. Baker D, Chappelle D. Health Status and Needs of Latino Dairy Farmworkers in Vermont. J Agromedicine. 2012;17(3):277-287. doi:10.1080/1059924X.2012.686384
13. National Center for Farmworker Health. Farm Labor Data Dashboard. Accessed January 16, 2024. https://ncfh.org/dashboard.html
14. Baker D, Kades J, Kolodinsky J, Belarmino EH. Dairy is Different: Latino Dairy Worker Stress in Vermont. J Immigr Minor Health. 2021;23(5):965-975. doi:10.1007/s10903-021-01232-5
15. Schenker M, Gunderson P. Occupational Health in the Dairy Industry Needs to Focus on Immigrant Workers, the New Normal. J Agromedicine. 2013;18(3):184-186. doi:10.1080/1059924X.2013.797375
16. Adcock F, Anderson D, Rosson P. The Economic Impacts of Immigrant Labor on U.S. Dairy Farms.
17. Maloney T, Eiholzer L, Ryan B. Survey of Hispanic Dairy Workers in New York State 2016.
18. Menger-Ogle LM, Pezzutti F, Menger-Ogle AD, Stallones L, Rosecrance J, Roman-Muniz IN. Occupational Safety and Health of Foreign-Born, Latinx Dairy Workers in Colorado. J Occup Environ Med. 2019;61(1):61. doi:10.1097/JOM.0000000000001472
19. Benoit M, Austin E, Simcox N, Rabinowitz P, Yost M. Predictors of Dairy Worker Pre-Test and Post-Test Performance on a Dairy Safety Knowledge Test: Impact of Education Level and Native Language. J Agromedicine. 2023;28(3):456-469. doi:10.1080/1059924X.2022.2140732
20. Uliasz A. Not Everyone Speaks Spanish! Western Center for Agricultural Health and Safety. July 19, 2018. Accessed September 12, 2025. https://aghealth.ucdavis.edu/news/not-everyone-speaks-spanish-need-indigenous-language-interpreters-californias-agricultural

BIBLIOGRAPHY (CONTINUED)

21. Bohnert K. More and More Dairy Workers Speak Another Language: K'iche'. Bovine Veterinarian. April 17, 2024. Accessed September 12, 2025. https://www.bovinevetonline.com/news/industry/more-and-more-dairy-workers-speak-another-language-kiche
22. FAO. Livestock's Long Shadow: Environmental Issues and Options.
23. Toth JD, Aceto HW, Rankin SC, Dou Z. Short communication: Survey of animal-borne pathogens in the farm environment of 13 dairy operations. J Dairy Sci. 2013;96(9):5756-5761. doi:10.3168/jds.2012-6499
24. Pinn-Woodcock T, Frye E, Guarino C, et al. A one-health review on brucellosis in the United States. Published online April 1, 2023. doi:10.2460/javma.23.01.0033
25. Torres-Gonzalez P, Soberanis-Ramos O, Martinez-Gamboa A, et al. Prevalence of Latent and Active Tuberculosis among Dairy Farm Workers Exposed to Cattle Infected by Mycobacterium bovis. PLoS Negl Trop Dis. 2013;7(4):e2177. doi:10.1371/journal.pntd.0002177
26. Rodriguez A, Douphrate DI, Hagevoort R, et al. Association of Exposure to Cattle with Self-Reported History of TB Among Dairy Workers. Workplace Health Saf. 2021;69(7):306-314. doi:10.1177/2165079920976521
27. FCCA. NATIONAL CENTER FOR FARMWORKER HEALTH. Accessed September 16, 2024. https://www.ncfh.org/fcca.html
28. USDA. National Agricultural Statistics Service Cattle Inventory Survey. Accessed November 8, 2024. https://www.nass.usda.gov/Surveys/Guide_to_NASS_Surveys/Cattle_Inventory/
29. Cabrera VE, Hagevoort RG. Importance of the New Mexico Dairy Industry. New Mexico State University. Accessed September 29, 2025. https://pubs.nmsu.edu/_circulars/CR613/index.html
30. Durst P. Dairy farm labor efficiency. Michigan State University Extension. May 8, 2020. Accessed September 29, 2025. https://www.canr.msu.edu/news/dairy-farm-labor-efficiency
31. Gold A, Fung W, Gabbard S, Carroll D. Findings from the National Agricultural Workers Survey (NAWS) 2019–2020.
32. Owusu H, Sanad YM. Comprehensive Insights into Highly Pathogenic Avian Influenza H5N1 in Dairy Cattle: Transmission Dynamics, Milk-Borne Risks, Public Health Implications, Biosecurity Recommendations, and One Health Strategies for Outbreak Control. Pathogens. 2025;14(3):278. doi:10.3390/pathogens14030278
33. CDC. Personal Protective Equipment for Avian Influenza A Viruses in the Workplace. Avian Influenza (Bird Flu). May 7, 2025. Accessed September 29, 2025. https://www.cdc.gov/bird-flu/worker-safety/personal-protective-equipment.html
34. Song S, Calhoun BH, Kucik JE, Konnyu KJ, Hilson R. Exploring the association of paid sick leave with healthcare utilization and health outcomes in the United States: a rapid evidence review. Glob Health J. 2023;7(1):9-17. doi:10.1016/j.glohj.2023.01.002
35. Mitchell SM. State Paid Sick Leave Laws. U.S. Department of Labor; 2024.
36. Soto S, Yoder AM, Aceves B, Nuño T, Sepulveda R, Rosales CB. Determining Regional Differences in Barriers to Accessing Health Care Among Farmworkers Using the National Agricultural Workers Survey. J Immigr Minor Health. 2023;25(2):324-330. doi:10.1007/s10903-022-01406-9
37. Hoerster KD, Mayer JA, Gabbard S, et al. Impact of Individual-, Environmental-, and Policy-Level Factors on Health Care Utilization Among US Farmworkers. Am J Public Health. 2011;101(4):685-692. doi:10.2105/AJPH.2009.190892
38. Kaiser Family Foundation. Introduction - Employer-Sponsored Health Insurance 101. KFF. May 28, 2024. Accessed October 1, 2025. https://www.kff.org/health-costs/health-policy-101-employer-sponsored-health-insurance/?entry=table-of-contents-introduction

BIBLIOGRAPHY (CONTINUED)

36. Soto S, Yoder AM, Aceves B, Nuño T, Sepulveda R, Rosales CB. Determining Regional Differences in Barriers to Accessing Health Care Among Farmworkers Using the National Agricultural Workers Survey. J Immigr Minor Health. 2023;25(2):324-330. doi:10.1007/s10903-022-01406-9
37. Hoerster KD, Mayer JA, Gabbard S, et al. Impact of Individual-, Environmental-, and Policy-Level Factors on Health Care Utilization Among US Farmworkers. Am J Public Health. 2011;101(4):685-692. doi:10.2105/AJPH.2009.190892
38. Kaiser Family Foundation. Introduction - Employer-Sponsored Health Insurance 101. KFF. May 28, 2024. Accessed October 1, 2025. https://www.kff.org/health-costs/health-policy-101-employer-sponsored-health-insurance/?entry=table-of-contents-introduction

This publication was supported by the Centers for Disease Control and Prevention of the United States Department of Health and Human Services (HHS) as part of a financial assistance award totaling $108,150 with 100 percent funded by CDC/HHS. The contents are those of the author(s) and do not necessarily represent the official views of, nor an endorsement, by CDC/HHS, or the United States Government.