

Predictors of Influenza Vaccination Among Latino Immigrant Swine Farmworkers and Their Household Members in Missouri



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HIGHLIGHTS

- Swine farmworkers face high risk of flu exposure, which can extend to their household members.
- Access to the flu vaccine for swine farmworkers is essential to protect both human and animal health.
- Having health insurance is crucial for increasing flu vaccination rates among Latino swine farmworkers.

ABSTRACT. *Swine production in the United States is vital to food security. Although there has been a decline in the number of hog farms across the country, there has been an expansion of large-scale operations. These larger facilities can create environments that facilitate the zoonotic transmission of viruses such as influenza, posing risks not only to workers and their families but also to public health. The seasonal influenza vaccine can reduce the risk of infection and subsequent transmission. The purpose of this study was to explore predictors of seasonal influenza vaccine uptake among Latino immigrant swine farmworkers and their household members. Descriptive statistics, correlations, and logistic regression were used to assess factors associated with seasonal influenza vaccine uptake among participants (n=62). About 60% of the participants reported that they had received the seasonal influenza vaccine within the previous year. Self-reported seasonal influenza vaccine uptake was positively associated with reporting a regular healthcare provider and having health insurance coverage. The odds of a Latino immigrant swine farmworker or a household member receiving the seasonal influenza vaccine were seven times higher for those with health insurance. Ensuring that agricultural workers and members of their household have access to the seasonal influenza vaccine and encouraging vaccine uptake is a critical strategy for preventing the spread of influenza and ensuring both human and animal health.*



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The United States (U.S.) pork industry has experienced substantial transformations in recent decades. Commercial pork production has expanded significantly, positioning the country as the world's third largest producer and consumer of pork, as well as the second largest exporter of pork muscle meats (USDA, ERS, 2025). Although the number of hog farms has declined over time across the country, individual farm sizes have expanded and there has been a significant rise in the number of commercial swine operations across the country (Davis et al., 2022; Hollenbeck, 2016). In these environments, the high density of livestock, the shared air space, and waste removal processes have the potential to create ideal conditions for viral pathogens, such as the influenza virus, to flourish (Guo et al., 2021).

Zoonotic transmission of viruses, such as influenza, is common as evidenced by the current H5N1 avian flu outbreak in poultry and dairy operations that has also infected humans who have contact with the animals (CDC, 2025; Ma et al., 2008; Mena et al., 2025; Thacker and Janke, 2008). Influenza transmission can be bidirectional, and influenza transmission from humans to swine is the largest documented reverse zoonosis (Nelson and Vincent, 2015). Reports of epizootic influenza outbreaks in the Midwest have been linked to farmworkers and their families' exposure to infected animals. Additionally, evidence suggests that workers may report sick to work infected with human-origin influenza A viruses (IAV), potentially facilitating transmission to pigs (Gray et al., 2007; Lopez-Moreno et al., 2022). Among all animals that serve as hosts for influenza viruses, only swine and humans can be infected with the existing four types of influenza (A, B, C, and D), making the swine-human relationship of great relevance, particularly in light of growing concerns about potential public health threats, including possible H5N1 mutations leading to another pandemic (Bailey et al., 2018; Borkenhagen et al., 2019).

Biosecurity encompasses a set of management practices designed to prevent the introduction and dissemination of disease-causing agents within swine herds (National Pork Board, 2021). Many U.S. swine producers, particularly those managing breeding herds, have voluntarily implemented biosecurity protocols to mitigate the risk of disease introduction and transmission, as documented by Harlow et al. (2024) in a recent survey. Since the onset of the H5N1 outbreak in early 2024, no cases have been reported in commercial swine operations in the U.S., potentially reflecting the effectiveness of on-farm biosecurity measures. However, a portion of producers, especially those operating non-commercial or small-scale operations, may not have biosecurity plans in place (Harlow et al., 2024). At the end of 2024, there was an isolated H5N1 case that was reported in pigs in a backyard farm (CDC, 2025; USDA, Animal and Plant Health Inspection Service, 2024). Despite the absence of outbreaks in commercial swine operations, swine remain an important reservoir for influenza viruses; co-infection with avian, swine, or human influenza viruses in pigs could facilitate the emergence of new influenza strains (Gray and Baker, 2007, 2011).

The introduction of these viruses into animal feeding operations has a high transmission potential, particularly because of the high density of animals, consistent receipt of new animals, and shipping of those ready for the next stage of production. As such, these viruses could also become endemic, creating a threat for farmworkers, their families, and public health more broadly (Bailey et al., 2018). A zoonotic event where a virus is transmitted

from mammals to humans has been identified as the most likely source of a future pandemic (Neumann and Kawaoka, 2023).

Immigrant Farmworkers

U.S. agriculture relies heavily on an immigrant workforce, with the majority of immigrant farmworkers identifying as Latinos, primarily from Mexico or parts of Central America, and representing a diversity of cultures, languages, and experiences in agriculture (Arcury et al., 2010; Villarejo et al., 2010). Unfortunately, Latino immigrant farmworkers and their families face many barriers to accessing healthcare services, including limited eligibility for and access to health insurance coverage, high costs associated with healthcare services, and low health literacy (Arcury et al., 2010; Moran et al., 2017). Several factors place Latino farmworkers at a disadvantage when there is a need for healthcare services, such as limited English proficiency, lower levels of formal education, less access to job-related training, and fewer job-related protections (Moran et al., 2017; Ramos et al., 2016). As a result, immigrant farmworkers are considered a vulnerable worker population by the National Occupational Research Agenda for Agriculture, Forestry, and Fishing (CDC, NORA Agriculture, Forestry, and Fishing Sector Council, 2018). Their vulnerabilities are compounded by challenges associated with immigration status and documentation requirements that are sometimes needed to obtain services (Hacker et al., 2015). Additionally, factors such as the lack of knowledge of the U.S. healthcare system, stigma, discrimination, and logistical barriers (e.g., work hours, transportation) further hinder immigrant workers' access to health information and healthcare services (Hacker et al., 2015; Steege et al., 2009).

Influenza Vaccination and Farmworkers

Annual influenza vaccination is one of the most important ways to protect the population against influenza and its complications (CDC, 2024c). The Centers for Disease Control and Prevention (CDC) recommends that all people over six months of age who do not have any contraindications receive the influenza vaccination each year (Grohskopf et al., 2024). Unfortunately, there are disparate rates of vaccination based on social factors such as race and ethnicity as well as demographic factors such as age, income, and geography. For example, during the 2023–2024 flu season, the influenza vaccination rate among Hispanic adults in the U.S. was 34.6%, the lowest among all racial and ethnic groups. Vaccination rates were higher among non-Hispanic Blacks (42.1%), non-Hispanic Whites (49.1%), and other non-Hispanics (42.6%). The vaccination rate among Hispanic adults declined from the previous flu season (2022–2023), when their vaccination rate was 36.7% (CDC, 2024d). Seasonal influenza vaccination rates are generally higher in urban and suburban areas than in rural areas of the country. This gap in vaccine coverage based on urbanicity has persisted for several years and continues to widen (CDC, 2024a; Kriss et al., 2024). Additionally, since rural populations often experience higher rates of chronic disease and limited access to healthcare, rural and agricultural communities may be at a higher risk of severe influenza outcomes compared to those in urban and suburban areas (Czaja et al., 2020).

Livestock workers, especially those working with swine, are at risk for occupational exposure to influenza. A study conducted in Iowa found that workers with direct exposure to pigs, as well as their spouses who were not directly exposed, were more likely to have elevated antibody levels against classical swine influenza viruses (Borkenhagen et al., 2019). Furthermore, O'Brien and Nonnenmann (2016) documented influenza in the

breathing zones of veterinarians working with swine. Getting a seasonal influenza vaccine can help individuals who work with swine and other livestock lower their risk of transmitting human seasonal influenza A viruses to the animals and other people, such as co-workers and their family members (CDC, 2024b; Lantos et al., 2016; Loubet et al., 2019; Nelson et al., 2015). Researchers have simulated that influenza vaccine uptake as low as 50% among farmworkers could decrease the number of influenza cases among workers and prevent the development of novel influenza strains generated by contact between humans and swine (Moore et al., 2021). Vaccination also aligns with the ethical principles of the Pork Quality Assurance Plus (PQA Plus) certification program, which, consistent with the *One Health* approach, emphasizes the importance of protecting people, animals, and the environment (National Pork Board, 2024; US EPA, 2025).

Although there is available data about influenza disparities and vaccine uptake among racial and ethnic minority groups, to our knowledge, there is no specific data about seasonal influenza vaccination among livestock workers in the U.S., especially those working in swine production. These workers may be at high risk given their occupational exposure to swine in addition to known social determinants of health. The purpose of this study was to better understand seasonal influenza vaccination uptake and explore factors associated with influenza prevention among Latino immigrant swine farmworkers and members of their household in Missouri.

Materials and Methods

Data for the current study are a secondary analysis from a community-based participatory study conducted in partnership between the University of Nebraska Medical Center and the Rural Community Workers Alliance (RCWA), a worker-focused non-profit organization based in Milan, Missouri. The study principal investigator (academic partner) and the executive director of RCWA (community partner) met at a regional conference where they were part of a table discussion on farmworker well-being. The community partner commented on how there was a growing swine industry in Missouri and shared some concerns about the experiences of Latino farmworkers in their area. The academic partner shared about her previous work with Latino farmworkers. There was a common interest among both partners to align their efforts. When a funding opportunity became available, the partners collaborated to develop the project idea and research questions. The grant was awarded, and funds were shared nearly equally. Both partners worked together to create the research protocol, collect and interpret data, and disseminate the main results.

Participants

Individuals were eligible to participate in the study if they identified as Latino immigrants, were at least 18 years old, and were currently employed in swine production in Missouri. Individuals who lived with a worker who was participating in the study were also eligible to participate as a household member (e.g., spouse, family member, or roommate) if they were over age 18. Participants were recruited for this study using snowball and convenience sampling. Some workers had participated in safety and workers' rights workshops conducted by the community partner; however, the majority of recruitment was conducted through door-to-door outreach in trailer parks where community leaders had reported workers lived.

Procedures

The study consisted of a 130-question worker survey and a 115-question household member survey that addressed the work environment, physical and emotional health, and demographics. Surveys were administered through verbal face-to-face interviews with workers and household members. Data were collected by two bilingual and bicultural research team members (one academic partner and one community partner) at participants' homes and in the RCWA's office between June and September 2015. Research team members provided an overview of the project, discussed the research process and the rights of study participants, answered questions, and obtained informed consent prior to beginning the research interview. A member of the research team read the questions to the participant and marked the corresponding answers on a paper survey. All study materials were available in English and Spanish, and participants could choose to participate in the language in which they were most comfortable. Participants were given a \$10 gift card for their participation. The study was reviewed and approved by the Institutional Review Board at the University of Nebraska Medical Center.

Measures

Questions were based on valid and reliable standardized measures and standard Spanish translations, to the extent possible. The cultural and linguistic appropriateness of the survey instrument was reviewed by the RCWA executive director, who had more than 10 years of experience working with rural Latino agricultural communities in the U.S. and had agricultural training in Guatemala. The specific measures used in this analysis are described below.

Influenza Vaccination

Seasonal influenza vaccination was assessed using the question, "Have you had a flu shot within the last year?" Response options were dichotomous: no (0) and yes (1).

Access to and use of Healthcare Services

Participants were asked if they had any kind of health care coverage, including health insurance, prepaid plans such as HMOs, or government plans such as Medicare. They were also asked, "Was there a time in the past 12 months when you needed to see a doctor but could not because of cost?" Response options for both questions were dichotomous: no (0) and yes (1). Participants were asked if they had a regular healthcare provider. Those who did not have a regular healthcare provider were coded (0) and those with a regular healthcare provider were coded (1). Finally, participants were asked, "About how long has it been since you last visited a doctor for a routine checkup?" Response options included never, within the past year, within the past 2 years, within the past 5 years, 5 or more years ago, and don't know/not sure (CDC, 2014).

Self-Rated Health

Participants were asked, "Would you say that in general your health is...poor (0), fair (1), good (2), very good (3), or excellent (4)?" Response categories were dichotomized and grouped into fair or poor (0) and good, very good, or excellent (1) based on standard convention (CDC, 2014).

Occupational Health

Participants were asked if they would like to receive more information on health and safety related to their job. Household members were also asked if they believed that they

had health problems as a result of living with someone who worked in a swine operation and if they would like to receive additional information about health and safety risks associated with that line of work. Additionally, participants were asked if they had received any job-related health and/or safety training from their current employer. Participants who reported receiving training were subsequently asked follow-up questions regarding the frequency of the training.

Personal Protective Equipment (PPE) Provision and Usage

Participants were asked about the types of personal protective equipment (PPE) that were provided by their employer and what PPE they used regularly on the job to understand the frequency of PPE use. In order to try to assess risks related to storage and laundering of PPE, participants were asked if they ever take home any PPE to be laundered or disinfected.

Demographic Characteristics

Several demographic characteristics were assessed including sex, age, length of time in the U.S., English language proficiency, and education. Sex was a binary variable, male (0) and female (1). Participants' age and length of time in the U.S. were measured as continuous variables. English language proficiency was measured by a single question, "How well do you speak English?" Response options (not at all, not well, well, and very well) were dichotomized into well or very well (0) and not well or not at all (1) to create a variable representing limited English proficiency. Education was dichotomized into completed less than a high school education (0) and completed a high school education or higher (1).

Analysis

First, descriptive statistics such as frequencies, means, and standard deviations were calculated for all variables of interest. A chi-square test of independence was conducted to assess the association of seasonal influenza vaccination and healthcare access variables including having health insurance, a regular healthcare provider, last routine check-up, and cost barriers to access health services. Descriptive analyses included all available data, with the number of valid responses reported for each variable. Then, we explored predictors of influenza vaccination through a multivariate logistic regression model with health insurance coverage, having a regular healthcare provider, limited English proficiency, age, and sex as independent variables. Workers and household members were analyzed together in a combined model. To evaluate the appropriateness of combining farmworkers and household members in the logistic regression model, we conducted chi-square tests on key categorical variables (e.g., vaccination status, health insurance, regular provider) by participant type and included participant type as a covariate in preliminary models. As no significant differences were found and participant type did not affect model estimates, both groups were combined in the final analysis without compromising the validity of the findings. For the logistic regression analysis, three cases were automatically excluded due to missing values on one or more independent variables. All statistical tests were two-tailed using $p < .05$ to denote statistical significance. SPSS version 30 was used to analyze the data (IBM Corp., 2023).

Results and Discussion

Results

A total of 40 workers and 22 household members participated in the study. Most participants were males (67.7%) and were between the ages of 25 and 55 years old (86.9%). Most were immigrants from Mexico (75.8%) with an average tenure in the U.S. of 11 years (SD = 7.2). Demographic characteristics of participants are presented in table 1.

Half of workers and less than half of household members reported having health insurance. Most participants did not have a regular healthcare provider and nearly a third delayed care due to cost. Most participants were not accessing preventive care on a regular basis (table 2).

More than half of the workers (57.7%) perceived their health to be good, very good, or excellent; however, nearly 30% reported that they had health problems that they associated with their job such as burning eyes, coughing, and headaches. Over 82% were interested in receiving more job-related health and safety information. Similarly, most household members (63.6%) perceived their health to be good, very good, or excellent; however, 13.6% reported that they had health problems that they associated with the worker's job such as allergies and asthma. Nearly all household members indicated that they would like more information related to health consequences associated with working in swine production.

Approximately 60% of workers reported that they received health and/or safety training when hired, but only 20.8% indicated that they received regular training at least every year. Most workers reported that their employers provided them with respirators, but only 32.4%

Table 1. Demographic characteristics of participants.

Variable	Workers (n=40) n (%)	Household Members (n=22) n (%)	Total Participants (n=62) n (%)
Sex (n=62)			
Male	37 (92.5)	5 (22.7)	42 (67.7)
Female	3 (7.5)	17 (77.3)	20 (32.3)
Age (n=61), M (SD)	36.1 (10.03)	34.9 (9.3)	35.6 (9.7)
18–24	5 (12.8)	1 (4.5)	6 (9.8)
25–40	22 (56.5)	15 (68.2)	37 (60.7)
41–55	10 (25.6)	6 (27.3)	16 (26.2)
56 or older	2 (5.1)	0 (0.0)	2 (3.3)
Relationship status (n=60)			
Married	22 (56.4)	9 (42.9)	31 (51.7)
Member of an unmarried couple	12 (30.8)	10 (47.6)	22 (36.7)
Separated/Never married	5 (12.8)	2 (9.5)	7 (11.6)
Country of origin (n=62)			
Mexico	28 (70.0)	19 (86.4)	47 (75.8)
Guatemala	10 (25.0)	2 (9.1)	12 (19.4)
El Salvador	2 (5.0)	1 (4.5)	3 (4.8)
Length of time in the U.S., M (SD) (n=60)	11.1 (7.2)	12.0 (7.1)	11.3 (7.1)
Education (n=62)			
Less than a high school education	31 (77.5)	15 (68.2)	46 (74.2)
Completed at least a high school education or higher	9 (22.5)	7 (31.8)	16 (25.8)
English proficiency (n=62)			
Limited English proficiency	32 (80.0)	19 (86.4)	51 (82.2)
English proficient	8 (20.0)	3 (13.6)	11 (17.8)

Table 2. Healthcare access indicators among participants.

Variable	Workers (n=40) n (%)	Household Members (n=22) n (%)	Total Participants (n=62) n (%)
Health insurance (n=62)	20 (50.0)	10 (45.5)	30 (48.4)
Regular healthcare provider (n=61)	13 (33.3)	11 (50.0)	24 (39.3)
Could not afford to see a doctor in the past 12 months (n=61)	12 (30.8)	6 (27.3)	18 (29.5)
Last routine check-up (n=61)			
Within the past year	10 (25.0)	11 (52.4)	21 (34.4)
Two or more years ago	14 (35.0)	6 (28.6)	20 (32.8)
Never	14 (35.0)	3 (14.3)	17 (27.9)
Don't know/Not sure	2 (5.0)	1 (4.7)	3 (4.9)
Received the influenza vaccine within the past year (n=62)	24 (60.0)	13 (59.1)	37 (59.7)

indicated that they wore the respirator all the time when exposed to hazards at the workplace. Most workers were also provided with disposable gloves, but less than one third reported using them regularly. Use of other types of PPE such as boots/disposable shoe covers, uniforms/coveralls, and safety goggles was far less frequent, and no workers reported taking PPE home.

Influenza Vaccination

About 60% of the participants reported that they had received the seasonal influenza vaccine within the previous year. A chi-square test of independence was conducted to assess the association of influenza vaccination and healthcare access (e.g., having health insurance, having a regular healthcare provider, last routine check-up, and cost barriers to access health services). Participants with health insurance coverage, $\chi^2(1) = 14.4, p < .001$, and those with a regular healthcare provider, $\chi^2(1) = 6.6, p = .01$, were significantly more likely to have had the seasonal influenza vaccine within the previous year. Of participants who had health insurance, 83% had received the seasonal influenza vaccine, and of participants who had both health insurance and a regular healthcare provider, 100% had gotten vaccinated.

Results from the logistic regression model indicated that having health insurance coverage was the only statistically significant predictor of having received the seasonal influenza vaccination (table 3). The odds of having received a seasonal influenza vaccination were seven times higher for those with health insurance, OR: 7.24 (CI: 1.98-26.43), $p = .003$.

Discussion

Influenza transmission is an important concern (Ma et al., 2008; Thacker and Janke, 2008), and immigrant swine farmworkers are at risk for occupational exposure to influenza,

Table 3. Logistic regression model predicting seasonal influenza vaccination among Latino immigrant swine farmworkers and their household members (n=59).

	B	S.E.	Exp(B)	95% C.I. for Exp(B)	
				Lower	Upper
Health insurance	1.98	0.66	7.24 ^[a]	1.98	26.43
Regular healthcare provider	1.19	0.71	3.30	0.82	13.20
Limited English proficiency	0.76	1.01	2.13	0.30	15.40
High school education or higher	0.91	0.74	2.49	0.58	10.68
Age	0.02	0.04	1.02	0.95	1.09
Male	0.13	0.70	1.14	0.29	4.52
Constant	-2.50	1.53	0.08		

^[a] $p < .01$.

which may also affect the well-being of members of their households. This study provides insights about factors related to influenza prevention among swine farmworkers and their household members by exploring self-reported influenza vaccine uptake, health status, and access to healthcare. Results indicate that 60% of workers and household members had received the seasonal influenza vaccine. This is positive since influenza vaccine uptake as low as 50% could reduce influenza cases and prevent the emergence of novel influenza strains (Moore et al., 2021). About half of participants reported having health insurance, and we found that health insurance coverage was a critical factor in predicting seasonal influenza vaccination.

Our findings align with previous research in the U.S. highlighting limited health insurance coverage among immigrant workers (Guild and Figueroa, 2018; Quandt et al., 2021). Immigrant livestock workers, especially those working in swine production, should have options for health insurance coverage through employer-sponsored plans or the Health Insurance Marketplace. However, continued funding for migrant health centers through the Health Resources and Services Administration, Section 330(g) of the Public Health Service Act, is still critically important as these community health center sites often serve farmworkers and their families, regardless of insurance status.

Several strategies may improve access to information and vaccinations, such as educational outreach campaigns focused specifically on agricultural workers, no-cost vaccinations provided onsite at the workplace, and incentives for workers who choose to be vaccinated (Ramos et al., 2025). Farm employers may partner with trusted community organizations or community health workers (CHWs) from local health departments or clinics to conduct on-farm vaccination events that also include household members. Mathematical modeling suggests that small increases in influenza vaccination could prevent thousands of influenza-associated hospitalizations even in low-severity seasons, thus resulting in public health benefits (Hughes et al., 2020). Additionally, it would be beneficial to develop partnerships to provide no-cost or low-cost medical screenings (Gualano et al., 2022; Moore et al., 2021; Rodriguez et al., 2023; Schoch-Spana et al., 2010). Previous research has found that farmworkers without access to health resources were less likely to receive information about influenza prevention, preparedness, and outbreaks (Steege et al., 2009). Local public health departments in partnership with swine producers may be key resources in serving farmworkers and their families in rural areas where most swine production occurs.

Swine production facilities can create environments conducive to the bidirectional zoonotic transmission of influenza and other pathogens (Gray and Baker, 2007, 2011; Ma et al., 2008); the swine production sector does not operate in isolation. Rather, the practices of one segment may affect the health security of the entire U.S. swine industry and all individuals involved in the production chain. Thus, producers have a critical opportunity to strengthen their biosecurity measures. The U.S. Swine Health Improvement Plan (USHIP) serves as a notable example of a voluntary initiative aimed at enhancing disease preparedness through collaborative efforts among industry stakeholders, state agencies, and federal authorities (Estienne, 2022). Importantly, swine producers should prioritize the development of formal biosecurity plans that align with best practices. Such plans are essential for protecting public health by minimizing the risk of influenza transmission among workers through vaccination, employee training, and the use of PPE (National Pork Board, 2021). Even though most workers in our sample reported that their employers provided respirators, only one-third reported using them when exposed to workplace hazards, reflecting inconsistent use despite availability. This pattern aligns with previous research

documenting limited use of respirators and gloves among agricultural workers, even when provided by employers (Saenz et al., 2006). Inconsistent use of PPE is concerning as prior studies have linked inadequate PPE utilization to increased influenza activity and outbreaks in agricultural settings (Lindley et al., 2020). Therefore, employers should provide appropriate PPE along with culturally and linguistically tailored training to workers to increase their awareness of biological risk factors associated with working with swine and preventive health measures that could reduce the transmission risk of influenza and other zoonotic diseases, such as the proper use of respirators (Rodriguez et al., 2025). Such information may help workers to better understand the risks associated with their work and encourage them to use appropriate biosecurity practices to protect both themselves and the animals. Finally, employers should consider providing paid sick leave to workers and encourage them to seek medical attention if they feel ill. Unfortunately, workers may face barriers to taking time off when feeling unwell, including concerns about lost wages or job security. Limited access to health insurance, high out-of-pocket costs, and logistical challenges, such as clinic hours that conflict with work schedules, can make it difficult to seek timely medical care (Tulimiero et al., 2021; Vamos et al., 2022). Therefore, having a supportive workplace climate that communicates clearly about the importance of a healthy workforce and provides benefits to workers, such as health insurance, can promote worker health and well-being.

There are some limitations to note. This study was exploratory and hypothesis-building in nature, and it relied on self-reported information from a non-random sample of Latino immigrant swine farmworkers and their household members in rural Missouri. As a pilot study, this research is inherently limited by a small sample size. Therefore, caution should be taken in generalizing to other groups. Because influenza vaccination status was self-reported, we are unable to rule out recall and social desirability bias. Workers may not have viewed influenza as a job-related hazard, especially prior to the COVID-19 pandemic and recent outbreaks of H5N1. Individuals who chose to participate may differ systematically from those who did not participate. Participants may have been more likely to be vaccinated, have health insurance, or possess legal status in the U.S., which could have increased their comfort in disclosing personal health and occupational information. Although our data were collected in 2015, the findings remain highly relevant due to the persistent lack of research with this population. We incorporate recent studies to contextualize our results and underscore their ongoing significance. As Palacios and Sexsmith (2020) note, there is a substantial gap in the literature regarding Latino workers in swine production, an industry increasingly reliant on this labor force. To our knowledge, no studies have specifically examined influenza vaccination among immigrant Latino swine farmworkers in the Midwest, highlighting the uniqueness and value of our data. Understanding historical patterns of healthcare access and vaccination uptake is also essential, particularly in light of shifting federal health policies that may introduce new barriers to agricultural worker outreach, vaccine education, and public health (Hughes, 2023; Rubin, 2025; Sable-Smith et al., 2025; Ungar and Smith, 2025). Although vaccine outreach and education had been promoted among farmworkers due to the COVID-19 pandemic and somewhat now due to the H5 bird flu outbreaks, these efforts have not been universal across the country, and continued funding for such engagement may not be secure moving forward (CDC, 2024e; Sable-Smith et al., 2025). Changes to the funding and policy environment could disproportionately affect a workforce that has long been underserved and vulnerable to such fluctuations. Additionally, the current political climate is marked by ongoing immigration

enforcement actions, including workplace raids in the agrifood sector, where immigrants represent a substantial portion of the workforce, which may negatively impact healthcare access and limit opportunities for routine preventive care, such as annual vaccinations, among Latino farmworkers (Eadie, 2025). While updated research is needed to provide a more current picture of working conditions and health risks, our study offers critical insights into factors influencing influenza vaccination uptake and can inform health promotion strategies aimed at improving vaccination rates. Continued research is essential to better understand the occupational, political, social, and health system factors influencing vaccine uptake, including how and where vaccines are obtained and broader health behaviors among immigrant workers, to inform responsive and equitable public health strategies.

Conclusions

Swine farmworkers are at risk for occupational exposure to the influenza virus, which also puts their household members at risk for contracting the virus. Many of these workers are immigrants who face multiple barriers to accessing preventive health services. Having health insurance can improve influenza vaccination rates. Promoting policies that expand health insurance coverage and access to healthcare services among farmworkers is vital to protecting both worker and animal health and reducing the transmission of influenza.

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