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Workplace Interventions and Vaccination-Related Attitudes Associated With Influenza Vaccination Coverage Among Healthcare Personnel Working in Long-Term Care Facilities, 2015–2016 Influenza Season

Xin Yue, MPS, MS^{a,b,*}, Carla Black, PhD^b, Sarah Ball, MPH, ScD^c, Sara Donahue, DrPH, MPH^c, Marie A. de Perio, MD^d, A. Scott Laney, MPH, PhD^e, and Stacie Greby, DVM, MPH^b

^aLeidos Inc., Atlanta, GA

^bAssessment Branch, Immunization Service Division, National Center for Immunization and Respiratory Diseases, Centers for Disease Control and Prevention, Atlanta, GA

^cAbt Associates, Cambridge, MA

^dDivision of Surveillance, Hazard Evaluations, and Field Studies, National Institute for Occupational Safety and Health, Centers for Disease Control and Prevention, Cincinnati, OH

^eRespiratory Health Division, National Institute for Occupational Safety and Health, Centers for Disease Control and Prevention, Morgantown, WV

Abstract

Objectives: Influenza vaccination of healthcare personnel working in long-term care (LTC) facilities can reduce influenza-related morbidity and mortality among healthcare personnel and among resident populations who are at increased risk for complications from influenza and who may respond poorly to vaccination. The objective of this study was to investigate workplace interventions and healthcare personnel vaccination-related attitudes associated with higher influenza vaccination coverage among healthcare personnel working in LTC facilities.

Setting and participants: Data were obtained from an online survey of healthcare personnel conducted in April 2016 among a nonprobability sample of 2258 healthcare personnel recruited from 2 preexisting national opt-in Internet panels. Respondents were asked about influenza vaccination status, workplace vaccination policies and interventions, and their attitudes toward vaccination. Analyses were restricted to the 332 healthcare personnel who worked in nursing homes, assisted living facilities, or other LTC facilities.

Measures: Logistic regression models were used to assess the independent associations between each workplace intervention and higher influenza vaccination coverage compared with referent levels, controlling for occupation, age, and race/ethnicity. Prevalence ratios were calculated under the assumption of simple random sampling.

*Address correspondence to Xin Yue, MPS, MS, Assessment Branch, Immunization Services Division, National Center for Immunization and Respiratory Diseases, Centers for Disease Control and Prevention, Mailstop A-19, 1600 Clifton Rd NE, Atlanta, GA 30345., hwg3@cdc.gov (X. Yue).

The authors declare no conflicts of interest.

Results: Approximately 77% of healthcare personnel working in LTC facilities reported receiving influenza vaccination in the 2015–2016 influenza season. Influenza vaccination was independently associated with an employer vaccination requirement (prevalence ratio (PR) [95% confidence interval] = 1.28 [1.11, 1.47]), being offered free onsite vaccination (PR = 1.20 [1.04, 1.39]), and employers publicizing vaccination coverage level to employees (PR = 1.24 [1.09, 1.41]). Vaccination was most highly associated with a combination of 3 or more workplace interventions. Most healthcare personnel working in LTC facilities reported positive attitudes toward the safety and effectiveness of influenza vaccination.

Conclusions/Implications: Implementing employer vaccination interventions in LTC facilities, including employer vaccination requirements and free on-site influenza vaccination that is actively promoted, could increase influenza vaccination among healthcare personnel.

Keywords

Influenza vaccination; healthcare personnel; long-term care facilities

The Advisory Committee on Immunization Practices (ACIP) recommends that all healthcare personnel receive an annual influenza vaccination to reduce influenza-related morbidity and mortality among healthcare personnel and their patients.¹ Influenza vaccination coverage among healthcare personnel has improved from less than 50% before the 2009–2010 influenza season to 68.6% in the 2014–2015 season; however, coverage remains below the national Healthy People 2020 target of 90%.^{2–5} Vaccination coverage among healthcare personnel working in long-term care (LTC) settings is lower than coverage for healthcare personnel in all other occupational settings.^{6,7} Vaccination of LTC healthcare personnel is especially important; influenza outbreaks in LTC facilities have been associated with substantial morbidity and mortality because these facilities generally have older or frailer resident populations who may respond poorly to vaccination.^{1,8–10} Influenza vaccination of healthcare personnel has been shown to reduce the risk of respiratory illness and deaths in LTC residents.^{11–13}

Previous studies of workplace interventions associated with increased influenza vaccination among healthcare personnel have been conducted in hospital settings^{14,15} or in LTC facilities in a single institution or geographic area.^{16–18} The objective of this study was to describe attitudes toward vaccination and assess workplace interventions associated with influenza vaccination among a national sample of healthcare personnel working in LTC facilities. This information can be used to guide implementation of evidence-based strategies to increase influenza vaccination coverage among healthcare personnel working in LTC facilities.

Methods

Setting and Participants

Data on healthcare personnel working in LTC facilities were collected from an Internet panel survey conducted in April 2016 by Abt Associates Inc. (Cambridge, MA) for the Centers for Disease Control and Prevention (CDC). Participants were recruited through 2 preexisting national opt-in Internet sources. Participants in clinical occupations, including physicians,

nurse practitioners, physician assistants, nurses, allied health practitioners, and clinical technical professionals were recruited from the membership roster of Medscape (www.medscape.com), a medical website managed by WebMD Health Professional Network. Assistants and aides and nonclinical support staff (such as administrators, clerical workers, food service, and housekeeping staff) were recruited from general population internet panels operated by Research Now Survey Sampling International (SSI) (<https://www.surveysampling.com/>). Respondents were eligible for the survey if they were aged 18 years or older, living in the United States, and reported any patient contact or reported working in at least 1 of 8 healthcare settings (hospital; physician's office or other ambulatory care setting; dentist office or dental clinic; pharmacy; LTC facilities; home health agency or home healthcare; emergency medical service (EMS), ambulance, or other patient transport; or other healthcare settings). A total of 2258 eligible healthcare personnel completed the survey. This analysis is restricted to the 332 respondents who reported working in a LTC facility (including a nursing home, assisted living facility or other long-term care facility).

Survey items included occupation, age, sex, education, race/ ethnicity, work setting, self-reported vaccination status for the 2015–2016 influenza season (vaccinated between July 2015 and April 2016), number of years working in current LTC facilities, employer vaccination policies and interventions (including vaccination requirements and vaccination availability at the workplace), employer promotion of vaccination (including educational activities; recognition, rewards, or compensation for vaccination; penalties for nonvaccination; personal reminders to be vaccinated; and free or subsidized vaccination), and respondents' attitudes towards influenza and influenza vaccination.

Respondents could report working in more than 1 work setting, and 47 of the respondents included in this analysis reported working in at least 1 other setting in addition to a LTC facility. The workplace vaccination interventions included in this analysis were those reported for any setting where the respondent worked. Occupation was classified as clinical professional (physicians, dentists, nurse practitioners, physician assistants, nurses, allied health professionals, pharmacists, and students in a medical-related field), clinical paraprofessional (technicians and technologists, paramedics, emergency medical technicians, and assistants and aides), and nonclinical support staff (administrative support staff/managers, housekeeping and food service staff, and other nonclinical support staff).

Measures

Analyses were conducted using SUDAAN 11 (RTI International, Research Triangle Park, NC). Logistic regression was used to estimate unadjusted and adjusted prevalence ratios (aPRs) and corresponding 95% confidence intervals (CIs) for the associations between influenza vaccination coverage and demographic and employment characteristics and vaccination-related workplace policies or interventions. Interaction terms between employer requirements and other workplace interventions were added to the model one at a time to test for significance. No interaction terms were statistically significant, and, thus, none were included in the final model. A second logistic regression model included a composite variable for number of workplace interventions rather than each individual intervention. Both models were also repeated restricted to respondents without employer requirements for

vaccination. Education was not included in the logistic regression models because of collinearity with occupation. Workplace interventions reported by less than 30 respondents were excluded from the multivariable models. Influenza vaccination coverage among respondents who reported “Strongly agree” or “Agree” with each statement regarding attitude toward influenza and influenza vaccination was compared with those who reported “Disagree” or “Strongly disagree” using χ^2 tests. Data were weighted to the US population of healthcare personnel by work setting, occupation, race/ethnicity, sex, age, and geographic region. A poststratification weight for each responding person in the survey was developed through raking using the most recent Bureau of Labor Statistics Occupational Employment and Wage Estimates¹⁹ and Current Population Survey data.²⁰ *P* values of < .05 were considered to be statistically significant.

Results

Table 1 presents the distribution of the study population and influenza vaccination coverage by occupation, demographic characteristics, and presence of workplace vaccination interventions. The majority of respondents were clinical paraprofessionals (52.6%) and nonclinical support staff (27.4%), aged 18–49 years (77.3%), female (75.9%), had less than a college education (73.8%), were non-Hispanic white (64.7%), and worked at the facility 3 years or more (59.4%). Approximately 89% of healthcare personnel reported at least 1 workplace intervention in any location where they worked. The most commonly reported interventions were employers publicizing the risks and benefits of vaccination (72.5%), employers sending a personal reminder to be vaccinated (72.1%), and employers offering on-site vaccination (61.5%). Overall, 77.1% of respondents reported receiving influenza vaccination in the 2015–2016 influenza season. Among those vaccinated, 63.4% reported receiving the vaccination at work. Highest vaccination coverage was reported among healthcare personnel who had an employer requirement for vaccination (96.2%). However, only 28.4% of respondents reported having such a requirement.

Table 2 presents the associations between influenza vaccination and occupation, demographic characteristics, and workplace requirements or individual interventions among healthcare personnel working in LTC facilities. In bivariate analysis, vaccination was associated with working as a clinical professional, being required to be vaccinated by an employer, being offered on-site vaccination, being informed of the risks and benefits of vaccination, receiving a personal reminder to be vaccinated, being required to sign a waiver or declination form if not vaccinated, and having an employer who publicized vaccination coverage levels to employees compared with each corresponding referent level (Table 2). After adjustment for other factors in multivariable analysis (model I), the individual workplace interventions that remained associated with vaccination were an employer vaccination requirement [aPR, 95% CI = 1.28 (1.11, 1.47)], being offered on-site vaccination [aPR, 95% CI = 1.20 (1.04, 1.39)], and having an employer who publicized vaccination coverage levels to employees [aPR, 95% CI = 1.24 (1.09, 1.41)]. In analyses using a composite variable for number of workplace interventions (model II), healthcare personnel working in LTC facilities with 3 or more workplace interventions of any type were about 1.5 times more likely to be vaccinated compared with those with no workplace interventions [aPR = 1.48 (1.08, 2.02)]. An employer requirement for vaccination remained

independently significantly associated with vaccination in both multivariable models (Table 2). When models were restricted to respondents without an employer requirement for vaccination, the statistical associations in either model did not change with the exception of clinical professional [aPR = 1.49 (1.02, 2.18)] compared with nonclinical support staff in model II (Table 3). The magnitudes of the aPRs remained similar for all incentives in both models.

Most healthcare personnel working in LTC facilities reported positive attitudes toward the effectiveness and safety of influenza vaccine; 76.7% agreed that “Flu vaccination can protect me from getting flu” and 81.7% agreed that “Flu vaccination is safe” (Table 4). Healthcare personnel, who agreed that vaccination was effective and safe, had higher vaccination coverage compared with those who disagreed with these statements. Although 87.9% of respondents agreed that “Flu is a serious threat to the health of people around me,” fewer (59.8%) agreed that flu was a serious threat to their own health. The highest vaccination coverage (90.7%) was reported among those who agreed that “Getting vaccinated for flu is worth the time and expense.” Approximately 69% of respondents agreed that healthcare personnel should be required to be vaccinated for flu.

Discussion

In this national survey, 77.1% of healthcare personnel working in LTC facilities reported receiving influenza vaccination in the 2015–2016 influenza season, substantially lower than coverage among healthcare personnel working in hospital (91.2%) settings.⁶ An employer requirement to be vaccinated was strongly associated with increased vaccination coverage, with 96.2% coverage among healthcare personnel in LTC facilities who reported being required to be vaccinated. Workplace vaccination requirements have previously been reported to be associated with high vaccination coverage in hospital and long-term care settings.^{21,22} However, only 28.4% of healthcare personnel in LTC facilities in the current survey reported an employer vaccination requirement, compared with 61% of healthcare personnel working in hospital settings.⁶ Despite the low implementation of vaccination requirements in LTC facilities, healthcare personnel showed strong support for workplace vaccination requirements, with over 69% of surveyed respondents agreeing that healthcare personnel should be required to be vaccinated for influenza.

Availability of vaccination on-site at the workplace and employers publicizing vaccination coverage levels to employees were also individually associated with increased vaccination coverage, independent of an employer vaccination requirement. Access to vaccination at the workplace has previously been associated with increased vaccination coverage among healthcare personnel in long-term care and other healthcare settings.^{6,7,14,18,23} Publicizing vaccination coverage levels to employees has only been previously reported as a component of broader multicomponent influenza vaccination campaigns that have been successful in increasing vaccination coverage among healthcare personnel.^{24,25} As with previous studies,^{14,15,18} we found that a combination of multiple interventions was more effective than any single intervention outside of employer vaccination requirements at increasing vaccination coverage. These results are consistent with guidance from the Task Force for Community Preventive Services, which recommends interventions with free on-site and actively

promoted influenza vaccination to increase influenza vaccination among healthcare personnel.²³

Only 61.5% of healthcare personnel in LTC facilities were offered on-site vaccination at their workplace, and among those vaccinated, only 63.4% were vaccinated at work. By contrast, in the same survey, 72.7% of vaccinated healthcare personnel working in all medical settings were vaccinated at work.⁶ Nonworkplace factors such as access to medical care likely have an important role in vaccination coverage in the healthcare personnel population in LTC facilities. A study of healthcare personnel participating in the nationally representative National Health Interview Survey (NHIS) found that increased vaccination coverage among healthcare personnel was associated with having health insurance and having at least 2 physician contacts within the past year, although this analysis was not restricted to healthcare personnel working in LTC facilities.⁷ Our survey did not collect information on factors regarding health insurance or utilization of medical care services.

Healthcare personnel in LTC facilities in this study generally reported positive attitudes towards influenza vaccination, and those who believed the vaccine was safe and effective and who believed influenza to be a threat to them and those around them were more likely to be vaccinated than those who did not express these beliefs. Previous studies have reported positive associations between attitudes toward vaccination and likelihood of being vaccinated among healthcare personnel in LTC settings.²⁶ Despite this finding, education about the risks of influenza and benefits of vaccination was not associated with increased vaccination coverage in the current study. This is consistent with numerous studies that have found that education alone is insufficient to increase vaccination coverage in healthcare personnel working in LTC and other healthcare settings,^{15–18,23,27} However, programs including educational campaigns along with improved access to vaccine were found to be more effective than education or on-site vaccination alone.^{16,18} Interventions that include active promotion of on-site vaccination and incorporate education about the benefits of vaccination to patients as well as healthcare personnel could improve influenza vaccination coverage among healthcare personnel in LTC facilities.

This study is subject to several limitations. First, all results in the current survey are based on self-report and might be subject to recall bias. Second, noncoverage and nonresponse bias might remain even after weighting adjustments. Third, although financial incentives were shown to be associated with increased influenza vaccination coverage among nursing home healthcare personnel,²⁶ use of financial incentives or rewards and wearing badge or other visible sign of nonvaccination status were not evaluated as a possible intervention in multivariable models because only 16 and 21 respondents reported receiving these incentives for vaccination, respectively. Fourth, the analysis included all respondents who reported working in any LTC facility; the 47 employees also working in hospital, ambulatory care, or other healthcare settings might be subject to the vaccination policies of these institutions, and, therefore, our results may overstate the impact of the interventions examined on vaccination coverage. However, in a sensitivity analysis in which these 47 respondents were eliminated, the magnitude of any of the associations with vaccination coverage did not change from those reported here. Finally, the survey used a non-probability-based sample of volunteer members of 2 Internet panels and was not randomly selected from healthcare

personnel in the United States. Therefore, the results presented here are not generalizable to all US healthcare personnel working in LTC facilities. The sample was weighted to be representative of the US healthcare personnel population; however, bias may remain in estimates of vaccination coverage and interventions. The standard errors reported from this nonrandom sample assume that the weighted estimates are approximately unbiased, but no analyses were conducted to validate this assumption.²⁸ Because the opt-in Internet panel was not a random sample, the statistical measures of association presented here should be used as guides to implementing interventions that may improve influenza vaccination coverage among healthcare personnel in LTC facilities. In previous influenza seasons, vaccination coverage estimates among healthcare personnel from similar internet panel surveys were higher than those obtained from the population-based sample of healthcare personnel in the NHIS, though trends in coverage were similar across seasons.² However, the NHIS and other population-based surveys such as the Behavioral Risk Factor Surveillance System, do not collect information about workplace vaccination practices, limiting their ability to inform intervention design.

Conclusions/Relevance

Employer vaccination requirements were associated with high influenza coverage among healthcare personnel working in LTC facilities, with 96.2% coverage achieved among healthcare personnel with vaccination requirements. Independent of vaccination requirements, a combination of multiple workplace interventions was most strongly associated with increased vaccination coverage, with coverage increasing with increasing numbers of interventions. LTC facility employers can implement interventions with free on-site and actively promoted influenza vaccination, as recommended by the Task Force for Community Preventive Services, to increase influenza vaccination among healthcare personnel.²³ Resources, strategies, and educational materials to assist LTC facilities in implementing these interventions can be found online.²⁹

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Table 1
 Distribution of Study Population and Influenza Vaccination Coverage by Occupation, Demographic Characteristics, and Influenza Vaccination-Related Workplace Interventions* Among LTC Facilities — Internet Panel Survey, United States, 2015–2016 Influenza Season

Healthcare Personnel Characteristics/Workplace Interventions	Unweighted N	Weighted % (95% CI)	Weighted % Vaccinated (95% CI)
Total	332	100	77.1 (71.1, 83.1)
Occupation			
Clinical professional [†]	66	20.0 (13.9, 26.2)	92.5 (85.4, 99.6)
Clinical paraprofessional [‡]	234	52.6 (45.2, 59.9)	74.3 (68.5, 80.1)
Nonclinical support staff [§]	32	27.4 (19.5, 35.3)	71.3 (54.2, 88.4)
Age (y)			
18–49	253	77.3 (71.5, 83.1)	76.4 (69.5, 83.3)
50–64	66	17.6 (12.6, 22.7)	75.2 (61.2, 89.3)
65	13	5.1 (1.7, 8.5)	94.3 (83.1, 100)
Sex			
Male	49	24.1 (16.9, 31.2)	78.1 (63.7, 92.4)
Female	283	75.9 (68.8, 83.1)	76.8 (70.4, 83.2)
Education			
Less than college	248	73.8 (67.2, 80.4)	75.8 (68.8, 82.7)
College	35	13.8 (8.5, 19.0)	86.9 (76.8, 97.0)
More than college	49	12.4 (7.4, 17.4)	74.3 (53.9, 94.7)
Race/ethnicity			
White, non-Hispanic	225	64.7 (57.7, 71.7)	75.9 (68.7, 83.2)
Black, non-Hispanic	56	19.3 (13.3, 25.3)	77.6 (62.5, 92.7)
Hispanic	32	10.1 (5.7, 14.5)	89.3 (79.0, 99.7)
Other, non-Hispanic	19	5.9 (2.5, 9.3)	67.4 (37.3, 97.5)
Region			
Northwest	85	25.9 (19.4, 32.4)	79.0 (66.2, 91.9)
Midwest	88	23.5 (18.0, 29.1)	79.4 (69.3, 89.5)
South	103	29.1 (22.6, 35.6)	77.4 (67.4, 87.4)
West	56	21.4 (15.3, 27.5)	71.8 (57.0, 86.6)

Healthcare Personnel Characteristics/Workplace Interventions	Unweighted N	Weighted % (95% CI)	Weighted % Vaccinated (95% CI)
Employer vaccination requirement			
Yes	235	28.4 (22.0, 34.9)	96.2 (92.1, 100)
No	97	71.6 (65.1, 78.0)	69.5 (61.7, 77.3)
Number of years working at current LTC facility			
<3 y	129	40.6 (33.5, 47.6)	73.3 (63.0, 83.6)
3 y	199	59.4 (52.4, 66.5)	79.3 (86.6, 61.3)
Offered on-site vaccination			
Yes	204	61.5 (54.6, 68.4)	87.3 (81.0, 93.6)
No	128	38.5 (31.6, 45.4)	60.9 (49.9, 71.8)
Employer publicized risks and benefits of vaccination			
Yes	242	72.5 (65.9, 79.0)	82.4 (75.4, 89.3)
No	90	27.5 (21.0, 34.1)	63.3 (50.8, 75.9)
Received personal reminder to be vaccinated			
Yes	237	72.1 (65.8, 78.4)	82.6 (75.5, 89.7)
No	95	27.9 (21.6, 34.2)	62.8 (51.0, 74.6)
Required to sign waiver or declination form if not vaccinated			
Yes	190	52.8 (45.6, 60.0)	88.7 (81.8, 95.6)
No	141	47.2 (40.0, 54.4)	64.0 (54.0, 74.0)
Employer publicized vaccination coverage level to employees			
Yes	75	22.9 (16.9, 28.9)	94.7 (87.6, 100)
No	257	77.1 (71.1, 83.1)	71.9 (64.6, 79.1)
Financial incentives or rewards			
Yes	16	6.6 (2.5, 10.6)	—
No	316	93.4 (89.4, 97.5)	75.5 (69.2, 81.8)
Wear a badge or other visible sign of nonvaccination status			
Yes	21	6.2 (2.9, 9.6)	96.5 (89.6, 100)
No	311	93.8 (90.4, 97.1)	75.8 (69.5, 82.1)
Total number of workplace interventions^{//}			
0	40	11.4 (7.0, 15.7)	47.5 (26.7, 68.3)
1	30	9.8 (5.3, 14.3)	55.0 (31.2, 78.9)
2	55	18.4 (12.6, 24.3)	68.5 (52.3, 84.8)

Healthcare Personnel Characteristics/Workplace Interventions	Unweighted N	Weighted % (95% CI)	Weighted % Vaccinated (95% CI)
3	207	60.4 (53.3, 67.5)	88.9 (82.5, 95.3)

* Interventions not restricted to the LTC facilities for LTC healthcare personnel who worked in more than 1 setting.

[†]Physicians, dentists, nurse practitioners, physician assistants, nurses, allied health professionals, pharmacists, and students in a medical-related field.

[‡]Technicians/technologists, emergency medical technicians, paramedics, and assistants/aides.

[§]Administrative support staff/managers, housekeeping and food service staff, and other nonclinical support staff.

^{||}Employer vaccination requirements are not included in the total number of workplace interventions.

Table 2
 Associations Between Influenza Vaccination and Demographic and Occupational Characteristics and Vaccination-Related Workplace Interventions*
 Among Healthcare Personnel Working in LTC Facilities – Internet Panel Survey, United States, 2015–2016 Influenza Season

Healthcare Personnel Characteristics/Workplace Intervention	Unadjusted PR (95% CI)	aPR (95% CI) (Model I) [†]	aPR (95% CI) (Model II) [‡]
Sample size	332	327	328
Occupation			
Clinical professional [§]	1.30 (1.01, 1.67) [¶]	1.19 (0.92, 1.53)	1.25 (0.97, 1.61)
Clinical paraprofessional [¶]	1.04 (0.81, 1.34)	1.02 (0.81, 1.29)	1.05 (0.83, 1.34)
Nonclinical support staff ^{***}	Referent	Referent	Referent
Age (y)			
18–49	Referent	Referent	Referent
50–64	0.99 (0.80, 1.21)	0.97 (0.82, 1.15)	0.99 (0.83, 1.17)
65	1.24 (1.06, 1.43)	1.24 (1.04, 1.47)	1.25 (1.06, 1.47)
Race/ethnicity			
White, non-Hispanic	Referent	Referent	Referent
Black, non-Hispanic	1.02 (0.56, 1.40)	0.98 (0.77, 1.13)	1.02 (0.81, 1.28)
Hispanic	1.18 (1.01, 1.37)	1.14 (0.80, 1.21)	1.15 (0.98, 1.34)
Other, non-Hispanic	0.89 (0.56, 1.40)	0.85 (0.61, 1.18)	0.92 (0.66, 1.29)
Employer vaccination requirement			
Yes	1.38 (1.23, 1.56) [¶]	1.28 (1.11, 1.47) [¶]	1.28 (1.12, 1.47) [¶]
No	Referent	Referent	Referent
Number of years working at current LTC facility			
<3 y	Referent	Referent	Referent
3 y	1.08 (0.92, 1.28)	Referent	Referent
Offered on-site vaccination			
Yes	1.43 (1.18, 1.74) [¶]	1.20 (1.04, 1.39) [¶]	
No	Referent	Referent	
Employer publicized risks and benefits of vaccination			
Yes	1.30 (1.05, 1.61) [¶]	1.07 (0.88, 1.30)	

Healthcare Personnel Characteristics/Workplace Intervention	Unadjusted PR (95% CI)	aPR (95% CI) (Model I) [†]	aPR (95% CI) (Model III) [‡]
No	Referent	Referent	Referent
Personal reminder to be vaccinated			
Yes	1.32 (1.07, 1.62) ^{//}	0.98 (0.81, 1.18)	
No	Referent	Referent	
Required to sign waiver or declination form if not vaccinated			
Yes	1.29 (1.16, 1.65) ^{//}	1.08 (0.92, 1.28)	
No	Referent	Referent	
Employer publicized vaccination coverage level to employees			
Yes	1.32 (1.16, 1.49) ^{//}	1.24 (1.09, 1.41) ^{//}	
No	Referent	Referent	
Total number of workplace interventions ^{††}			
0	Referent	Referent	Referent
1	1.16 (0.63, 2.15)		1.07 (0.70, 1.63)
2	1.44 (0.88, 2.38)		1.14 (0.79, 1.64)
3	1.87 (1.20, 2.92) ^{//}		1.48 (1.08, 2.02) ^{//}

* Interventions not restricted to the LTC facilities for LTC healthcare personnel who worked in more than 1 setting.

[†] Contains variables for individual workplace interventions.

[‡] Contains composite variable for number of workplace interventions.

[§] Physicians, dentists, nurse practitioners, physician assistants, nurses, allied health professionals, pharmacists, and students in a medical-related field.

^{//} *P* < .05 compared with referent category.

[¶] Technicians/technologists; emergency technicians, paramedics, and EMTs; and assistants/aides.

^{**} Administrative support staff/managers, housekeeping and food service staff, and other nonclinical support staff.

^{††} Employer vaccination requirements are not included in the total number of workplace interventions. Financial incentives or rewards and wearing a badge or other visible sign of nonvaccination status are included in the total, although these were not included as individual interventions in model I because fewer than 30 respondents reporting these interventions.

Table 3
 Associations Between Influenza Vaccination and Demographic and Occupational Characteristics and Vaccination-Related Workplace Interventions*
 Among Healthcare Personnel Working in LTC Facilities Without Employer Requirements for Vaccination – Internet Panel Survey, United States, 2015–
 2016 Influenza Season

Healthcare Personnel Characteristics/Workplace Intervention	Unadjusted PR (95% CI)	aPR (95% CI) (Model I) [†]	aPR (95% CI) (Model II) [‡]
Sample size	235	230	231
Occupation			
Clinical professional [§]	1.46 (1.03, 2.06) ^{//}	1.38 (0.96, 2.00)	1.49 (1.02, 2.18) ^{//}
Clinical paraprofessional ^{//}	1.06 (0.74, 1.50)	1.05 (0.73, 1.51)	1.13 (0.77, 1.65)
Non-clinical support staff ^{**}	Referent	Referent	Referent
Age (y)			
18–49	Referent	Referent	Referent
50–64	0.94 (0.69, 1.29)	0.95 (0.73, 1.24)	0.96 (0.73, 1.26)
65	1.34 (1.09, 1.65)	1.36 (1.06, 1.75)	1.36 (1.07, 1.73)
Race/ethnicity			
White, non-Hispanic	Referent	Referent	Referent
Black, non-Hispanic	0.97 (0.71, 1.34)	0.93 (0.68, 1.26)	0.99 (0.71, 1.39)
Hispanic	1.16 (0.89, 1.51)	1.17 (0.91, 1.51)	1.19 (0.92, 1.53)
Other, non-Hispanic	0.82 (0.45, 1.51)	0.74 (0.42, 1.31)	0.89 (0.55, 1.43)
Number of years working at current LTC facility			
<3 y	Referent	Referent	Referent
3 y	0.99 (0.79, 1.25)	0.90 (0.72, 1.13)	0.89 (0.72, 1.10)
Offered on-site vaccination			
Yes	1.51 (1.17, 1.95) ^{//}	1.32 (1.06, 1.65) ^{//}	
No	Referent	Referent	
Employer publicized risks and benefits of vaccination			
Yes	1.24 (0.95, 1.62)	1.09 (0.81, 1.46)	
No	Referent	Referent	
Personal reminder to be vaccinated			
Yes	1.26 (0.98, 1.63)	0.93 (0.71, 1.23)	

Healthcare Personnel Characteristics/Workplace Intervention	Unadjusted PR (95% CI)	aPR (95% CI) (Model I) [†]	aPR (95% CI) (Model II) [‡]
No	Referent	Referent	Referent
Required to sign waiver or declination form if not vaccinated			
Yes	1.33 (1.06, 1.67) [¶]	1.13 (0.88, 1.44)	
No	Referent	Referent	
Employer publicized vaccination coverage level to employees			
Yes	1.42 (1.17, 1.72) [¶]	1.41 (1.19, 1.67) [¶]	
No	Referent	Referent	
Total number of workplace interventions ^{††}			
0	Referent	Referent	Referent
1	1.13 (0.59, 2.15)		1.13 (0.63, 2.05)
2	1.35 (0.80, 2.29)		1.24 (0.75, 2.06)
3	1.74 (1.10, 2.74) [¶]		1.71 (1.13, 2.61) [¶]

* Interventions not restricted to the LTC facilities for LTC healthcare personnel who worked in more than 1 setting.

[†] Contains variables for individual workplace interventions.

[‡] Contains composite variable for number of workplace interventions.

[§] Physicians, dentists, nurse practitioners, physician assistants, nurses, allied health professionals, pharmacists, and students in a medical-related field.

[¶] $P < .05$ compared with referent category.

^{¶¶} Technicians/technologists; emergency technicians, paramedics, and EMTs; and assistants/aides.

** Administrative support staff/managers, housekeeping and food service staff, and other nonclinical support staff.

^{†††} Financial incentives or rewards and wearing a badge or other visible sign of nonvaccination status are included in the total, though these were not included as individual interventions in model I because of fewer than 30 respondents reporting these interventions.

Table 4
 Attitudes Toward Influenza and Influenza Vaccination Among Healthcare Personnel Working in LTC Facilities — Internet Panel Survey, United States, 2015–2016 Influenza Season

Attitudes	Unweighted N	Weighted % (Agree*)	Weighted % Vaccinated (95% CI)	Disagree [†]
Total	332	100		
Getting vaccinated for flu is worth the time and expense	257	77.8	90.7 (86.0, 95.4)	29.5 (15.9, 43.2) [‡]
Flu vaccination can protect me from getting flu	252	76.7	88.6 (83.5, 93.8)	39.2 (25.2, 53.1) [‡]
If I get a flu vaccination, people around me will be better protected from flu	258	78.2	87.6 (82.4, 92.9)	39.4 (25.2, 53.7) [‡]
Flu vaccination is safe	270	81.7	86.9 (81.4, 92.4)	33.3 (17.8, 48.9) [‡]
Healthcare workers should be required to be vaccinated for flu	232	69.3	86.2 (80.3, 92.0)	56.7 (43.9, 69.6) [‡]
Flu is a serious threat to my health	210	59.8	84.3 (77.6, 91.1)	66.3 (55.5, 77.1) [‡]
Flu is a serious threat to the health of people around me	299	87.9	80.4 (74.5, 86.3)	53.1 (31.7, 74.5) [‡]
I am at risk of getting flu	234	70.1	80.3 (73.4, 87.1)	69.7 (57.9, 81.6)
Healthcare workers should be rewarded for getting vaccinated for flu	232	66.5	79.5 (72.5, 86.4)	72.4 (61.1, 83.7)
People around me are at risk of getting flu	283	84.4	78.5 (72.2, 84.9)	69.3 (52.9, 85.8)

* Respondents who answered “Strongly agree” or “Agree” to each statement.

[†] Respondents who answered “Disagree” or “Strongly disagree” to each statement.

[‡] $P < .05$ for χ^2 comparison of vaccination coverage between healthcare personnel who agree with statement with those who disagree with statement.