

Low Influenza Vaccination Rates Among Child Care Workers in the United States: Assessing Knowledge, Attitudes, and Behaviors

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Abstract Influenza can spread quickly among children and caregivers in child day care settings. Vaccination is the most effective method to prevent influenza. We determined 2009 pandemic influenza A (H1N1) (pH1N1) and seasonal influenza vaccination rates during the 2009–2010 influenza season among child care center employees, assessed knowledge and attitudes regarding the vaccines, and determined factors associated with vaccine receipt. Using a cross-sectional study design, from January 30–March 1, 2010, we surveyed 384 (95%) of 403 employees at 32 licensed child centers in the United States about personal and work characteristics, vaccine receipt, and knowledge and attitudes regarding each vaccine. Forty-five (11%) and eighty five (22%) respondents reported receiving the pH1N1 and seasonal influenza vaccines, respectively. The most common reasons cited for not getting either vaccine were “I don’t think I need the vaccine,” “I don’t think the vaccine will keep me from getting the flu,” and “the vaccine is not safe.” Factors independently associated with receipt of either vaccine included belief in its efficacy, having positive attitudes towards it, and feeling external pressure to get it. Child care center employees had low rates of pH1N1 and seasonal influenza vaccination largely due to misconceptions about the need for and efficacy of the vaccine. Public health messages should address misconceptions about vaccines, and employers should consider methods to maximize influenza vaccination of employees as part of a comprehensive influenza prevention program.

Keywords Influenza · Vaccination · Child care · Occupational health · Immunization · Workers

Introduction

The 2009 pandemic influenza A (H1N1) (pH1N1) virus emerged in the United States in April 2009 [1] and has since caused significant morbidity and mortality worldwide [2–10]. Vaccination is the most effective method to prevent influenza and to prevent serious illness and death from influenza infection [11, 12]. In July 2009, the US Advisory Committee on Immunization Practices (ACIP) recommended that certain groups of the general population receive the 2009 pH1N1 vaccine first [13]. This group included pregnant women, healthcare personnel, all individuals from 6 months to 24 years of age, and individuals aged 25–64 years with health conditions associated with higher risk of complications from influenza. This group also included caregivers of children <6 months since these children are too young to get the vaccine themselves and thus, are particularly vulnerable. The US Food and Drug Administration licensed the first pH1N1 vaccine in September 2009, and it became available in the United States in October 2009 [14].

In July 2009, the ACIP also updated its recommendations for seasonal influenza vaccination [15]. The targeted groups were similar to those for pH1N1 and also included caregivers of children aged <5 years, with particular emphasis on vaccinating contacts of children aged <6 months. Annual influenza vaccination is now recommended for all persons aged ≥ 6 months [16].

In the United States, over 1.3 million people are employed in child day care settings, which include private households, home day cares, and child care centers [17].

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These workers care for children who have not yet entered kindergarten. Influenza can spread quickly among children and caregivers in child care settings because children <5 years of age are particularly susceptible and close interpersonal contact is part of the caregiver's job. Also, young children may have a limited ability to practice effective hand hygiene and respiratory etiquette.

In November 2009, the National Institute for Occupational Safety and Health in the US Centers for Disease Control and Prevention received a technical assistance request from a county social services agency in Ohio. The agency wanted assistance in determining pH1N1 and seasonal influenza vaccination rates among child care center employees, assessing their knowledge and attitudes regarding each vaccine, and determining factors associated with receipt of each vaccine.

Methods

Study Design and Survey Instrument

Using a cross-sectional study design, we surveyed employees at randomly selected child care centers located in the county and licensed by the state of Ohio. The anonymous questionnaire covered personal and work characteristics, pertinent medical history, and receipt of or intention to receive the pH1N1 and seasonal influenza vaccines. Demographic questions from the Behavioral Risk Factor Surveillance System Survey Questionnaire [18] and influenza vaccine questions from the National 2009 H1N1 Flu Survey Questionnaire [19] were used.

We used the Theory of Planned Behavior [20, 21], a widely applied theory in predicting social and health behavior, in developing some questions for our survey. The theory states that a person's attitude (positive or negative feelings towards a behavior), perception of subjective norms (the perception that there is social pressure to perform or not perform the behavior), and perceived behavioral control (the perception of choice and availability of resources necessary to perform or not perform the behavior) influence the person's intention to perform the behavior [20].

We created questions drawing from the three domains of the Theory of Planned Behavior to assess knowledge about and attitudes towards each vaccine [22]. Knowledge and attitudes questions were examined by extent of agreement with statements about each vaccine, using a four-point Likert scale (i.e., disagree, somewhat disagree, somewhat agree, and agree). Additional attitudes questions were examined using a four-point scale with bipolar adjectives (e.g., very good, somewhat good, somewhat bad, very bad).

Study Population

The study population consisted of all employees ≥ 18 years old working at randomly selected licensed child care centers in the county. As of January 2010, the county had 362 licensed child care centers. Of these centers, 135 served infants <18 months. Since caregivers of children <6 months were among the initial target groups by the ACIP to receive the pH1N1 vaccine [13], 38 centers were selected randomly from this list of 135 centers. We visited all participating child care centers from January 30–March 1, 2010. All part-time and full-time employees working at the facility on the date of our visit to the center were invited to participate.

As a public health response, per the guidelines of US Title 45 Code of Federal Regulations Part 46, this evaluation was determined to not require review by an institutional review board.

Information about center characteristics, including center type and number of employees, was collected from center directors. Additional information, including National Association for the Education of Young Children (NAEYC) accreditation, and child capacity was obtained from the Ohio Department of Jobs and Family Services website [23].

Data Analysis

Survey responses using a Likert scale were categorized as "expressed agreement" if respondents marked "agree" or "somewhat agree" and as "expressed disagreement" if respondents marked "disagree" or "somewhat disagree." Internal consistency for the attitudes, subjective norms, and perceived behavioral control variables was measured using Cronbach's coefficient (α) after adjusting for directionality. We created composite scores for variables within the attitudes, subjective norms, and perceived behavioral control domains where $\alpha > 0.7$ by calculating the mean of the individual scores for each respondent. All composite scores were based on a four-point scale. A higher score on the composite score represented more favorable attitudes about the vaccines.

Characteristics of child care center employees who reported receipt of each vaccine were compared to those who denied receipt of the respective vaccine. Responses to the knowledge and attitudes questions were also compared among each group. We conducted bivariate analyses using the Student's *t* test, χ^2 test, or Fisher's exact test. We also used logistic regression for the bivariate analyses of the composite scores for the attitudes, subjective norms, and perceived behavioral control domains. Bivariate analyses were conducted using SPSS (SPSS Inc., Chicago, Illinois). All tests were two-tailed, and statistical significance was

set at $P < 0.05$. We calculated odds ratio and 95% confidence intervals. We then used a stepwise backward elimination multiple logistic regression model to identify factors independently associated with receipt of each vaccine. The model was then analyzed using a Generalized Estimating Equations (GEE) model to account for the random effect of center with SAS 9.2 (SAS Institute, Cary, North Carolina).

Results

Characteristics of Participating Child Care Centers

Thirty-two (84%) of 38 invited licensed child care centers agreed to participate in the evaluation. The six declining centers cited lack of interest and/or lack of time as reasons for not participating. Participating and declining centers had similar characteristics including center type and number of employees. Most participating centers were independent or religiously-affiliated centers (75%) versus chain or corporate- or university-affiliated centers (25%). Four (12%) centers were NAEYC accredited. Fifteen (47%) centers had capacity for ≥ 100 children, and 16 (50%) centers had ≥ 15 employees.

Characteristics of Survey Respondents

We visited all 32 participating child care centers, and 384 (95%) of 403 employees ≥ 18 years old working on the day of the visits completed a survey. The median age of respondents was 30 years (range, 18–81 years), and 105 (27%) were ≤ 24 years old. Demographic and work characteristics of survey respondents are shown in Table 1.

Of 384 respondents, 45 (12%) reported having asthma or another chronic lung disease, 16 (4%) reported having heart disease, and 14 (4%) reported having diabetes. In total, 315 (82%) respondents denied having an underlying medical condition that would put them at high risk for influenza-related complications. These conditions also included kidney disease, liver disease, current diagnosis of cancer, any immunosuppressive disease, and taking immunosuppressive therapy.

pH1N1 and Seasonal Influenza Vaccine Receipt

Forty-five (12%) respondents reported having received the pH1N1 vaccine between October 2009 and survey administration. Rates of pH1N1 vaccination among respondents ranged from 0 to 83% by child care center. Thirteen (41%) of the 32 centers had 0% pH1N1 vaccination rates among their staff.

Table 1 Demographic and work characteristics of survey respondents

Characteristic	No. respondents (%) n = 363–384 ^a
Demographic characteristic	
Female	371 (97)
Pregnant at the time of survey completion	16 (4)
Race	
Black or African American	161 (42)
White	197 (52)
Other ^b	23 (6)
Hispanic or Latino ethnicity	13 (4)
Household included	
One or more children ≤ 5 months old	16 (4)
One or more children 6 months–17 years old	204 (53)
Highest year of school completed	
High school graduate or GED or less	122 (32)
Some college or technical school or higher	262 (68)
Annual household income	
$< \$35,000$	233 (63)
$\geq \$35,000$	135 (37)
Work characteristic	
Full-time employment	325 (85)
Median years worked in child care (range)	6 (0–50)
Median years worked at center (range)	2 (0–38)
Ages of children cared for in job ^c	
0–5 months	95 (25)
6–12 months	116 (30)
13 months–3 years	237 (62)
4 years and older	142 (37)
Did not provide direct care to children	51 (13)
Type of center worked at	
Independent or religiously-affiliated center	252 (66)
Chain or corporate or university-affiliated center	132 (34)
Work at NAEYC accredited center	65 (17)

NAEYC National Association for the Education of Young Children

^a Sample sizes ranged from 363 to 384 because of missing values

^b Other race includes those respondents who selected American Indian or Alaska Native, Asian, Native Hawaiian or Pacific Islander, or “other” for race

^c Respondents could select more than one age group

The most common places where respondents received the pH1N1 vaccine were a doctor’s office (35%), workplace (24%), clinic or health center (9%), health department (9%), and school (9%). pH1N1 vaccination rates were 14% for respondents caring for young infants (0–5 months), 13% for those caring for older infants (6–12 months old), 16% for those caring for toddlers (13 months–3 years), and 11% for those caring for children ≥ 4 years old.

Eighty-five (22%) respondents reported having received the 2009–2010 seasonal influenza vaccine between August 2009 and survey administration. Rates of seasonal influenza vaccination among respondents ranged from 0 to 57% by child care center. Four (12%) of the 32 centers had seasonal influenza vaccination rates of 0%.

The most common places where respondents received the seasonal influenza vaccine were a doctor’s office (45%), pharmacy or drug store (27%), clinic or health center (13%), hospital (5%), and workplace (5%). Seasonal influenza vaccination rates were 14% for respondents caring for young infants, 18% for those caring for older infants, 23% for those caring for toddlers, and 21% for those caring for children ≥4 years old.

Twenty-five (7%) respondents reported receiving both the pH1N1 and the seasonal influenza vaccines, 20 (5%) respondents reported receiving the pH1N1 but not the seasonal influenza vaccine, and 60 (16%) respondents reported receiving the seasonal influenza but not the pH1N1 vaccine. A total of 278 (72%) respondents reported receiving neither influenza vaccine.

The most common main reason cited by respondents for receiving the pH1N1 or seasonal influenza vaccines was “to protect myself/my family” (54% for pH1N1 and 65% for seasonal influenza). The next most common reasons were “my doctor recommended that I receive the vaccine” (16% for pH1N1 vaccine and 20% for seasonal influenza) and “to protect the children I care for” (14% for pH1N1 vaccine and 6% for seasonal influenza).

Of the 339 respondents who had not received the pH1N1 influenza vaccine, 65 (19%) reported they would definitely

(n = 15) or probably (n = 50) get one. In contrast, 274 (81%) reported they would definitely not (n = 127) or probably not (n = 147) get one. Of the 298 respondents who had not received the seasonal influenza vaccine, 56 (19%) reported they would definitely (n = 13) or probably (n = 43) get one. In contrast, 242 (81%) reported they would definitely not (n = 127) or probably not (n = 115) get one. One respondent did not answer this question. Main reasons cited by respondents for not intending to receive either vaccine are shown in Table 2.

pH1N1 and Seasonal Influenza Vaccine Knowledge, Beliefs, and Attitudes

Most respondents had positive attitudes towards both vaccines, as most believed the vaccines to be “beneficial” (69% for pH1N1 and 82% for seasonal influenza) versus “harmful,” “good” (71% for pH1N1 and 80% for seasonal influenza) versus “bad,” and “wise” (68% for pH1N1 and 79% for seasonal influenza) versus “unwise.” These three measures of attitudes towards each vaccine had a high Cronbach’s coefficient; $\alpha = 0.879$ for pH1N1 and $\alpha = 0.865$ for seasonal influenza. Thus, for subsequent analyses, we created one positive attitudes composite score for each vaccine by calculating the mean of the scores for the three items.

Respondents’ beliefs about the pH1N1 and seasonal influenza vaccines are shown in Table 3. Respondents’ agreement with subjective norm and perceived behavioral control statements about both vaccines is also shown in Table 3. The seven subjective norms items (Table 3) regarding each vaccine had a high Cronbach’s coefficient;

Table 2 Main reasons cited by respondents for not intending to receive the pH1N1 and seasonal influenza vaccines

Main reason cited ^a	No. respondents who did not intend to receive the pH1N1 vaccine (%) n = 270 ^b	No. respondents who did not intend to receive the seasonal influenza vaccine (%) n = 235 ^c
I don’t think I need the vaccine	67 (25)	73 (31)
I don’t think the vaccine will keep me from getting the flu	43 (16)	69 (29)
The vaccine is not safe	42 (16)	13 (6)
I haven’t had time to get the vaccine	16 (6)	12 (5)
It costs too much to get the vaccine	8 (3)	6 (3)
I have already had the flu	4 (2)	5 (2)
I tried to get the vaccine but could not get it	4 (2)	2 (1)
Other	71 (26) ^d	47 (20) ^e

pH1N1 2009 pandemic influenza A (H1N1)

^a Respondents were asked to choose one main reason

^b Four respondents were excluded because they selected multiple reasons or failed to select a reason

^c Seven respondents were excluded because they selected multiple reasons or failed to select a reason

^d The most common “other” reasons cited for not intending to receive the pH1N1 vaccine included “I don’t know enough about or have enough information on the vaccine,” “the vaccine is too new or was created too fast,” and “I just didn’t want it.”

^e The most common “other” reasons cited for not intending to receive the seasonal influenza vaccine included “I just didn’t want it,” and “the vaccine makes me sick or gives me the flu.”

Table 3 Respondents' agreement with belief, subjective norms, and perceived behavioral control statement about the pH1N1 and seasonal influenza vaccines

Statement	No. respondents who expressed agreement with statement regarding pH1N1 (%) n = 364–384 ^a	No. respondents who expressed agreement with statement regarding seasonal influenza (%) n = 364–382 ^a
Belief statement		
Child care providers can spread __ flu to children	344 (90)	359 (94)
Children can spread __ flu to child care providers	361 (95)	360 (94)
__ flu is a serious infection	345 (91)	322 (85)
The __ vaccine could make me sick	322 (84)	319 (84)
The __ vaccine will prevent me from getting the __ flu	221 (58)	213 (56)
Subjective norm statement		
It is/was my duty to get the __ vaccine for my job	116 (30)	115 (30)
A majority of my coworkers have gotten or plan to get the __ vaccine	95 (26)	128 (35)
People who are important to me want(ed) me to get the __ vaccine	115 (30)	125 (33)
My manager/employer wants(ed) me to get the __ vaccine	91 (24)	85 (23)
My doctor recommends(ed) that I get the __ vaccine	133 (35)	161 (43)
My family/friends want(ed) me to get the __ vaccine	106 (28)	121 (32)
I feel/felt social pressure to get the __ vaccine	83 (22)	63 (17)
Perceived behavioral control statement		
It is/was my decision whether or not to get the __ vaccine	362 (94)	369 (97)
I am/was confident I could get the __ vaccine if I wanted	347 (91)	358 (94)
I do/did not have the time to get the __ vaccine	111 (29)	109 (29)
I do/did not have the money to get the __ vaccine	118 (31)	104 (27)
Getting the __ vaccine requires(ed) a lot of effort on my part	98 (26)	95 (25)

pH1N1 2009 pandemic influenza A (H1N1)

^a Sample sizes varied because of missing values

$\alpha = 0.835$ for pH1N1 and $\alpha = 0.839$ for seasonal influenza. We created one subjective norms composite score for each vaccine by calculating the mean of the scores for the seven items.

The latter three perceived behavioral control items (Table 3) regarding each vaccine had a high Cronbach's coefficient; $\alpha = 0.733$ for pH1N1 and $\alpha = 0.784$ for seasonal influenza. We created one perceived behavioral control composite score for each vaccine by calculating the mean of the scores for the three items.

Factors Associated with Influenza Vaccine Receipt

We found no statistically significant associations between age and mean number of years worked in child care or at the current center with receipt of either vaccine. Other demographic and work characteristics and their association with receipt of either vaccine are shown in Table 4. Agreement with belief statements about each vaccine and their association with receipt of the corresponding vaccine are also shown in Table 4.

Respondents with higher positive attitudes composite scores for each vaccine, or those who had more positive

attitudes towards the vaccines, were more likely to have received that vaccine (OR = 9.52, 95% CI = 4.99, 18.16 for pH1N1 and OR = 5.87, 95% CI = 3.57, 9.65 for seasonal influenza). Respondents with higher subjective norms composite scores for each vaccine, or those who felt external pressure from others to receive the vaccine, were more likely to have received that vaccine (OR = 4.93, 95% CI = 3.10, 7.86 for pH1N1 and OR = 4.05, 95% CI = 2.80, 5.86 for seasonal influenza). Respondents with higher perceived behavioral control composite scores for each vaccine, or those who felt personal control over whether or not to get the vaccine, were more likely to have received that vaccine (OR = 1.52, 95% CI = 1.02, 2.27 for pH1N1 and OR = 1.42, 95% CI = 1.06, 1.90 for seasonal influenza).

Variables with $P < 0.05$ associated with receipt of the pH1N1 vaccine and those associated with receipt of the seasonal influenza vaccine were selected and entered into a stepwise backward elimination multiple logistic regression model and then a GEE model. Factors independently associated with receipt of the pH1N1 vaccine included having some college or technical school or higher (OR = 3.87, 95% CI = 1.69, 8.84), caring for toddlers

Table 4 Factors associated with receipt of pH1N1 and seasonal influenza vaccines

Variable	No. received pH1N1 vaccine (%)	OR (95% CI)	No. received seasonal influenza vaccine (%)	OR (95% CI)
Sex (n = 383)				
Female	44 (12)	1.48 (0.19, 11.76)	82 (22)	0.85 (0.22, 3.22)
Male	1 (8)		3 (25)	
Race (n = 381)				
White	25 (13)	Ref	51 (26)	Ref
Black/African American	15 (9)	0.71 (0.36, 1.39)	27 (17)	0.58* (0.34, 0.97)
Other ^a	5 (22)	1.91 (0.65, 5.60)	6 (26)	1.01 (0.38, 2.70)
Ethnicity (n = 375)				
Hispanic or Latino	6 (46)	7.53** (2.40, 23.59)	5 (38)	2.35 (0.75, 7.40)
Not Hispanic or Latino	37 (10)		76 (21)	
Household includes children ≤5 months (n = 384)				
Yes	1 (6)	0.48 (0.06, 3.76)	7 (44)	2.84 (1.03, 7.87)
No	44 (12)		78 (22)	
Household includes children 6 months–17 years (n = 384)				
Yes	22 (11)	0.86 (0.46, 1.61)	33 (16)	0.48** (0.30, 0.79)
No	22 (12)		51 (29)	
Highest education level (n = 384)				
High school graduate or less	6 (5)	0.30** (0.12, 0.72)	22 (18)	0.69 (0.40, 1.19)
Some college or higher	39 (15)		63 (24)	
Annual household income (n = 368)				
<\$35,000	30 (13)	1.39 (0.70, 2.76)	50 (22)	0.92 (0.55, 1.53)
≥\$35,000	13 (10)		31 (23)	
Have underlying medical condition (n = 383)				
Yes	8 (12)	1.00 (0.44, 2.25)	19 (28)	0.67 (0.40, 1.22)
No	37 (12)		66 (21)	
Pregnant (n = 363)				
Yes	6 (38)	5.18** (1.78, 15.10)	5 (31)	1.64 (0.56, 4.89)
No	36 (10)		75 (22)	
Employment status (n = 384)				
Part time	14 (24)	2.95** (1.46, 5.97)	17 (29)	1.52 (0.82, 2.84)
Full time	31 (10)		68 (21)	
Care for children 0–5 months (n = 384)				
Yes	13 (14)	1.27 (0.64, 2.54)	13 (14)	0.48* (0.25, 0.92)
No	32 (11)		72 (25)	
Care for children 6–12 months (n = 384)				
Yes	15 (13)	1.18 (0.61, 2.28)	21 (18)	0.71 (0.41, 1.23)
No	30 (11)		64 (24)	
Care for children 13 months–3 years (n = 384)				
Yes	37 (16)	3.21** (1.45, 7.11)	55 (23)	1.18 (0.72, 1.96)
No	8 (5)		30 (20)	
Care for children ≥4 years (n = 384)				
Yes	15 (11)	0.84 (0.43, 1.61)	29 (21)	0.86 (0.52, 1.43)
No	30 (12)		56 (23)	
Center type worked at (n = 384)				
Chain, corporate or university-affiliated center	29 (22)	4.15** (2.16, 7.98)	38 (29)	1.78* (1.09, 2.92)
Independent or religiously-affiliated center	16 (6)		47 (19)	

Table 4 continued

Variable	No. received pH1N1 vaccine (%)	OR (95% CI)	No. received seasonal influenza vaccine (%)	OR (95% CI)
Work at NAEYC-accredited center (n = 384)				
Yes	18 (28)	4.14** (2.12, 8.10)	16 (25)	1.21 (0.65, 2.26)
No	27 (8)		69 (22)	
Child care providers can spread _ flu to children (n = 382, 381)				
Agree	42 (12)	1.62 (0.48, 5.51)	81 (23)	1.31 (0.43, 3.98)
Disagree	3 (8)		4 (18)	
Children can spread _ flu to child care providers (n = 382, 381)				
Agree	43 (11.9)	1.28 (0.29, 5.71)	80 (22)	0.91 (0.32, 2.57)
Disagree	2 (9.5)		5 (24)	
_ flu is a serious infection (n = 378, 381)				
Agree	41 (12)	0.98 (0.33, 2.92)	77 (24)	2.00 (0.91, 4.41)
Disagree	4 (12)		8 (14)	
The _ vaccine could make me sick (n = 382, 380)				
Agree	36 (11)	0.71 (0.32, 1.57)	63 (20)	0.47* (0.26, 0.85)
Disagree	9 (15)		21 (34)	
The _ vaccine will prevent me from getting the _ flu (n = 383, 381)				
Yes	38 (17)	4.60** (2.00, 10.59)	71 (33)	5.50** (2.97, 10.19)
No	7 (4)		14 (8)	

pH1N1 2009 pandemic influenza A (H1N1), OR odds ratio, CI confidence interval, NAEYC National Association for the Education of Young Children

^a Other race includes those respondents who selected American Indian or Alaska Native, Asian, Native Hawaiian or Pacific Islander, or “other” for race

* $P < 0.05$; ** $P < 0.01$

(OR = 3.25, 95% CI = 1.15, 9.19), having positive attitudes towards the vaccine (OR = 5.23, CI = 3.32, 8.22), feeling external pressure to get it (OR = 3.10, 95% CI = 2.01, 4.77), and feeling personal control over whether or not to get it (OR = 1.68, 95% CI = 1.03, 2.74).

Factors independently associated with receipt of the seasonal influenza vaccine included believing in the efficacy of that vaccine (OR = 3.16, 95% CI = 1.44, 6.92), having positive attitudes towards it (OR = 2.83, 95% CI = 1.46, 5.48), feeling external pressure to get it (OR = 3.34, 95% CI = 2.04, 4.84), and feeling personal control over whether or not to get it (OR = 2.07, 95% CI = 1.06, 4.04). Factors independently associated with not receiving the seasonal influenza vaccine were caring for young infants (OR = 0.36, 95% CI = 0.16, 0.83) and having children 6 months–17 years old in the household (OR = 0.43, CI = 0.25, 0.74).

Discussion

Only 12 and 22% of responding child care center employees reported receiving the 2009 pH1N1 and the

2009–2010 seasonal influenza vaccines, respectively, despite the fact that caregivers of children aged <5 years were in the target groups to receive the vaccines by the ACIP at the time of the survey [13, 15, 16]. Vaccination of caregivers of children <6 months is especially important because young infants are at high risk for influenza complications yet are too young to receive the vaccine. Despite this recommendation, only 14 and 17% of child care center employees caring for young infants received the pH1N1 and seasonal influenza vaccines, respectively. Our evaluation demonstrates the need for promotion of influenza vaccination among child care workers.

To our knowledge, this is the first published study regarding pH1N1 vaccination in child care center employees, and data regarding seasonal influenza vaccination rates among this group is limited. Our vaccine rates were lower than the seasonal influenza vaccine rates (26–51% annually) found by Lee et al. [24] among child care providers at one Pennsylvania child care center from 2002–2007. In that study, the 51% vaccine coverage rate occurred during the year free on-site vaccination was offered. One-third of those vaccinated stated they would not have been vaccinated if they needed to pay for it.

Our influenza vaccination rates were also lower than those found by Hayney and Bartell [25] (30–60% annually) among child care staff at five centers in Wisconsin from 2002 to 2003. Findings from this study demonstrate that offering free on-site influenza vaccination and a vaccination education program as part of regular staff meetings significantly increased the vaccination rates to 60%. Studies have also shown that offering free vaccines leads to higher coverage rates in healthcare personnel [26–31].

We found that working at chain or corporate- or university-affiliated child care centers was positively associated with pH1N1 vaccine receipt. Eleven (24%) of 45 respondents who received the pH1N1 vaccine reported receiving it at the workplace. Ten of these 11 respondents worked for the same university-affiliated child care center. This center had the highest pH1N1 vaccine rate of all centers at 83, and 92% of respondents from this center expressed agreement that their manager/employer wanted them to get the vaccine.

Employers and managers should consider recommending the influenza vaccine to employees and explore the feasibility of offering influenza vaccination at no or reduced cost to employees on-site. Employer requirement of influenza vaccine was associated with higher rates of pH1N1 and seasonal influenza vaccination among healthcare personnel [32]; methods to maximize employee vaccination should be considered in child care centers as part of a comprehensive influenza control strategy. We also recommended to the county that its agencies consider offering more specific training on influenza to child care center employees.

The most common reasons cited for not receiving the pH1N1 and seasonal influenza vaccine were “I don’t think I need the vaccine,” “I don’t think the vaccine will keep me from getting the flu,” and “the vaccine is not safe.” These cited reasons are similar to those most commonly cited by respondents of a community study examining intent to receive the pH1N1 vaccine. These included the belief that they were unlikely to be infected, concern over vaccine side effects, and a perception that if infected the illness would be mild [33]. Though the supply of pH1N1 vaccine was initially limited in the beginning of the 2009–2010 influenza season and the supply of the seasonal influenza vaccine was limited towards the end of that season, very few respondents cited “I tried to get the vaccine but could not get it” as the main reasons for not getting the pH1N1 (2%) and seasonal influenza vaccines (1%). This suggests that lack of supply was not an issue.

The majority of responding child care center employees believed that child care workers and children can spread influenza infection amongst each other and believed that influenza infection is serious. However, 25 and 31% of respondents cited “I don’t think I need the vaccine” as the

main reason for not receiving the pH1N1 and seasonal influenza vaccines, respectively. This lack of perceived need was also shown to be a common reason for influenza vaccine refusal in healthcare personnel [32, 34].

In our evaluation, 42 and 44% of respondents believed that the pH1N1 and seasonal influenza vaccines would not prevent them from getting infected. In addition, 84% of respondents believed that each vaccine “could make me sick” though influenza vaccination cannot cause influenza [16]. Belief in these commonly held misconceptions was also found to be associated with influenza vaccine declination among healthcare personnel in other US studies [29–31, 35–39]. Thus, these barriers are not exclusive to child care employees.

We recommended to the county that child care center employees and the general population be kept informed of vaccination campaigns through various media. Health communications messages should include information to address the most common misconceptions about the need for, efficacy of, and safety of the vaccine. We created a fact sheet targeted to child care employees that dispels some misunderstandings about influenza and the influenza vaccine, and we distributed it to the county and participating centers. Since annual influenza vaccination is now recommended for all persons aged ≥ 6 months [16], it is possible that this simpler message may improve influenza vaccination coverage.

Factors independently associated with receipt of each vaccine included having positive attitudes towards the vaccine and feeling external pressure to get vaccinated. These findings suggest that employees’ feelings towards the vaccines and perceptions about getting the vaccines were more predictive of receipt of each vaccine than demographic and work characteristics and underlying medical conditions. Lack of perception of external pressure from managers and coworkers likely played a contributory role in the 13 centers with 0% pH1N1 vaccination rates and 4 centers with 0% seasonal influenza vaccination rates among employees. We recommended that employers, managers, and center directors identify an employee who can advocate getting the influenza vaccine to coworkers. This was shown to be effective in increasing influenza vaccination rates among healthcare personnel [40].

Our evaluation was subject to some limitations. First, respondents self-reported their receipt of either vaccine, and this may have been subject to recall bias. Vaccination was not validated by medical records, and respondents may have confused receipt of the pH1N1 and seasonal influenza vaccinations. Second, our evaluation focused on employees of licensed child care centers in one county, and our results may not be generalizable to workers in other child care settings such as nannies or home providers or in other counties.

In conclusion, employees at child care centers in one Ohio county had low rates of pH1N1 and 2009–2010 seasonal influenza vaccination. Factors associated with receipt of either vaccine included having positive attitudes towards it and feeling external pressure from others to get it. Misconceptions about the need for the vaccines and the efficacy and safety of the vaccines were the most common reasons cited for not receiving either vaccine. Our findings highlight the need to focus efforts on child care employees with health communications messages about the benefits, safety, and effectiveness of vaccination.

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