Centers for Disease Control and Prevention
MMWR
Morbidity and Mortality Weekly Report
Weekly / Vol. 63 / No. 37
September 19, 2014

Influenza Vaccination Coverage Among Health Care Personnel — United States, 2013–14 Influenza Season

Carla L. Black, PhD[1], Xin Yue, MPS, MS[1], Sarah W. Ball, ScD[2], Sara M.A. Donahue, DrPH[2], David Izrael, MS[2], Marie A. de Perio, MD[3], A. Scott Laney, PhD[4], Megan C. Lindley, MPH[1], Samuel B. Graitcer, MD[1], Peng-jun Lu, MD, PhD[1], Walter W. Williams, MD[1], Carolyn B. Bridges, MD[1], Charles DiSogra, DrPH[5], John Sokolowski[5], Deborah K. Walker, EdD[2], Stacie M. Greby, DVM[1] (Author affiliations at end of text)

The Advisory Committee on Immunization Practices recommends that all health care personnel (HCP) be vaccinated annually against influenza (*1*). Vaccination of HCP can reduce influenza-related morbidity and mortality among both HCP and their patients (*1–4*). To estimate influenza vaccination coverage among HCP during the 2013–14 season, CDC analyzed results of an opt-in Internet panel survey of 1,882 HCP conducted during April 1–16, 2014. Overall, 75.2% of participating HCP reported receiving an influenza vaccination during the 2013–14 season, similar to the 72.0% coverage among participating HCP reported in the 2012–13 season (*5*). Coverage was highest among HCP working in hospitals (89.6%) and lowest among HCP working in long-term care (LTC) settings (63.0%). By occupation, coverage was highest among physicians (92.2%), nurses (90.5%), nurse practitioners and physician assistants (89.6%), pharmacists (85.7%), and "other clinical personnel" (87.4%) compared with assistants and aides (57.7%) and nonclinical personnel (e.g., administrators, clerical support workers, janitors, and food service workers) (68.6%). HCP working in settings where vaccination was required had higher coverage (97.8%) compared with HCP working in settings where influenza vaccination was not required but promoted (72.4%) or settings where there was no requirement or promotion of vaccination (47.9%). Among HCP without an employer requirement for vaccination, coverage was higher for HCP working in settings where vaccination was offered on-site at no cost for 1 day (61.6%) or multiple days (80.4%) compared with HCP working in settings not offering free on-site vaccination (49.0%). Comprehensive vaccination strategies that include making vaccine available at no cost at the workplace along with active promotion of vaccination might be needed to increase vaccination coverage among HCP and minimize the risk for influenza to HCP and their patients.

The opt-in Internet panel survey was conducted for CDC by Abt Associates, Inc. (Cambridge, Massachusetts) during April 1–16, 2014, to provide estimates of influenza vaccination coverage among HCP during the 2013–14 influenza season. Two preexisting national opt-in Internet panels were used to recruit HCP for the survey. HCP were recruited through e-mails and messages on the panel websites and were eligible for the survey if they reported working in at least one of eight health care settings or reported any patient contact. Professional clinical HCP (physicians, nurse practitioners, physician assistants, nurses,

INSIDE

Continuing Education examination available at http://www.cdc.gov/mmwr/cme/conted_info.html#weekly.

U.S. Department of Health and Human Services
Centers for Disease Control and Prevention

dentists, pharmacists, allied health professionals, technicians, and technologists) were recruited from the current membership roster of Medscape, a medical website managed by WebMD Health Professional Network.* Medscape's terms of service explicitly permit WebMD Professional Network to contact members about programming, including survey research; panelists receive an honorarium for completing surveys. HCP in other occupations (e.g., assistants, aides, administrators, clerical support workers, janitors, food service workers, and housekeepers) who met eligibility criterion were recruited for a health survey from general population Internet panels operated by or in partnership with Survey Sampling International (SSI) that provide panel members with online survey opportunities in exchange for nominal incentives.† Among the 2,054 HCP who entered the two panel survey sites and had eligible responses to the screening questions, 1,949 (94.9%) completed the survey.§ Sixty-six respondents with completed surveys who reported working in "other health care settings" were excluded because examination of other survey responses indicated that they were either unlikely to have contact with patients or that their work setting was not one of the health care settings of interest for this analysis. One respondent was excluded because of missing data for the question used to determine vaccination status, leaving a final analytic sample of 1,882 HCP.

Survey items included demographic characteristics, occupation type, work setting, self-reported influenza vaccination, and employer vaccination policies (vaccination requirements, vaccination availability at the workplace, and promotion of vaccination [including recognition, rewards, compensation, and free or subsidized vaccination]). Based on responses to the questionnaire, occupation type for HCP from both opt-in Internet panel sources were divided into seven groups for this analysis: physicians, nurse practitioners/physician assistants, nurses, pharmacists, assistants/aides, other clinical HCP, and nonclinical HCP. Work settings for HCP from both opt-in Internet panel sources were divided into four groups for this analysis: 1) hospitals, 2) ambulatory care/physician offices, 3) LTC settings, and 4) other clinical settings.¶ Respondents could specify working in more than one work setting. Sampling weights were calculated based on each occupation type by age, sex, race/ethnicity, work setting, and census region to represent the U.S. population of HCP. Vaccination coverage estimates

* Additional information available at http://www.medscape.com.
† Additional information available at http://www.surveysampling.com.
§ A survey response rate requires specification of the denominator at each stage of sampling. During recruitment of an online opt-in survey sample, such as the Internet panels described in this report, these numbers are not available; therefore, a response rate cannot be calculated. Instead, the survey completion rate is provided.

¶ Ambulatory care/physician's office included physicians' offices, medical clinics, and other nonhospital outpatient or ambulatory care settings. LTC settings included nursing homes, home health agencies, home health care settings, assisted living facilities, or other LTC settings. Other clinical setting included dental offices or clinics, pharmacies, laboratories, public health settings, health care education settings, emergency medical services settings, or other settings where clinical care or related services were provided to patients.

The *MMWR* series of publications is published by the Center for Surveillance, Epidemiology, and Laboratory Services, Centers for Disease Control and Prevention (CDC), U.S. Department of Health and Human Services, Atlanta, GA 30329-4027.

Suggested citation: [Author names; first three, then et al., if more than six.] [Report title]. MMWR 2014;63:[inclusive page numbers].

What is already known on this topic?

The Advisory Committee on Immunization Practices recommends annual influenza vaccination for all health care personnel (HCP) to reduce influenza-related morbidity and mortality in health care settings. Estimates of overall HCP vaccination coverage were 66.9% for the 2011–12 season and 72.0% for the 2012–13 season.

What is added by this report?

Influenza vaccination coverage among HCP during the 2013–14 influenza season, assessed using an opt-in Internet panel survey, was 75.2%, similar to coverage for the 2012–13 season. Vaccination coverage was highest among physicians overall and HCP working in hospital settings; coverage was lowest among assistants/aides overall and HCP working in long-term care settings. Offering vaccination at the workplace at no cost was associated with higher vaccination coverage.

What are the implications for public health practice?

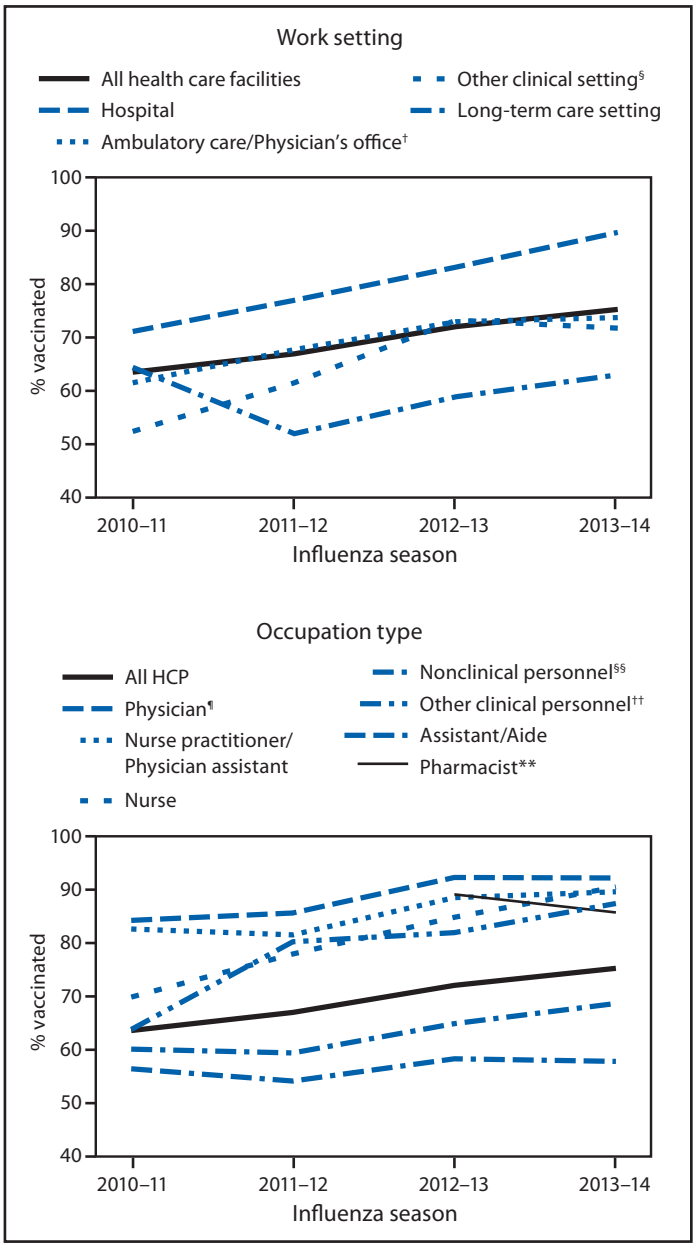
Comprehensive worksite intervention strategies that include vaccination promotion and convenient access to vaccination at no cost might increase vaccination coverage among HCP.

from opt-in Internet panel surveys completed for the 2010–11, 2011–12, 2012–13, and 2013–14 seasons were compared to assess trends over time. Similar methodology was used for all four influenza seasons, although Internet panels used to recruit both clinical and nonclinical HCP in 2010-11 differed from those used in subsequent years (*5–7*). Because the study sample was based on HCP from opt-in Internet panels rather than probability samples, no statistical tests were performed.** Differences were noted when there was a difference of ≥5 percentage points between any estimates being compared.

Overall, 75.2% of HCP reported receiving an influenza vaccination during the 2013–14 season, an increase of 11.7 percentage points compared with the 2010–11 season estimate, but similar to the 72.0% coverage estimate reported in 2012–13 (Figure, Table 1). With the exception of LTC settings, coverage for the 2013–14 season was higher in all work settings compared with the 2010–11 and 2011–12 seasons (Figure). However, overall, only HCP working in hospital settings had an increase in coverage during the 2013–14 season compared with the 2012–13 season (Figure, Table 1). By occupation type, coverage during the 2013–14 season was 92.2% among physicians, 89.6% among nurse practitioners/physician assistants, 90.5% among nurses, 85.7% among pharmacists, 57.7% among assistants/aides, 87.4% among other clinical personnel, and 68.6% among nonclinical personnel (Table 1). Only nurses and other clinical personnel had increased coverage

** Additional information available at http://www.aapor.org/opt_in_surveys_and_margin_of_error1.htm.

FIGURE. Percentage of health-care personnel (HCP)* who received influenza vaccination, by work setting and occupation type — Internet panel survey, United States, 2010–11 through 2013–14 influenza seasons



* Persons who work in a place where clinical care or related services were provided to patients, or whose work involves face-to-face contact with patients or who were ever in the same room as patients.
† Ambulatory care (physician's office, medical clinic, and other ambulatory care setting).
§ Dentist's office or dental clinic, pharmacy, laboratory, public health setting, health care education setting, emergency medical services setting, or other setting where clinical care or related services was provided to patients.
¶ Included dentists for 2010–11 season.
** Individual data on pharmacists not collected before the 2012–13 season.
†† Allied health professionals, technicians, and technologists. Includes pharmacists for the 2010–11 and 2011–12 seasons.
§§ Administrative support staff or managers and nonclinical support staff (e.g., food service workers, housekeeping staff, maintenance staff, janitors, and laundry workers).

TABLE 1. Percentage of health care personnel (HCP)* who received influenza vaccination, by work setting and occupation — Internet panel survey, United States, 2012–13 and 2013–14 influenza seasons

Work setting†/ Occupation	2012–13			2013–14			Percentage-point difference 2012–13 to 2013–14
	No. in sample	Weighted %§	Weighted % vaccinated	No. in sample	Weighted %§	Weighted % vaccinated	
Overall	**1,944**	**100.0**	**72.0**	**1,882**	**100.0**	**75.2**	**3.2**
Hospital	961	38.1	83.1	880	40.8	89.6	6.5
Physician	209	6.3	93.2	185	5.7	93.1	-0.1
NP/PA	50	1.3	88.0	42	0.8	97.6	9.6
Nurse	121	28.2	86.5	125	27.5	94.7	8.2
Pharmacist	44	0.6	97.7	—¶	—¶	—¶	—¶
Assistant/Aide	—¶	—¶	—¶	—¶	—¶	—¶	—¶
Other clinical personnel**	328	25.1	88.1	271	28.3	92.3	4.2
Nonclinical personnel††	177	27.2	79.5	198	29.2	84.4	4.9
Ambulatory care/ Physician office§§	636	32.9	72.9	649	28.0	73.7	0.8
Physician	221	9.4	91.6	250	11.4	91.6	0.0
NP/PA	94	2.9	92.6	98	2.6	89.8	-2.8
Nurse	48	18.0	79.9	56	19.4	82.2	2.3
Pharmacist	—¶	—¶	—¶	—¶	—¶	—¶	—¶
Assistant/Aide	—¶	—¶	—¶	—¶	—¶	—¶	—¶
Other clinical personnel**	163	22.2	80.3	125	18.2	78.9	-1.4
Nonclinical personnel††	79	36.1	58.6	90	40.7	62.7	4.1
Long-term care setting	427	22.8	58.9	364	30.5	63.0	4.1
Physician	—¶	—¶	—¶	—¶	—¶	—¶	—¶
NP/PA	—¶	—¶	—¶	—¶	—¶	—¶	—¶
Nurse	32	7.5	85.4	—¶	—¶	—¶	—¶
Pharmacist	—¶	—¶	—¶	—¶	—¶	—¶	—¶
Assistant/Aide	143	70.7	54.7	121	60.9	54.4	-0.3
Other clinical personnel**	52	4.1	65.7	47	6.2	89.4	23.7
Nonclinical personnel††	165	16.1	60.8	139	22.6	66.4	5.6
Other clinical setting¶¶	237	15.1	73.2	327	11.9	71.7	-1.5
Physician	—¶	—¶	—¶	—¶	—¶	—¶	—¶
NP/PA	—¶	—¶	—¶	—¶	—¶	—¶	—¶
Nurse	—¶	—¶	—¶	—¶	—¶	—¶	—¶
Pharmacist	61	2.2	88.5	64	9.4	87.6	-0.9
Assistant/Aide	—¶	—¶	—¶	—¶	—¶	—¶	—¶
Other clinical personnel**	74	25.5	75.0	167	27.0	82.0	7.0
Nonclinical personnel††	46	35.1	56.7	46	34.3	52.1	-4.6
Overall occupation							
Physician	322	4.3	92.3	326	4.1	92.2	-0.1
NP/PA	131	1.3	88.5	125	0.9	89.6	1.1
Nurse	202	19.4	84.8	203	18.7	90.5	5.7
Pharmacist	92	0.5	89.1	75	1.3	85.7	-3.4
Assistant/Aide	178	24.7	58.2	152	23.6	57.7	-0.5
Other clinical personnel**	544	19.2	81.9	533	19.3	87.4	5.5
Nonclinical personnel††	449	30.2	64.8	445	31.9	68.6	3.8

Abbreviation: NP/PA = nurse practitioner/physician assistant.

* Persons who work in a place where clinical care or related services were provided to patients, or whose work involves face-to-face contact with patients or who were ever in the same room as patients.

† Respondents could specify working in more than one setting.

§ Weights were calculated based on each occupation type by age, sex, race/ethnicity, work setting, and census region to represent the U.S. population of HCP. Work setting and overall occupation are presented as weighted estimates of the total sample. Where the groups are stratified by work setting, the weighted estimates are presented for each subgroup within the group.

¶ Estimate suppressed because sample size was <30.

** Allied health professionals, technicians, and technologists.

†† Administrative support staff or managers and nonclinical support staff (e.g., food service workers, housekeeping staff, maintenance staff, janitors, and laundry workers).

§§ Physician's offices, medical clinics, and other ambulatory care settings.

¶¶ Dentist office or dental clinic, pharmacy, laboratory, public health setting, health care education setting, emergency medical services setting, or other settings where clinical care or related services was provided to patients.

compared with the 2012–13 season (90.5% versus 84.8% and 87.4% versus 81.9%, respectively).

During the 2013–14 season, influenza vaccination coverage was higher for HCP working in settings where vaccination was required (97.8%) compared with HCP working in settings where vaccination was not required but promoted (72.4%) or settings where there was no requirement or promotion (47.9%) (Table 2). Influenza vaccination coverage was above 96% in all work settings where vaccination was required, including LTC settings (Table 2). Thirty-six percent of HCP were required by their employer to be vaccinated, an increase from 13% during the 2010–11 season. HCP working in hospitals were more likely to be required to be vaccinated (58.2%) than those working in other settings (range = 20.1%–33.6%), whereas HCP working in LTC settings were least likely to be required to be vaccinated (20.1%). HCP working in LTC settings were most likely to report that their employer neither required nor promoted vaccination (42.6%) compared with HCP working in other health care settings. In contrast, only 7.0% of HCP working in hospitals reported that their employer neither required nor promoted vaccination (Table 2).

The majority of vaccinated HCP (77.3%) reported receiving the vaccination at work. Among HCP without an employer requirement for vaccination, vaccination coverage among HCP working in facilities that made vaccination available on-site at no cost for more than 1 day was 80.4%, compared with 61.6% in facilities that made vaccination available at no cost for 1 day only and 49.0% in facilities that did not provide influenza vaccination on-site or offered on-site vaccination but not at no cost (Table 2). On-site vaccination for more than 1 day at no cost was more likely to be available to HCP working in hospitals (75.1%) than to HCP working in ambulatory care settings (43.0%), other clinical settings (31.1%), and LTC settings (14.6%).

Among vaccinated HCP, the most common reasons given for vaccination were "To protect myself from flu" (43.5%), "My employer requires me to be vaccinated for flu" (25.5%), and "To protect patients from getting flu" (8.5%). Among unvaccinated HCP, the most common reasons given for not being vaccinated†† were "I might get sick from the vaccine" (20.1%), "I don't think that flu vaccines work" (16.3%), and "I don't need it" (16.0%).

†† Among respondents, 28.4% initially selected "I just don't want the vaccine" as their main reason for not being vaccinated. When these persons were asked in a follow-up question to identify a more specific reason for not wanting the vaccine, 28.0% replied "I don't think the ingredients in the vaccine are good for you," 27.8% said "I don't need it," 23.2% said "I might get sick from the vaccine," and 20.9% said "I don't think that flu vaccines work."

TABLE 2. Percentage of health care personnel (HCP)* who received influenza vaccination, by work setting and vaccination requirements/availability status — Internet panel survey, United States, 2010–11 through 2013–14 influenza seasons

	2010–11			2011–12			2012–13			2013–14		
Vaccination status/ Work setting	No. in sample	Weighted %†	Weighted % vaccinated	No. in sample	Weighted %†	Weighted % vaccinated	No. in sample	Weighted %†	Weighted % vaccinated	No. in sample	Weighted %†	Weighted % vaccinated
Influenza vaccination requirement and vaccine promotion (2012–13 season definition)												
Required	230	13.0	98.1	496	21.1	93.7	549	22.4	96.5	738	35.5	97.8
Hospital	121	21.9	98.1	362	32.0	95.2	388	37.2	95.1	520	58.2	97.7
Ambulatory care/ Physician office§	76	11.0	96.2	153	21.8	95.5	191	21.0	99.8	252	33.6	96.4
Long-term care	—¶	—¶	—¶	45	10.4	86.1	61	13.0	95.8	88	20.1	98.4
Other clinical setting**	—¶	—¶	—¶	—¶	—¶	—¶	38	10.7	100.0	88	29.3	99.5
No requirement but promotion††	320	17.2	64.8	390	16.1	75.4	901	43.1	76.9	764	38.6	72.4
Hospital	141	22.3	62.0	255	21.6	75.4	456	49.7	78.1	307	34.8	79.8
Ambulatory care/ Physician office§	88	13.9	60.2	106	15.3	70.0	273	41.2	80.1	247	40.2	73.6
Long-term care	31	18.1	71.9	62	14.0	77.7	183	35.0	67.0	149	37.3	61.5
Other clinical setting**	60	11.0	71.8	30	8.9	94.9	134	49.9	85.7	164	43.7	71.9
No requirement or promotion	1,373	69.9	56.7	1,450	62.8	55.2	487	34.5	50.4	378	25.6	47.9
Hospital	352	55.8	64.2	566	46.4	65.0	115	13.1	67.7	53	7.0	70.3
Ambulatory care/ Physician office§	490	75.1	56.5	486	62.9	57.0	170	37.9	50.4	150	26.2	44.5
Long-term care	173	73.2	58.2	343	75.6	41.4	179	52.0	45.0	127	42.6	47.7
Other clinical setting**	358	86.2	48.4	225	84.0	56.5	65	39.5	50.2	75	26.9	41.0

See table footnotes on page 810.

TABLE 2. (*Continued*) Percentage of health care personnel (HCP)* who received influenza vaccination, by work setting and vaccination requirements/availability status — Internet panel survey, United States, 2010–11 through 2013–14 influenza seasons

Vaccination status/ Work setting	2010–11			2011–12			2012–13			2013–14		
	No. in sample	Weighted %†	Weighted % vaccinated	No. in sample	Weighted %†	Weighted % vaccinated	No. in sample	Weighted %†	Weighted % vaccinated	No. in sample	Weighted %†	Weighted % vaccinated
Influenza vaccination available at no cost§§												
For more than 1 day¶¶	1,095	60.1	69.6	971	44.2	71.6	658	36.7	80.5	542	38.9	80.4
Hospital	436	86.5	69.0	598	69.7	72.3	382	59.4	81.9	261	75.1	82.0
Ambulatory care/ Physician office§	385	62.4	70.4	314	41.8	70.0	189	35.2	82.3	183	43.0	80.7
Long-term care	121	55.4	71.0	124	22.8	61.2	115	19.8	74.8	63	14.6	71.6
Other clinical setting**	153	27.9	69.3	88	30.1	87.1	85	32.0	84.3	107	31.1	85.0
1 day only¶¶	64	4.8	46.0	245	15.1	59.9	227	12.7	67.6	169	11.8	61.6
Hospital	—¶	—¶	—¶	104	14.9	60.1	89	15.8	66.3	43	10.0	55.6
Ambulatory care/ Physician office§	—¶	—¶	—¶	82	15.8	52.8	88	11.8	80.1	76	17.0	69.3
Long-term care	—¶	—¶	—¶	48	14.9	53.2	58	12.9	49.7	43	12.5	54.1
Other clinical setting**	—¶	—¶	—¶	40	13.6	89.7	—¶	—¶	—¶	31	9.2	72.9
Not available* **	529	35.0	40.4	622	40.7	45.0	510	50.6	53.1	433	49.3	49.0
Hospital	41	9.4	33.9	120	15.5	56.9	102	24.9	67.9	56	15.0	74.5
Ambulatory care/ Physician office§	175	32.9	28.7	197	42.4	51.3	168	53.0	51.6	138	40.0	39.1
Long-term care	67	37.0	51.4	231	62.3	39.1	193	67.3	47.8	170	72.9	50.6
Other clinical setting**	246	67.8	42.2	125	56.3	39.4	89	59.8	60.7	101	59.7	45.1

* Persons who work in a place where clinical care or related services were provided to patients, or whose work involves face-to-face contact with patients or who were ever in the same room as patients.

† Weights were calculated based on each occupation type by age, sex, race/ethnicity, work setting, and census region to represent the U.S. population of HCP. Requirement status and vaccine availability are presented as weighted estimates of the total sample. Where the groups are stratified by work setting, the estimates are presented as weighted estimates of the subsample of each work setting subgroup.

§ Physician's offices, medical clinics, and other ambulatory care settings.

¶ Estimate suppressed because sample size was <30.

** Dentist office or dental clinic, pharmacy, laboratory, public health setting, health care education setting, emergency medical services setting, or other setting where clinical care or related services was provided to patients.

†† Influenza vaccination was promoted among employees through public identification of vaccinated persons, financial incentives or rewards to groups of employees, competition among units or care areas, free or subsidized cost of vaccination, reminders, publicizing of the number or percentage of employees receiving vaccination, and special events.

§§ Restricted to respondents without a requirement for vaccination. In the 2013–14 season, 87.9% of HCP with a requirement for vaccination had vaccination available onsite at no cost for at least 1 day. Vaccination coverage among HCP with a vaccination requirement was >96%, regardless of workplace availability of vaccination.

¶¶ Question only asked of those reporting influenza vaccinations offered on-site during this influenza season.

*** Influenza vaccination not offered on-site during the influenza season or offered on-site but not available at no cost to employees.

Discussion

The overall HCP influenza vaccination coverage estimate for the 2013–14 season was 75.2%, similar to the estimate of 72.0% from the previous influenza season, but higher than the estimates of 63.5% and 66.9% observed for the 2010–11 and 2011–12 seasons, respectively (*5*–*7*). As in the 2012–13 season, coverage during the 2013–14 season was >90% for two groups of HCP: physicians, regardless of the settings in which they worked, and HCP with an employer requirement to be vaccinated, regardless of work setting.

The results of this survey showed that higher vaccination coverage among HCP was associated with employer vaccination requirements, vaccination promotion, and access to vaccination at the workplace at no cost for more than 1 day. Vaccination at the worksite, the most common place of vaccination reported by HCP in this survey, has been associated with higher seasonal vaccination coverage among HCP (*8*). This study found that coverage of 80.4% was achieved in the absence of a vaccination requirement among HCP working in facilities where free on-site vaccination was available for more than 1 day. However, 49.3% of HCP without a requirement to be vaccinated worked in locations that either did not offer vaccination on-site, or if offered, did not make vaccination available at no cost. These results indicate that a comprehensive strategy that includes promotion of vaccination along with easy access to vaccination at no cost on multiple days might increase HCP vaccination coverage.

Consistent with the previous two seasons, coverage among HCP working in LTC settings was the lowest among the work

settings examined. This might be attributable to several factors. The majority of surveyed HCP working in LTC settings were assistants or aides, the occupational group with the lowest coverage in this analysis. HCP working in LTC settings also were most likely to report that their employer neither required nor promoted vaccination and least likely to report that their employer made vaccination available at no cost for multiple days. Influenza vaccination of HCP in LTC settings is important given that influenza vaccine effectiveness is generally lowest in the elderly, making vaccination of close contacts even more critical (*3*). In addition, multiple studies have demonstrated that vaccination of HCP in LTC settings confers a health benefit to patients, including reduced risk for mortality (*2–4*).

The findings in this report are subject to at least six limitations. First, the findings might differ from those based on the National Health Interview Survey (NHIS), a probability-based survey that might be more representative of the general HCP personnel population. Influenza vaccination coverage among HCP from the opt-in Internet panel survey differed from the population-based sample in the NHIS in the 2009–10 through 2011–12 seasons (e.g., 66.9% influenza vaccination coverage among HCP in the opt-in Internet panel survey versus 62.4% in the NHIS for the 2011–12 season) (*9*). Additional comparisons with NHIS and other available data sources over multiple seasons are needed to determine whether the more timely opt-in Internet panel survey estimates, despite sampling differences, provide valid assessments of trends. Second, the sample was not randomly selected from HCP in the United States. The opt-in Internet panel survey used a nonprobability sample of volunteer HCP members of the Medscape and SSI Internet panels and did not include HCP without Internet access. Despite poststratification weighting, the results based on this nonprobability sample might not be representative of the HCP population in the United States. Noncoverage and nonresponse bias might remain even after weighting adjustments. Third, all results were based on self-report and were not verified by employment or medical records. Self-report of vaccination might be subject to recall bias. Fourth, the wording of the questions used to ascertain vaccination promotion in the 2012–13 and 2013–14 surveys differed from previous surveys; therefore, the vaccination promotion trend might not be comparable across survey years. Fifth, the 2011–12 through 2013–14 opt-in Internet panel survey might not be directly comparable with the 2010–11 opt-in Internet panel survey because different methods of recruitment were used for the 2010–11 season. Whereas the same two opt-in Internet panels were used for the 2011–12 through 2013–14 surveys, the majority of HCP in the 2010–11 survey were recruited from a population-based Internet research panel that was supplemented with respondents from opt-in medical specialty and general population Internet panels that differed from those used in subsequent years (*5–7*). Sixth, the definitions of some occupational groups differ across survey years; dentists were included with physicians in the 2010-11 survey, and pharmacists were included with "other clinical personnel" prior to the 2012–13 survey. Finally, the definitions of HCP, occupation type, and work setting used in this opt-in Internet panel survey vary from definitions used in other surveys of vaccination coverage; therefore, results might not be comparable.

The *Guide to Community Preventive Services*[§§] provides guidance on effective evidence-based interventions to increase the use of influenza vaccination. Higher vaccination coverage and increased use of vaccination requirements and promotion in hospitals compared with other settings might be partly attributable to the Centers for Medicare & Medicaid Services requirement to report HCP influenza vaccination levels as part of the Hospital Inpatient Quality Reporting Program (*10*). The results of this report indicate that higher HCP vaccination coverage was associated with employer requirements for vaccination. In the absence of vaccination requirements, expanding the number of health care facilities offering vaccination onsite, over multiple days, and at no cost might help sustain and improve influenza vaccination coverage among HCP.

[§§] Additional information available at http://www.thecommunityguide.org/vaccines/index.html.

[1]Immunization Services Division, National Center for Immunization and Respiratory Diseases, CDC; [2]Abt Associates Inc., Cambridge, MA; [3]Division of Surveillance, Hazard Evaluations, and Field Studies, National Institute for Occupational Safety and Health, CDC; [4]Division of Respiratory Disease Studies, National Institute for Occupational Safety and Health, CDC; [5]Abt SRBI, New York, NY (Corresponding author: Carla L. Black, cblack2@cdc.gov, 404-639-8436)

References

1. CDC. Immunization of health-care personnel: recommendations of the Advisory Committee on Immunization Practices (ACIP). MMWR 2011;60(No. RR-7).
2. Carman WF, Elder WG, Wallace LA, et al. Effects of influenza vaccination of health-care workers on mortality of elderly people in long-term care: a randomized controlled trial. Lancet 2000;355:93–7.
3. Hayward AC, Harling R, Wetten S, et al. Effectiveness of an influenza vaccine programme for care home staff to prevent death, morbidity, and health service use among residents: cluster randomised controlled trial. BMJ 2006;333:1241.
4. Lemaitre M, Meret T, Rothan-Tondeur M, et al. Effect of influenza vaccination of nursing home staff on mortality of residents: a cluster-randomized trial. J Am Geriatr Soc 2009;57:1580–6.
5. CDC. Influenza vaccination coverage among health-care personnel—United States, 2012–13 influenza season. MMWR 2013;62:781–6.
6. CDC. Influenza vaccination coverage among health-care personnel—United States, 2011–12 influenza season. MMWR 2012;61:753–7.
7. CDC. Influenza vaccination coverage among health-care personnel—2010–11 influenza season, United States. MMWR 2011;60:1073–7.
8. Harris K, Maurer J, Black C, Euler G, Kadiyala S. Workplace efforts to promote influenza vaccination among healthcare personnel and their association with uptake during the 2009 pandemic influenza A (H1N1). Vaccine 2011;29:2978–85.
9. CDC. Surveillance of influenza vaccination coverage—United States, 2007–08 through 2011–12 influenza seasons. MMWR 2013;62(No. SS-04).
10. Lindley MC, Bridges CB, Strikas RA, et al. Influenza vaccination coverage among acute care hospital-based health care personnel—United States, 2013–14 influenza season. MMWR 2014;63:812–5.

Morbidity and Mortality Weekly Report

Influenza Vaccination Performance Measurement Among Acute Care Hospital-Based Health Care Personnel — United States, 2013–14 Influenza Season

Megan C. Lindley, MPH[1], Carolyn B. Bridges, MD[1], Raymond A. Strikas, MD[1], Elizabeth J. Kalayil, MPH[1], LaDora O. Woods[1], Daniel Pollock, MD[2], Dawn Sievert, PhD[2] (Author affiliations at end of text)

Annual influenza vaccination is recommended for all health care personnel (HCP) (*1*). In August 2011, the Centers for Medicare and Medicaid Services (CMS) published a final rule requiring acute care hospitals that participate in its Hospital Inpatient Quality Reporting Program to report HCP influenza vaccination data through the National Healthcare Safety Network (NHSN) beginning January 1, 2013 (*2*). Data reported by 4,254 acute care hospitals, covering the period October 1, 2013, through March 31, 2014, were analyzed to collect estimates of the proportion of HCP vaccinated nationally and by state for three groups: 1) employees, 2) licensed independent practitioners (LIPs), and 3) adult students/trainees and volunteers. Overall in the United States, 81.8% of hospital-based HCP were reported vaccinated, with the highest proportion (86.1%) among employees and the lowest (61.9%) among LIPs. The proportion reported vaccinated varied widely by state, with ranges of 69.0%–97.6% for employees, 33.8%–93.6% for LIPs, and 50.3%–96.3% for adult students/trainees and volunteers. Public reporting of vaccination data has been shown to increase HCP influenza vaccination coverage (*3*). These new NHSN data provide a baseline for measuring changes in future hospital-based reporting of HCP influenza vaccination.

NHSN is a secure, voluntary, web-based surveillance system managed by CDC, which allows NHSN participants in health care facilities to track and analyze data on health care–associated infection and prevention practices to determine the incidence of adverse events by facility, identify trends, and undertake local quality improvement activities to reduce health care-associated infection and associated adverse events (*4*). Data in this analysis were reported by NHSN participants in 4,254 acute care hospitals in 50 states and the District of Columbia. Hospitals reported data for three mutually exclusive HCP groups, regardless of clinical responsibility or patient contact: employees, LIPs, and adult students/trainees and volunteers (Box). For each group, hospitals reported the number of HCP who physically worked in the facility for at least 1 day from October 1, 2013, through March 31, 2014.

For HCP working in the hospital during the reporting period, NHSN participants reported one of four vaccination statuses: vaccinated, medically contraindicated, declined vaccination, or unknown. Vaccinated HCP were subdivided into two separately reported groups: those vaccinated at the facility where they worked, and those who provided written attestation or documentation of receiving vaccination elsewhere (e.g., physician's office, pharmacy, or other retail location). HCP were considered contraindicated for influenza vaccination if they ever had a severe hypersensitivity reaction (e.g., anaphylaxis) to eggs or another vaccine component or had Guillain-Barré syndrome within 6 weeks of a previous influenza vaccination. HCP refusing vaccination for any other reason were reported as declining, and HCP not meeting the definition for any other vaccination status were reported as unknown. Because influenza vaccine might be available as early as July in some years, CDC instructed NHSN participants to report all vaccinations received from October 1 or when vaccine became available at their facility, whichever was earlier, through March 31.

Data were aggregated for all hospitals within a state and analyzed to calculate proportions of HCP reported as vaccinated for each of the three HCP groups by state and nationally. The proportion vaccinated was expressed as a percentage calculated as the number of HCP vaccinated at their facility plus the number who provided documentation of vaccination elsewhere, divided by the total number of HCP in that group, and multiplied by 100. The measure denominator included HCP with unknown vaccination status because ability to track and report HCP vaccination status is an important component of this performance measure. Aggregating vaccination data across facilities mitigated the effect of wide ranges among states in the number of reporting hospitals and the number of HCP working in those hospitals.

Overall in the United States, 81.8% of hospital-based HCP included in NHSN data reported receiving influenza vaccination during the 2013–14 influenza season, ranging from 62.4% in New Jersey to 96.4% in Maryland (Table). The reported proportion of HCP vaccinated was highest among employees (86.1%) and lowest among LIPs (61.9%); among adult students/trainees and volunteers, 79.9% were reported vaccinated. Similar patterns were noted at the state level, although in 10 states, the proportion of adult students/trainees and volunteers vaccinated was equal to or higher than the proportion among employees. The proportion vaccinated was lowest among LIPs in all but three states. Among LIPs, 35.0% had

BOX. Definitions of health care personnel groups for National Healthcare Safety Network reporting — United States, 2013–14 influenza season

Employees
All persons directly employed by the health care facility (i.e., receiving a direct paycheck from facility).

Licensed independent practitioners
Physicians, advanced practice nurses, and physician assistants who are affiliated with the health care facility, but are not directly employed by it.

Adult students/trainees and volunteers
Medical, nursing, or other health professional students, interns, medical residents, or volunteers aged ≥18 years who are affiliated with the health care facility, but are not directly employed by it.

unknown vaccination status compared with 5.5% of employees and 16.5% of adult students/trainees and volunteers.

The proportion reported vaccinated varied widely by state for all HCP groups: 69.0%–97.6% for employees, 33.8%–93.6% for LIPs, and 50.3%–96.3% for adult students/trainees and volunteers. NHSN participants in 13 states reported that 90% or more of hospital-based HCP overall were vaccinated. Vaccination of ≥90% of employees was reported by participants in 17 states, of LIPs by participants in two states, and of adult students/trainees and volunteers by participants in 11 states. A higher proportion of NHSN participants in states in the Midwest reported ≥90% of employees and HCP were vaccinated compared with other U.S. Census regions; this difference was less pronounced for adult students/trainees and volunteers. Only participants in the District of Columbia and Maryland reported vaccination of ≥90% of HCP in all three groups.

Discussion

For the 2013–14 influenza season, NHSN reports showed 81.8% of acute care hospital-based HCP received influenza vaccination. The reported proportion of HCP vaccinated was highest among employees and lowest among LIPs, and varied by state. Just over one quarter of states reached the *Healthy People 2020* (HP2020) target of 90% influenza vaccination among HCP (*5*) in their hospitals. NHSN performance measurement data also revealed challenges in tracking LIP vaccination status, indicating additional work is needed for hospitals to accurately track vaccination of all HCP.

The Advisory Committee on Immunization Practices defines HCP as "all paid and unpaid persons working in health care settings who have the potential for exposure to patients and/or

TABLE. Proportion of health care personnel (HCP) reported vaccinated for influenza by reporting acute care hospitals, by personnel group and state — National Healthcare Safety Network, United States, 2013–14 influenza season

State	% of employees	% of licensed independent practitioners	% of adult students/ trainees and volunteers	% of all HCP
Alabama	76.5	40.8	78.6	72.2
Alaska	78.7	55.9	53.1	72.8
Arizona	82.0	62.7	70.6	76.8
Arkansas	88.0	44.3	78.1	82.4
California	83.4	62.3	79.1	79.3
Colorado	97.1	88.6	95.0	94.9
Connecticut	87.6	72.5	87.6	85.6
Delaware	93.7	71.7	95.6	92.1
District of Columbia	96.4	92.0	93.6	95.5
Florida	72.4	33.8	67.0	64.4
Georgia	88.7	69.5	89.4	86.2
Hawaii	69.0	57.6	62.3	66.6
Idaho	86.9	34.5	74.5	78.8
Illinois	87.8	62.8	81.6	83.3
Indiana	90.3	73.4	86.4	87.5
Iowa	95.2	77.6	83.0	91.2
Kansas	92.0	69.6	92.2	88.7
Kentucky	81.5	45.8	68.3	75.2
Louisiana	77.0	39.6	77.1	71.2
Maine	86.5	70.1	86.8	85.8
Maryland	97.3	93.6	95.2	96.4
Massachusetts	87.1	78.0	87.3	86.1
Michigan	87.0	49.3	78.6	81.5
Minnesota	79.4	61.0	61.9	75.3
Mississippi	75.6	50.6	75.2	73.6
Missouri	93.0	64.9	85.3	88.4
Montana	87.4	62.0	75.0	83.8
Nebraska	94.3	73.4	94.3	91.5
Nevada	88.2	44.6	80.6	75.8
New Hampshire	94.5	82.2	93.4	93.1
New Jersey	70.8	39.1	50.3	62.4
New Mexico	83.1	41.5	74.1	76.4
New York	85.9	66.3	84.2	83.3
North Carolina	94.8	82.0	88.4	92.4
North Dakota	91.3	75.5	90.7	90.2
Ohio	87.1	58.3	72.0	82.0
Oklahoma	87.1	64.1	81.5	83.6
Oregon	82.3	58.1	63.0	76.7
Pennsylvania	86.2	62.8	82.5	82.1
Rhode Island	89.7	87.7	96.3	90.4
South Carolina	85.0	67.8	80.2	82.1
South Dakota	94.9	78.8	93.3	93.5
Tennessee	87.2	57.9	79.1	81.9
Texas	91.3	59.3	80.3	83.4
Utah	97.6	79.8	92.9	94.0
Vermont	78.3	46.5	62.0	74.7
Virginia	88.6	71.3	86.4	85.5
Washington	90.9	70.1	89.6	87.6
West Virginia	82.4	47.1	71.8	77.6
Wisconsin	92.2	88.3	86.6	90.7
Wyoming	89.3	71.7	62.8	82.5
U.S. overall	**86.1**	**61.9**	**79.9**	**81.8**
No. of HCP*	5,683,406	1,154,376	1,168,861	8,006,643
Range	*69.0–97.6*	*33.8–93.6*	*50.3–96.3*	*62.4–96.4*

* HCP are reported by each facility in which they worked. Therefore, persons might be counted more than once, and the actual number of unique HCP likely is lower.

to infectious materials" (*1*). All HCP, regardless of employment status, should receive annual influenza vaccination to protect themselves and patients. Data in this analysis indicate that tracking vaccination of LIPs, who are likely to have substantial patient contact, was challenging; this group had the lowest proportion reported vaccinated and the highest proportion of HCP with unknown vaccination status nationally. Independent practitioners are highly mobile, can work in multiple facilities, and might enter hospitals infrequently. Many LIPs likely receive influenza vaccination outside of reporting facilities; therefore, the actual proportion of LIPs vaccinated might be higher than reported. Improvements in hospitals' ability to track LIPs likely will result in higher reported proportions vaccinated in future influenza seasons.

Data on approximately 8 million HCP were reported by 4,254 acute care hospitals, which represents 85% of community hospitals* in the United States (*6*). These data represent the most complete accounting available of hospital-based HCP influenza vaccination measurement. Compared with unpublished data from the 2012–13 influenza season, when hospitals first reported HCP summary influenza vaccination to NHSN, the proportion reported vaccinated is higher for all HCP groups, and nearly 800,000 more HCP were included in 2013–14 reporting.†

CDC uses multiple systems to monitor HCP influenza vaccination. The National Health Interview Survey (NHIS) is the data source for measuring progress toward the HP2020 target for HCP influenza vaccination. NHIS is an in-person survey that collects self-reported vaccination status; it covers all health care settings but does not directly target HCP, resulting in small HCP sample sizes. The HCP opt-in Internet panel survey, conducted for CDC since 2010, collects self-reported vaccination status among HCP who have volunteered to be contacted for online surveys (*7,8*). The Internet panel survey provides timelier and more detailed data than NHIS, including coverage estimates by occupation type and health care setting, but the use of nonprobability sampling limits the generalizability of results. Vaccination status reported through NHSN is likely more accurate than self-report because of documentation requirements for some data elements, and NHSN provides state-level estimates. However, NHSN does not currently cover nonhospital settings§ nor provide the same level of detail about vaccination by occupation as the Internet panel survey. Because NHSN includes HCP with unknown vaccination status in the measure denominator, NHSN data represent minimum estimates of vaccination coverage. When restricted to those with known vaccination status, NHSN estimates of proportion vaccinated were 92.2% for HCP overall, 91.2% for employees, 95.4% for LIPs, and 95.7% for adult students/trainees and volunteers. Estimates of HCP influenza vaccination differ among the three systems and are not directly comparable (*7*). Although each has strengths and weaknesses, taken together, CDC's monitoring systems provide a comprehensive picture of U.S. HCP influenza vaccination.

The findings in this report are subject to at least two limitations. First, data reported by hospitals to NHSN are not validated by CDC. However, a validation study conducted prior to NHSN reporting indicated hospital-reported HCP vaccination data were catgorized in a manner consistent with measure definitions (*9*). Second, employment practices vary by state and hospital; therefore, NHSN-defined HCP categories might not represent the same mix of job functions and personnel across facilities. For example, some hospitals directly employ the majority of their physicians and nurses, whereas others rely on individual contracts or staffing agencies to supply these personnel.

Public reporting of HCP vaccination data is an important strategy to increase influenza vaccination coverage. A voluntary public reporting program among Iowa hospitals resulted in an increase of 20 percentage points in median employee influenza vaccination coverage over 4 years (*3*). The *Guide to Community Preventive Services* recommends assessment and feedback on vaccination rates as an evidence-based approach to increase vaccination coverage (*10*). Facility-level reports of HCP influenza vaccination will be published by CMS on its Hospital Compare website¶ in 2014. The CMS Hospital Inpatient Quality Reporting program comprises a list of performance measures, including HCP influenza vaccination, which acute care hospitals must report annually to CMS. Hospitals failing to report all required measures can be subject to a decrease in their annual payment update from CMS. This provides a financial incentive for acute care hospitals to report HCP influenza vaccination data to NHSN, contributing to completeness of reporting. Data in this report provide a baseline for measuring changes in hospital-based HCP vaccination reporting in future influenza seasons. States and hospitals can use these data to evaluate the effectiveness of efforts to increase HCP influenza vaccination in pursuit of the HP2020 target of 90% vaccination.

*The American Hospital Association defines community hospitals as all nonfederal, short-term general, and other special hospitals (including obstetrics and gynecology; eye, ear, nose, and throat; rehabilitation; orthopedic; and other individually described specialty services) accessible by the general public.

†Data for the 2012–13 season will not be published by CDC or CMS because reporting was required beginning January 1, 2013; therefore, reported data for 2012–13 might not cover the entire influenza season.

§Estimates of influenza vaccination coverage among health care personnel working in settings other than acute care hospitals can be obtained for selected states via the optional industry and occupation module of the Behavioral Risk Factor Surveillance System (BRFSS). This module was implemented in the 2013 BRFSS survey; module questions are available at http://www.cdc.gov/brfss/questionnaires/pdf-ques/2013%20brfss_english.pdf.

¶Available at http://www.medicare.gov/hospitalcompare/search.html.

What is already known on this topic?

The Advisory Committee on Immunization Practices recommends annual influenza vaccination for all health care personnel (HCP) to reduce influenza-related morbidity and mortality in health care settings.

What is added by this report?

Nationally, 81.8% of HCP included in National Healthcare Safety Network data were reported as receiving influenza vaccination during the 2013–14 influenza season. Reported proportion of HCP vaccinated was highest among employees (86.1%) and lowest among licensed independent practitioners (61.9%) and varied widely by state for all HCP groups.

What are the implications for public health practice?

Public reporting of vaccination data has been shown to increase HCP influenza vaccination coverage. These data provide a baseline from which to measure changes in reported hospital-based HCP vaccination and in ability to track HCP vaccination. Improvements in hospitals' ability to track licensed independent practitioners might result in higher reported vaccination among these HCP in future influenza seasons.

[1]Immunization Services Division, National Center for Immunization and Respiratory Diseases, CDC; [2]Division of Healthcare Quality Promotion, National Center for Emerging and Zoonotic Infectious Diseases, CDC (Corresponding author: Megan C. Lindley, mlindley@cdc.gov, 404-639-8717)

References

1. CDC. Immunization of health-care personnel: recommendations of the Advisory Committee on Immunization Practices (ACIP). MMWR 2011;60(No. RR-7).
2. US Department of Health and Human Services. Medicare program; hospital inpatient prospective payment systems for acute care hospitals and the long-term care hospital prospective payment system and FY2012 rates; hospitals' FTE resident caps for graduate medical education payment; final rules. Fed Regist 2011;76:51631–3.
3. Helms C, Polgreen P, Polgreen L, et al. Voluntary reporting of employee influenza vaccination rates by acute care hospitals in Iowa: the impact of a four year provider-based statewide performance improvement project. Vaccine 2011;29:3483–8.
4. CDC. National Healthcare Safety Network (NHSN). About NHSN. Atlanta, GA: US Department of Health and Human Services, CDC; 2013. Available at http://www.cdc.gov/nhsn/about.html.
5. US Department of Health and Human Services. Healthy people 2020. Immunization and infectious diseases, objective IID-12.13. Washington, DC: US Department of Health and Human Services; 2014, Available at http://www.healthypeople.gov/2020/topicsobjectives2020/objectiveslist.aspx?topicid=23.
6. American Hospital Association. Fast facts on U.S. hospitals. Washington, DC: American Hospital Association; 2014. Available at http://www.aha.org/research/rc/stat-studies/fast-facts.shtml.
7. CDC. Influenza vaccination coverage among health-care personnel—United States, 2012–13 influenza season. MMWR 2013;62:781–6.
8. Black CL, Yue X, Ball SW, et al. Influenza vaccination coverage among health care personnel —United States, 2013–14 influenza season. MMWR 2014;63:805–11.
9. Libby TE, Lindley MC, Lorick SA, et al. Reliability and validity of a standardized measure of influenza vaccination coverage among healthcare personnel. Infect Control Hosp Epidemiol 2013;34:335–45.
10. Task Force on Community Preventive Services. Increasing appropriate vaccination: provider assessment and feedback. Atlanta, GA: Task Force on Community Services; 2008. Available at http://www.thecommunityguide.org/vaccines/providerassessment.html.

Influenza Vaccination Coverage Among Pregnant Women — United States, 2013–14 Influenza Season

Helen Ding, MD[1], Carla L. Black, PhD[1], Sarah Ball, ScD[2], Sara Donahue, DrPH[2], David Izrael MS[2], Walter W. Williams, MD[1], Erin D. Kennedy, DVM[1], Carolyn B. Bridges, MD[1], Peng-Jun Lu, MD, PhD[1], Katherine E. Kahn, MPH[1], Lisa A. Grohskopf, MD[3], Indu B. Ahluwalia, PhD[4], John Sokolowski, MA[5], Charles DiSogra, DrPH[5], Deborah K. Walker, EdD[2], Stacie M. Greby, DVM[1]
(Author affiliations at end of text)

Pregnant women and infants are at increased risk for influenza-related complications and hospitalization. Influenza vaccination among pregnant women can reduce their risk for respiratory illness and reduce the risk for influenza in their infants aged <6 months (*1*). Since 2004, the Advisory Committee on Immunization Practices and the American College of Obstetricians and Gynecologists have recommended influenza vaccination for all women who are or will be pregnant during the influenza season, regardless of trimester (*1,2*). To assess influenza vaccination coverage among pregnant women during the 2013–14 influenza season, CDC analyzed data from an Internet panel survey conducted March 31–April 11, 2014. Among 1,619 survey respondents pregnant at any time during October 2013–January 2014, 52.2% reported vaccination before or during pregnancy (17.6% before and 34.6% during pregnancy), similar to the coverage in the preceding season. Overall, 65.1% of women reported receiving a clinician recommendation and offer of influenza vaccination, 15.1% received a clinician recommendation but no offer of vaccination, and 19.8% received no clinician recommendation or offer. Vaccination coverage among these women was 70.5%, 32.0%, and 9.7%, respectively. Continued efforts are needed to encourage clinicians to strongly recommend and offer influenza vaccination to their pregnant patients.

An Internet panel survey was conducted for CDC by Abt Associates, Inc. (Cambridge, Massachusetts) during March 31–April 11, 2014, to 1) provide end-of-season estimates of influenza vaccination coverage among pregnant women for the 2013–14 influenza season; 2) assess clinician recommendation and offer of influenza vaccination; and 3) obtain updated information on women's knowledge, attitudes, and behaviors related to influenza vaccination. Women aged 18–49 years who reported being pregnant at any time after August 2013 were eligible for the survey. Participants were recruited from a preexisting, national, opt-in, general population Internet panel operated by Survey Sampling International, which provides panel members with online survey opportunities in exchange for nominal incentives.* Pregnant women panelists were recruited from the Survey Sampling International panel using two methods: 1) an email invitation was sent to panel members aged 18–49 years, female, and living in the United States or 2) a message on the panel website inviting panel members to answer a series of screening questions and, if eligible, to take the survey. Of 12,068 women who entered the survey site, 2,127 were determined to be eligible, and 2,042 (96.0%) completed the survey.† Data were weighted to reflect the age, race/ethnicity, and geographic distribution of the total U.S. population of pregnant women. A woman was considered to be vaccinated if 1) vaccination was received during July 2013–April 2014, and 2) vaccination was received before or during the most recent pregnancy. The study population was limited to women who reported pregnancy any time during the peak influenza vaccination period of October 2013–January 2014 (N = 1,619). Vaccination coverage estimates from the Internet panel surveys completed for the 2010–11 through 2013–14 seasons were compared to assess trends over time. Similar methodology was used in all four survey years (*3*).

Survey respondents were asked questions about their vaccination status before and during pregnancy, whether their clinician recommended and offered influenza vaccination, their attitudes regarding influenza and influenza vaccination, and their reasons for receiving or not receiving influenza vaccination. Three composite variables defining attitudes toward influenza vaccination efficacy, influenza vaccination safety, and concerns about influenza infection were constructed using methods previously described (*3*). Because the opt-in Internet panel sample is not probability-based, no statistical tests were performed.§ Differences were noted when there was a difference of ≥5 percentage points between any values being compared.

Of the 1,619 women pregnant at any time during October 2013–January 2014, 52.2% reported receiving influenza vaccination after July 1, 2013 (17.6% before and 34.6%

*Additional information available at http://www.surveysampling.com.

†An opt-in Internet panel survey is a nonprobability sampling survey. The denominator for a response rate calculation cannot be determined because no sampling frame with a selection probability is involved at the recruitment stage. Instead, the survey completion rate is provided.

§Additional information available at http://www.aapor.org/opt_in_surveys_and_margin_of_error1.htm.

What is already known on this topic?

Pregnant women and infants are at increased risk for influenza-related complications and hospitalization. Influenza vaccination among pregnant women can reduce their risk for respiratory illness and reduce the risk for influenza in their infants aged <6 months. Influenza vaccination coverage among pregnant women increased substantially during the 2009–10 influenza season, and the increased coverage was sustained during the 2010–11 through 2012–13 seasons.

What is added by this report?

In the 2013–14 influenza season, 52.2% of pregnant women were vaccinated before or during pregnancy; 65.1% of women reported receiving a clinician recommendation and offer of influenza vaccination, an increase of about 10 percentage points from the 2012–13 season. Women who received a clinician offer of vaccination had higher vaccination coverage than those who did not receive an offer of vaccination. Barriers to vaccination included negative attitudes toward safety and efficacy of influenza vaccination and perceptions of low personal risk for influenza.

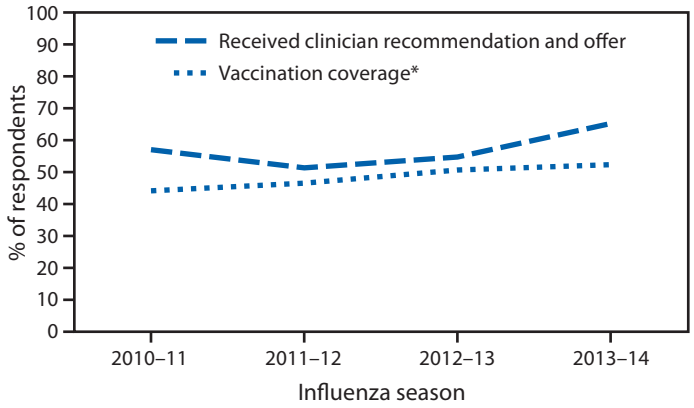
What are the implications for public health practice?

Continued efforts are needed to increase knowledge among pregnant women about the safety and efficacy of influenza vaccination and the risk for influenza for themselves and their infants. Additionally, efforts are needed to increase opportunities for clinicians to recommend and offer influenza vaccination to pregnant women.

during pregnancy). The overall vaccination coverage was similar to coverage in the 2012–13 influenza season (50.5%) but higher than that in the 2011–12 (46.4%) and 2010–11 seasons (44.0%) (Figure). Non-Hispanic black women had the lowest vaccination coverage (42.7%) compared with women of the other three racial/ethnic groups (non-Hispanic white: 52.0%, Hispanic: 56.7%, and non-Hispanic, other race: 61.9%). Women with the following reported characteristics had lower influenza vaccination coverage than other women within each comparison stratum: those aged 18–24 years, with education less than a college degree, not married, reporting no medical insurance, not working for wages, living below the poverty threshold, reporting no high-risk conditions associated with increased complications for influenza, reporting fewer than six visits to a clinician since July 2013, and having a negative attitude towards efficacy and safety of influenza vaccination or not being concerned about influenza infection. Vaccination coverage increased from 2012–13 to 2013–14 for Hispanic women, non-Hispanic women who reported race other than white or black, women aged 25–34 years, and women with greater than a college degree (Table 1).

Among women with at least one visit to a clinician since July, increases were observed between the 2010–11 to 2013–14 seasons in the percentage of women who reported receiving

FIGURE. Prevalence of clinician recommendation and offer of influenza vaccination and influenza vaccination coverage before and during pregnancy among women pregnant any time during October–January — Internet panel survey, United States, 2010–11 through 2013–14 influenza seasons



* Vaccination coverage estimates for the 2012–13 and 2013–14 influenza seasons were based on vaccinations given from July to mid-April. Coverage estimates for the 2010–11 and 2011–12 influenza seasons were based on vaccinations given from August to mid-April.

a clinician recommendation and offer of vaccination (from 56.9% to 65.1%) (Figure). In the 2013–14 season, women who reported receiving both a clinician recommendation and offer of influenza vaccination had higher vaccination coverage (70.5%) compared with women who reported receiving a clinician recommendation but no offer (32.0%) and women who reported receiving no recommendation (9.7%). Among women who reported negative attitudes toward influenza vaccination efficacy, vaccination safety, or no concern about influenza infection but reported receiving a clinician recommendation and offer of vaccination, vaccination coverage was 15.4%, 26.1%, and 56.7%, respectively, higher than coverage among women with the same attitude but who reported only receiving a clinician recommendation (0.0%, 3.3%, and 27.6%, respectively) or receiving no recommendation (0.0%, 3.9%, and 7.9%, respectively) (Table 2).

The most common reasons women reported for receiving vaccination were to protect their infant from influenza (31.1%), to protect themselves from influenza (23.3%), and because their clinician recommended the influenza vaccination (14.8%). The most common reasons women reported for not receiving vaccination were concern the vaccination would give them influenza (16.8%), concern about possible safety risk to their infants if they got vaccinated (14.4%), and belief that they did not need the vaccination (12.2%).

Discussion

During the 2013–14 influenza season, influenza vaccination among pregnant women was 52.2%, similar to coverage in

TABLE 1. Influenza vaccination coverage before and during pregnancy among women who were pregnant any time during October–January, by selected characteristics — Internet panel survey, 2013–14 and 2012–13 influenza seasons

Characteristic	2013–14 influenza season			2012–13 influenza season			Vaccination coverage difference (percentage points)
	Unweighted no.	Weighted %	Vaccinated weighted %	Unweighted no.	Weighted %	Vaccinated weighted %	
Total	**1,619**		**52.2**	**1,702**	—	**50.5**	**1.7**
Vaccinated before pregnancy	289		17.6	239		14.6	3.0
Vaccinated during pregnancy	577		34.6	638		35.9	-1.3
Age group (yrs)							
18–24	373	34.0	45.6	477	33.1	48.7	-3.1
25–34	942	50.4	56.5	970	50.5	50.5	6.0
35–49	304	15.6	53.0	255	16.3	54.1	-1.1
Race/Ethnicity							
Hispanic	260	23.7	56.7	278	23.8	50.1	6.6
Black, non-Hispanic	160	18.1	42.7	175	18.8	45.4	-2.8
White, non-Hispanic	1,033	50.1	52.0	1,093	50.3	52.2	-0.2
Other, non-Hispanic	166	8.1	61.9	156	7.2	53.1	8.8
Education							
Less than college degree	699	47.7	44.6	844	51.8	43.9	0.7
College degree	714	41.1	57.4	656	36.8	57.3	0.1
Greater than college degree	206	11.2	65.9	202	11.4	58.5	7.4
Married							
Yes	1,128	63.4	56.6	1,120	62.2	54.8	1.8
No	491	36.6	44.7	582	37.8	43.5	1.2
Insurance coverage							
Any public	579	40.0	51.0	659	41.8	50.0	1.0
Private/Military only	993	56.6	54.9	939	51.7	53.0	1.9
No insurance	47	3.3	22.2	104	6.5	33.7	-11.7
Working status*							
No	764	49.2	47.0	860	50.4	44.7	2.3
Yes	855	50.8	57.3	842	49.6	56.4	0.9
Poverty status†							
Below poverty	250	18.5	45.0	404	26.0	41.6	3.4
At or above poverty	1,369	81.5	53.9	1,289	74.0	53.8	0.1
High-risk conditions§							
Yes	538	33.0	60.5	613	36.3	57.8	2.8
No	1,081	67.0	48.2	1,089	63.7	46.4	1.8
No. of visits to a clinician since July							
No visit	16	0.9	—¶	27	1.5	—¶	
1–5 visits	370	23.2	42.7	682	41.6	48.0	-5.3
6–10 visits	652	40.4	55.0	598	34.9	53.1	1.9
>10 visits	581	35.5	56.5	395	21.9	53.1	3.3

See table footnotes on page 819.

the 2012–13 season (50.5%), but higher than the estimates in the 2011–12 season (46.4%) and 2010–11 season (44.0%) (*3*). Vaccination coverage among non-Hispanic black women was substantially lower compared with women of the other three racial/ethnic groups. This long-standing black-white disparity in vaccination coverage might be attributable to multiple factors, including weaker or less effective clinician recommendations, sociocultural norms, less awareness of vaccination recommendations, misperception of effectiveness and safety of vaccination, vaccination resistance and hesitancy, and poorer quality of clinician-patient relationships (*4,5*). Women who were younger (aged 18–24 years), reported having no medical insurance, had fewer than six visits to a clinician since July 2013, had less education, were not working, or lived below the poverty threshold also had lower vaccination coverage than other subgroups of women in the survey.

Women who reported receiving a clinician recommendation and offer of influenza vaccination had higher vaccination coverage compared with women who reported receiving only a recommendation but no offer or reported receiving no recommendation, even among those who reported having a negative attitude toward efficacy, safety of influenza vaccination, or no concern about influenza infection. These results are consistent with previous findings (*3*), and highlight the importance of a clinician offer of influenza vaccination to increase vaccination coverage among pregnant women. Previously reported

TABLE 1. (*Continued*) Influenza vaccination coverage before and during pregnancy among women who were pregnant any time during October–January, by selected characteristics — Internet panel survey, 2013–14 and 2012–13 influenza seasons

Characteristic	2013–14 influenza season			2012–13 influenza season			Vaccination coverage difference (percentage points)
	Unweighted no.	Weighted %	Vaccinated weighted %	Unweighted no.	Weighted %	Vaccinated weighted %	
Clinician recommendation and/or offer**							
Recommended and offered	1,037	65.1	70.5	895	54.6	70.5	0.0
Recommended with no offer	242	15.1	32.0	270	16.7	46.3	-14.3
No recommendation	324	19.8	9.7	455	28.7	16.1	-6.4
Attitude toward efficacy of influenza vaccination††							
Negative	303	18.7	5.8	430	25.2	9.8	-4.0
Positive	1,316	81.3	62.9	1,272	74.8	64.2	-1.3
Attitude toward safety of influenza vaccination§§							
Negative	378	24.8	13.2	475	28.7	13.0	0.2
Positive	1,241	75.2	65.1	1,227	71.3	65.6	-0.5
Attitude toward influenza infection¶¶							
Not concerned	492	30.2	39.0	564	36.9	49.9	-9.1
Concerned	1,127	69.8	58.0	939	63.1	54.1	3.9

* Those employed for wages and self-employed were grouped as working. Those who were out of work, homemakers, students, retired, or unable to work were grouped as not working.

† Below the poverty threshold was defined as a total of annual family income of <$23,283 for a family of four with two minors as of 2012, as categorized by the U.S. Census Bureau (http://www.census.gov/hhes/www/poverty/data/threshld).

§ Conditions associated with increased risk for serious medical complications from influenza, including chronic asthma, a lung condition other than asthma, a heart, kidney, or liver condition, diabetes, obesity, or a weakened immune system caused by a chronic illness or by medications taken for a chronic illness.

¶ Vaccination coverage estimates were not reliable because sample size was <30.

** Women were excluded if they did not visit a clinician after August 2013 (n = 16) for the 2013–14 influenza season, did not visit a clinician after August 2012 (n = 27), or did not know whether they received a clinician recommendation or offer (n = 55) for the 2012–13 influenza season.

†† A composite variable about attitude toward influenza vaccination efficacy was created based on two questions regarding attitudes toward influenza vaccination, "Flu vaccine is somewhat/very effective in preventing flu," and "Agree/Strongly agree that if a pregnant woman receives the flu vaccination, it will protect the baby from getting the flu after it is born." For the 2013–14 influenza season, the second question was slightly different: "The flu vaccine a pregnant woman receives is somewhat/very effective in protecting her baby from the flu." One point was given for each "yes" answer for either of the two questions. Respondents with a summary score of 1 or 2 were considered as having a "positive" attitude, and those with a summary score of 0 were considered as having a "negative" attitude.

§§ A composite variable about the attitude toward influenza vaccination safety was created based on three questions regarding the safety of influenza vaccination: "Flu vaccination is somewhat/very/completely safe for most adult women," "Flu vaccination is somewhat/very/completely safe for pregnant women," and "Flu vaccination that a pregnant woman receives is somewhat/very/completely safe for her baby." One point was given for each "yes" answer for any of the three questions. Respondents who had a summary score of 2 or 3 were considered as having a "positive" attitude, and those with a summary score of 0 or 1 were considered as having a "negative" attitude.

¶¶ A composite variable about the attitude toward influenza infection was created for the 2012–13 influenza season based on response to a single question regarding attitude toward influenza infection: "If a pregnant woman gets the flu, it is somewhat/very likely to harm the baby." Respondents with a "yes" answer were considered as "concerned," and those with a "no" answer were considered as "not concerned." For the 2013–14 influenza season, two more questions were added: Respondent was "somewhat/very worried about getting sick with the flu this season," and "If a pregnant woman gets the flu, it is somewhat/very likely to harm her." One point was given for each "yes" answer for any of the three questions. Respondents who had a summary score of 2 or 3 were considered as "concerned" and those with a summary score of 0 or 1 were considered as "not concerned."

clinician barriers to recommending and offering adult vaccination services include concern about lack of reimbursement for vaccination services and for the up-front cost of ordering vaccines, the high costs of storing and maintaining vaccine inventory, not having electronic health records, the inability to assess patients' vaccination status, not perceiving responsibility as the vaccinator, and organizational challenges of vaccine administration (*6,7*). Systems that support clinician ability to recommend and offer vaccination to pregnant women, such as client-based education with standing orders, clinician reminder systems, and expanded access to vaccination services in multiple health care settings (e.g., pharmacies) can increase opportunities for vaccination and improve vaccination coverage.¶

¶ Additional information available at http://www.thecommunityguide.org/vaccines/universally/communityinterventions.html.

Misbelief among pregnant women not receiving vaccination that vaccination would give them "the flu," having concerns about the safety risk to their infant if they were vaccinated, and lack of awareness about their risk for influenza were the most common reasons reported for not receiving vaccination. To help change negative attitudes and misperceptions about vaccination, clinic-based client education for pregnant women should emphasize that vaccination during pregnancy is safe and can reduce influenza risk not only for pregnant women themselves but also their infants during the first 6 months of life. Such messages can be delivered through multiple channels, including prenatal care consultation, social media, and text messaging (e.g., https://text4baby.org).

The findings in this report are subject to at least four limitations. First, vaccination was self-reported and not validated by

TABLE 2. Percentage of women receiving a clinician recommendation/offer of influenza vaccination and influenza vaccination coverage by clinician recommendation and offer, by attitude towards influenza vaccination, among women who visited a clinician at least one time since August 2013 and who were pregnant any time during October–January — Internet panel survey, United States, 2013–14 influenza season

	Clinician recommendation/offer				Vaccination coverage					
		Recommended and offered	Recommended without offer	No recommendation	Recommended and offered		Recommended without offer		No recommendation	
Attitude	No.	Weighted %	Weighted %	Weighted %	No.	Weighted %	No.	Weighted %	No.	Weighted %
Attitude toward efficacy of influenza vaccination*										
Negative	295	38.7	22.9	38.4	109	15.4	66	0.0	120	0.0
Positive	1,308	71.0	13.4	15.6	928	77.2	176	44.2	204	15.1
Attitude toward safety of influenza vaccination†										
Negative	372	43.2	20.7	36.1	155	26.1	78	3.3	139	3.9
Positive	1,231	72.3	13.3	14.4	882	79.2	164	46.6	185	14.5
Attitude toward influenza infection§										
Not concerned	482	58.4	16.8	24.8	271	56.7	85	27.6	126	7.9
Concerned	1,121	68.0	14.4	17.6	766	75.5	157	34.1	198	10.8

* A composite variable about attitude toward influenza vaccination efficacy was created based on two questions regarding attitudes toward influenza vaccination, "Flu vaccine is somewhat/very effective in preventing flu," and "The flu vaccine a pregnant woman receives is somewhat/very effective in protecting her baby from the flu." One point was given for each "yes" answer for either of the two questions. Respondents with a summary score of 1 or 2 were considered as having a "positive" attitude, and those with a summary score of 0 were considered as having a "negative" attitude.

† A composite variable about the attitude toward influenza vaccination safety was created based on three questions regarding the safety of influenza vaccination: "Flu vaccination is somewhat/very/completely safe for most adult women," "Flu vaccination is somewhat/very/completely safe for pregnant women," and "Flu vaccination that a pregnant woman receives is somewhat/very/completely safe for her baby." One point was given for each "yes" answer for any of the three questions. Respondents who had a summary score of 2 or 3 were considered as having a "positive" attitude, and those with a summary score of 0 or 1 were considered as having a "negative" attitude.

§ A composite variable about the attitude toward influenza infection was created based on response to three questions regarding attitude toward influenza infection: "If a pregnant woman gets the flu, it is somewhat/very likely to harm the baby." Respondent was "somewhat/very worried about getting sick with the flu this season," and "If a pregnant woman gets the flu, it is somewhat/very likely to harm her." One point was given for each "yes" answer for any of the three questions. Respondents who had a summary score of 2 or 3 were considered as "concerned" and those with a summary score of 0 or 1 were considered as "not concerned."

medical record review. Second, the results were weighted to the distribution of pregnant women in the U.S. population, but the study sample did not include women without Internet access. Therefore, results might not be generalizable to all pregnant women in the United States. Third, estimates might be biased if the selection processes for entry into the Internet panel and a woman's decision to participate in this particular survey were related to receipt of vaccination. Fourth, the composite variables computed for attitudes toward influenza vaccination and infection were not validated.

Despite these limitations, the opt-in Internet panel survey can provide timely estimates of influenza vaccination coverage and in-depth information about knowledge, attitudes, behaviors, and barriers related to influenza vaccination among pregnant women. Trends in vaccination coverage reported from the Internet panel surveys have been consistent with those reported from other less timely data sources, such as the Behavioral Risk Factor Surveillance System (*8*). Additionally, comparing the 2010–11 influenza season vaccination estimates from 18 states in both the Internet panel survey and the Pregnancy Risk Assessment Monitoring System, a probability sampling survey, the Internet panel survey estimate for women pregnant at any time during October 2010–January 2011 (50.2%) was similar to the estimate from the Pregnancy Risk Assessment Monitoring System for women who were pregnant in the same period (49.2%) (*3*).

Clinician offer of influenza vaccination was associated with higher vaccination coverage among pregnant women, even among women with negative attitudes towards vaccination. Although more women reported receiving a clinician's recommendation and offer of influenza vaccination compared with previous seasons, efforts to enhance clinician practices are needed. Missed opportunities for vaccination can be reduced by implementing systems to ensure vaccination is recommended and offered at each visit. If a clinician cannot offer vaccination, a referral should be provided to ensure influenza vaccination before or during pregnancy. To help pregnant women understand the importance of vaccination to them, clinicians should emphasize that vaccination is safe and can decrease the risk for influenza-related illness and complications in pregnant women and their infants (*9*).

[1]Immunization Services Division, National Center for Immunization and Respiratory Diseases, CDC; [2]Abt Associates, Inc., Cambridge, Massachusetts; [3]Influenza Division, National Center for Immunization and Respiratory Diseases, CDC; [4]Division of Reproductive Health, National Center for Chronic Disease Prevention and Health Promotion, CDC; [5]Abt SRBI, New York, New York (Corresponding author: Helen Ding, hding@cdc.gov, 404-639-8513)

References

1. CDC. Prevention and control of influenza with vaccines: recommendations of the Advisory Committee on Immunization Practices (ACIP), United States, 2013–14. MMWR 2013;62(No. RR-07).
2. American Congress of Obstetricians and Gynecologists Committee on Obstetric Practice. ACOG committee opinion no. 468: influenza vaccination during pregnancy. Obstet Gynecol 2010;116:1006–7.
3. CDC. Influenza vaccination coverage among pregnant women—United States, 2012–13 influenza season. MMWR 2013;62:787–92.
4. Ahluwalia IB, Ding H, Harrison L, et al. Disparities in influenza vaccination coverage among women with live born infants, PRAMS surveillance during the 2009–10 influenza season. Public Health Rep 2014;129:408–16.
5. Lu PJ, O'Halloran A, Bryan L, et al. Trends in racial/ethnic disparities in influenza vaccination coverage among adults during the 2007–08 through 2011–12 seasons. Am J Infect Control 2014;42:763–9.
6. Hurley LP, Bridges CB, Harpaz R, et al. U.S. physician's perspective of adult vaccine delivery. Ann Intern Med 2014;160:161–70.
7. Johnson DR, Nichol KL, Lipczynski K. Barriers to adult immunization. Am J Med 2008;121(7B):S28–S35.
8. CDC. Surveillance of influenza vaccination coverage—United States, 2007–2008 through 2011–12 influenza seasons. MMWR 2013;62(No. SS-04).
9. Panda B, Stiller R, Panda A. Influenza vaccination during pregnancy and factors for lacking compliance with current CDC guidelines. J Matern Fetal Neonatal Med 2011;24:402–6.

Use of 13-Valent Pneumococcal Conjugate Vaccine and 23-Valent Pneumococcal Polysaccharide Vaccine Among Adults Aged ≥65 Years: Recommendations of the Advisory Committee on Immunization Practices (ACIP)

Sara Tomczyk, MSc[1,2], Nancy M. Bennett, MD[3,4], Charles Stoecker, PhD[5], Ryan Gierke, MPH[2], Matthew R. Moore, MD[2], Cynthia G. Whitney, MD[2], Stephen Hadler, MD[2], Tamara Pilishvili, MPH[2] (Author affiliations at end of text)

On August 13, 2014, the Advisory Committee on Immunization Practices (ACIP) recommended routine use of 13-valent pneumococcal conjugate vaccine (PCV13 [Prevnar 13, Wyeth Pharmaceuticals, Inc., a subsidiary of Pfizer Inc.]) among adults aged ≥65 years. PCV13 should be administered in series with the 23-valent pneumococcal polysaccharide vaccine (PPSV23 [Pneumovax23, Merck & Co., Inc.]), the vaccine currently recommended for adults aged ≥65 years. PCV13 was approved by the Food and Drug Administration (FDA) in late 2011 for use among adults aged ≥50 years. In June 2014, the results of a randomized placebo-controlled trial evaluating efficacy of PCV13 for preventing community-acquired pneumonia among approximately 85,000 adults aged ≥65 years with no prior pneumococcal vaccination history (CAPiTA trial) became available and were presented to ACIP (*1*). The evidence supporting PCV13 vaccination of adults was evaluated using the Grading of Recommendations, Assessment, Development, and Evaluation (GRADE) framework and determined to be type 2 (moderate level of evidence); the recommendation was categorized as a Category A recommendation (*2*). This report outlines the new recommendations for PCV13 use, provides guidance for use of PCV13 and PPSV23 among adults aged ≥65 years, and summarizes the evidence considered by ACIP to make this recommendation.

Recommendations for routine use of vaccines in children, adolescents, and adults are developed by the Advisory Committee on Immunization Practices (ACIP). ACIP is chartered as a federal advisory committee to provide expert external advice and guidance to the Director of the Centers for Disease Control and Prevention (CDC) on use of vaccines and related agents for the control of vaccine-preventable diseases in the civilian population of the United States. Recommendations for routine use of vaccines in children and adolescents are harmonized to the greatest extent possible with recommendations made by the American Academy of Pediatrics (AAP), the American Academy of Family Physicians (AAFP), and the American College of Obstetrics and Gynecology (ACOG). Recommendations for routine use of vaccines in adults are harmonized with recommendations of AAFP, ACOG, and the American College of Physicians (ACP). ACIP recommendations adopted by the CDC Director become agency guidelines on the date published in the Morbidity and Mortality Weekly Report (MMWR). *Additional information regarding ACIP is available at http://www.cdc.gov/vaccines/acip.*

Epidemiology of Pneumococcal Disease Among Adults Aged ≥65 Years

Streptococcus pneumoniae (pneumococcus) remains a leading infectious cause of serious illness, including bacteremia, meningitis, and pneumonia, among older adults in the United States. Use of a 7-valent pneumococcal conjugate vaccine (PCV7) since 2000 and PCV13 since 2010 among children in the United States has reduced pneumococcal infections directly and indirectly among children, and indirectly among adults. By 2013, the incidence of invasive pneumococcal disease (IPD) caused by serotypes unique to PCV13 among adults aged ≥65 years had declined by approximately 50% compared with 2010, when PCV13 replaced PCV7 in the pediatric immunization schedule (*3*). However, in 2013 an estimated 13,500 cases of IPD occurred among adults aged ≥65 years (*3*). Approximately, 20%–25% of IPD cases and 10% of community-acquired pneumonia cases in adults aged ≥65 years are caused by PCV13 serotypes and are potentially preventable with the use of PCV13 in this population (*3,4*).

PCV13 Vaccine in Adults

On December 30, 2011, PCV13 was approved for use among adults aged ≥50 years to prevent pneumonia and invasive disease caused by *S. pneumoniae* serotypes contained in the vaccine. The new use for Prevnar 13 was approved under FDA's accelerated approval pathway, which allows for earlier approval of products that provide meaningful therapeutic benefit over existing

treatments for serious and life-threatening illnesses (*5*). FDA defined "meaningful therapeutic benefit over existing treatments" as protection of adults aged ≥50 years from nonbacteremic pneumococcal pneumonia or nonbacteremic pneumococcal pneumonia combined with protection from IPD (*7*). On June 20, 2012, ACIP recommended routine use of PCV13 for adults aged ≥19 years with immunocompromising conditions, functional or anatomic asplenia, cerebrospinal fluid leak, or cochlear implants (*6*). The ACIP decision to recommend PCV13 use among adults aged ≥65 years was deferred until data became available on 1) the impact of PCV13 use in children on disease in adults (i.e., indirect effects) and 2) the efficacy of PCV13 against noninvasive pneumococcal pneumonia among adults. In accordance with accelerated approval requirements, a randomized placebo-controlled trial (CAPiTA trial) was conducted in the Netherlands among approximately 85,000 adults aged ≥65 years during 2008–2013 to verify and describe further the clinical benefit of PCV13 in the prevention of pneumococcal pneumonia (*1*). The results of the CAPiTA trial demonstrated 45.6% (95% confidence interval [CI] = 21.8%–62.5%) efficacy of PCV13 against vaccine-type pneumococcal pneumonia, 45.0% (CI = 14.2%–65.3%) efficacy against vaccine-type nonbacteremic pneumococcal pneumonia, and 75.0% (CI = 41.4%–90.8%) efficacy against vaccine-type IPD among adults aged ≥65 years (*1*).

Two randomized, multicenter, immunogenicity studies conducted in the United States and Europe among older adults showed that PCV13 induced an immune response as good as or better than that induced by PPSV23 (*7,8*). Functional antibody responses were measured 1 month after vaccination using an opsonophagocytic activity (OPA) assay. In adults aged 60–64 years with no prior pneumococcal vaccination, PCV13 elicited OPA geometric mean antibody titers (GMTs) to the 12 serotypes common to both vaccines that were comparable with, or higher than, responses elicited by PPSV23 (*7*). In adults aged ≥70 years who previously had been immunized with a single dose of PPSV23 ≥5 years before enrollment, PCV13 elicited OPA responses that were comparable with those elicited by PPSV23 for two serotypes and higher for 10 serotypes (*8*).

Immunogenicity studies evaluating responses to PCV7 and PPSV23 administered in series showed a better immune response when PCV7 was administered first (*9–12*). An evaluation of immune response after a second pneumococcal vaccination administered 1 year after the initial study doses showed that subjects who received PPSV23 as the initial study dose had lower OPA antibody responses after subsequent administration of PCV13 than those who had received PCV13 as the initial dose followed by a dose of PPSV23, regardless of the level of the initial OPA response to PPSV23 (*9*). Studies evaluating the immune response after a sequence of PCV7 or PCV13 followed by PPSV23 with intervals of 2, 6, and 12 months or 3–4 years demonstrated that after the PPSV23 dose, antibody levels were higher than the pre-PCV baseline, and a noninferior response was observed when compared with post-PCV antibody levels (*9–12*). None of the studies were designed to evaluate the optimal interval between vaccine doses.

Safety of PCV13 was evaluated in approximately 6,000 PPSV23-naïve and PPSV23-experienced adults aged ≥50 years (*13*). Overall incidence of serious adverse events reported within 1 month of an initial study dose of PCV13 or PPSV23 did not differ between the two vaccines and ranged from 0.2% to 1.7%. From 1 to 6 months after an initial study dose, the overall incidence of serious adverse events ranged from 1.2% to 5.8% among persons vaccinated with PCV13 and 2.4% to 5.5% among persons vaccinated with PPSV23. Rates of reported serious adverse events in the treatment groups were similar among studies that enrolled PPSV23-naïve subjects and studies that enrolled PPSV23-experienced subjects. Common adverse reactions reported with PCV13 were pain, redness, and swelling at the injection site; limitation of movement of the arm in which the injection was given; fatigue; headache; chills; decreased appetite; generalized muscle pain; and joint pain. Similar reactions were observed in adults who received PPSV23 (*13*).

What is currently recommended?

In 2010, the Advisory Committee on Immunization Practices (ACIP) approved revised recommendations that all persons should be vaccinated with 23-valent pneumococcal polysaccharide vaccine (PPSV23) at age 65 years. In 2012, ACIP made recommendations for use of 13-valent pneumococcal conjugate vaccine (PCV13) and PPSV23 for adults aged ≥19 years with immunocompromising conditions.

Why are the recommendations being modified now?

PCV13 was approved by the Food and Drug Administration in late 2011 for use among adults aged ≥50 years. In June 2014, the results of a randomized placebo-controlled trial showing efficacy of PCV13 against community-acquired pneumonia among approximately 85,000 adults aged ≥65 years became available and were presented to ACIP. The evidence supporting PCV13 vaccination of adults was evaluated using the Grading of Recommendations, Assessment, Development, and Evaluation (GRADE) framework and determined to be type 2 (moderate level of evidence); the recommendation was designated as a Category A recommendation.

What are the new recommendations?

Both PCV13 and PPSV23 should be routinely administered in series to all adults aged ≥65 years. The recommendations for routine PCV13 use among adults aged ≥65 years will be reevaluated in 2018 and revised as needed. ACIP recommendations for routine use of PCV13 in adults aged ≥19 years with immunocompromising conditions, functional or anatomic asplenia, cerebrospinal fluid leak, or cochlear implants remain unchanged.

Indirect effects from PCV13 use among children, if similar to those observed after PCV7 introduction, might further reduce the remaining burden of adult pneumococcal disease caused by PCV13-types. A preliminary analysis using a probabilistic model following a single cohort of persons aged 65 years demonstrated that adding a dose of PCV13 to the current PPSV23 recommendations for adults aged ≥65 years, compared with current PPSV23 recommendations, would lead to additional health benefits (*14*). This strategy would prevent an estimated 230 cases of IPD and approximately 12,000 cases of community-acquired pneumonia over the lifetime of a single cohort of persons aged 65 years, assuming current indirect effects from the child immunization program and current PPSV23 vaccination coverage among adults aged ≥65 years (approximately 60%). In a setting of fully realized indirect effects assuming the same vaccination coverage, the expected benefits of PCV13 use among this cohort will likely decline to an estimated 160 cases of IPD and 4,500 cases of community-acquired pneumonia averted among persons aged ≥65 years (*14*).

CDC will assess the implementation and impact of the recommendation for PCV13 use among adults aged ≥65 years, including coverage with PCV13 and PPSV23, and impact of PCV13 on vaccine-type IPD burden and community-acquired pneumonia. Monitoring disease trends among adults who do not receive PCV13 might help quantify indirect effects and the long-term utility of routine PCV13 use among adults. ACIP will be updated routinely on changes in the burden of IPD and community-acquired pneumonia among adults during the next 3 years to determine the need for revisions to the adult PCV13 recommendations.

PPSV23 in Adults

A single dose of PPSV23 is recommended for routine use in the United States among adults aged ≥65 years (*15*). Effectiveness of PPSV23 in preventing IPD in adults has been demonstrated, but the data on the effectiveness of this vaccine in preventing noninvasive pneumococcal pneumonia among adults aged ≥65 years have been inconsistent. PPSV23 contains 12 serotypes in common with PCV13 and 11 additional serotypes. In 2013, 38% of IPD among adults aged ≥65 years was caused by serotypes unique to PPSV23 (*3*). Given the high proportion of IPD caused by serotypes unique to PPSV23, broader protection is expected to be provided through use of both PCV13 and PPSV23 in series. ACIP considered multiple factors when determining the optimal interval between a dose of PCV13 and PPSV23, including immune response, safety, the risk window for protection against disease caused by serotypes unique to PPSV23, as well as timing for the next visit to the vaccination provider.

ACIP Recommendations for PCV13 and PPSV23 Use

Both PCV13 and PPSV23 should be administered routinely in series to all adults aged ≥65 years (Box).

Pneumococcal vaccine-naïve persons. Adults aged ≥65 years who have not previously received pneumococcal vaccine or whose previous vaccination history is unknown should receive a dose of PCV13 first, followed by a dose of PPSV23. The dose of PPSV23 should be given 6–12 months after a dose of PCV13. If PPSV23 cannot be given during this time window, the dose of PPSV23 should be given during the next visit. The two vaccines should not be coadministered, and the minimum acceptable interval between PCV13 and PPSV23 is 8 weeks.

Previous vaccination with PPSV23. Adults aged ≥65 years who have previously received ≥1 doses of PPSV23 also should receive a dose of PCV13 if they have not yet received it. A dose of PCV13 should be given ≥1 year after receipt of the most recent PPSV23 dose. For those for whom an additional dose of PPSV23 is indicated, this subsequent PPSV23 dose should be given 6–12 months after PCV13 and ≥5 years after the most recent dose of PPSV23 (*15*).

Potential Time-Limited Utility of Routine PCV13 Use Among Adults ≥65 Years. The recommendations for routine PCV13 use among adults aged ≥65 years will be reevaluated in 2018 and revised as needed.

ACIP recommendations for routine use of PCV13 in adults aged ≥19 years with immunocompromising conditions, functional or anatomic asplenia, cerebrospinal fluid leak, or cochlear implants remain unchanged (*6*).

Coadministration with Other Vaccines

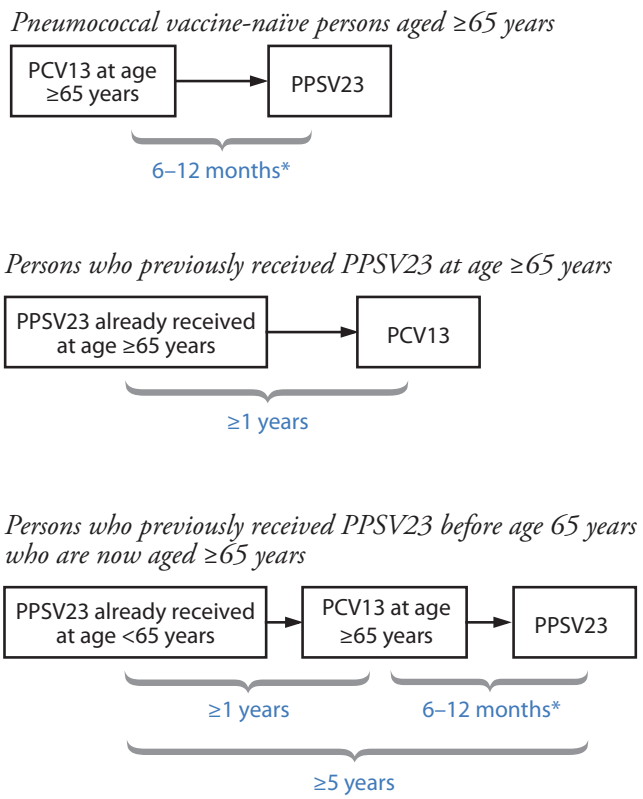
Concomitant administration of PCV13 and trivalent inactivated influenza vaccine (TIV) has been demonstrated to be immunogenic and safe. PCV13 can be coadministered with TIV in an adult immunization program. However, a randomized double-blind trial found slightly lower pneumococcal serotype–specific geometric mean concentrations and lower proportion achieving at least a fourfold rise in hemagglutination inhibition assay titer for one of three influenza subtypes (influenza A[H3N2]) with PCV13 plus TIV compared with PCV13 alone or TIV alone among adults aged ≥65 years (*16*). Currently, no data are available on coadministration with other vaccines (e.g., tetanus, diphtheria, and acellular pertussis vaccine or zoster vaccine) among adults.

Precautions and Contraindications

Before administering PCV13, vaccination providers should consult the package insert for precautions, warnings, and contraindications. Vaccination with PCV13 is contraindicated in persons known to have a severe allergic reaction (e.g., anaphylaxis) to any component of PCV13 or PCV7 or to any diphtheria toxoid–containing vaccine.

Adverse events occurring after administration of any vaccine should be reported to the Vaccine Adverse Event Reporting System (VAERS). Reports can be submitted to VAERS online, by fax,

BOX. Sequential administration and recommended intervals for PCV13 and PPSV23 for adults aged ≥65 years — Advisory Committee on Immunization Practices, United States



Abbreviations: PCV13 = 13-valent pneumococcal conjugate vaccine; PPSV23 = 23-valent pneumococcal polysaccharide vaccine.

*Minimum interval between sequential administration of PCV13 and PPSV23 is 8 weeks; PPSV23 can be given later than 6–12 months after PCV13 if this window is missed.

or by mail. Additional information about VAERS is available by telephone (1-800-822-7967) or online (http://vaers.hhs.gov).

Acknowledgments

ACIP members (membership roster for July 2014–June 2015 available at http://www.cdc.gov/vaccines/acip/committee/members-archive.html). ACIP Pneumococcal Work Group.

[1]Epidemic Intelligence Service, CDC; [2]National Center for Immunization and Respiratory Diseases, CDC; [3]Pneumococcal Vaccines Working Group, Advisory Committee on Immunization Practices; [4]School of Medicine and Dentistry, University of Rochester Medical Center, Rochester, New York; [5]Department of Global Health Systems and Development, Tulane University of Public Health and Tropical Medicine, New Orleans, Louisiana (Corresponding author: Tamara Pilishvili, tdp4@cdc.gov, 404-639-3585)

References

1. Bonten M, Bolkenbaas M, Huijts S, et al. Community Acquired Pneumonia Immunization Trial in Adults (CAPiTA). Abstract no. 0541. Pneumonia 2014;3:95. Available at https://pneumonia.org.au/public/journals/22/PublicFolder/ABSTRACTBOOKMASTERforwebupdated20-3-14.pdf.
2. Advisory Committee on Immunization Practices. GRADE tables: 2014. Atlanta, GA: US Department of Health and Human Services, CDC; 2014. Available at http://www.cdc.gov/vaccines/acip/recs/grade/pneumo-vac-adult.html.
3. Active Bacterial Core Surveillance (ABCs): Emerging Infections Program Network. Unpublished data (2013). Atlanta, GA: US Department of Health and Human Services, CDC; 2013.
4. Grijalva C, Wunderink R, Williams D, et al. Distribution of pneumococccal serotypes detected through urine analysis among US adults hospitalized with pneumonia after introduction of PCV13. Proceedings of the International Symposium on Pneumococci and Pneumococcal Diseases 2014; Hyderabad, India. Available at http://www2.kenes.com/isppd2014/scientific/documents/isppd-9%20abstract%20book.pdf.
5. Food and Drug Administration. FDA expands use of Prevnar 13 vaccine for people ages 50 and older. Silver Spring, MD: US Department of Health and Human Services; Food and Drug Administration; 2011. Available at http://www.fda.gov/newsevents/newsroom/pressannouncements/ucm285431.htm.
6. CDC. Use of 13-valent pneumococcal conjugate vaccine and 23-valent pneumococcal polysaccharide vaccine for adults with immunocompromising conditions: recommendations of the Advisory Committee on Immunization Practices (ACIP). MMWR 2012;61:816–9.
7. Jackson LA, Gurtman A, van Cleeff M, et al. Immunogenicity and safety of a 13-valent pneumococcal conjugate vaccine compared to a 23-valent pneumococcal polysaccharide vaccine in pneumococcal vaccine-naive adults. Vaccine 2013;31:3577–84.
8. Jackson LA, Gurtman A, Rice K, et al. Immunogenicity and safety of a 13-valent pneumococcal conjugate vaccine in adults 70 years of age and older previously vaccinated with 23-valent pneumococcal polysaccharide vaccine. Vaccine 2013;31:3585–93.
9. Greenberg RN, Gurtman A, Frenck RW, et al. Sequential administration of 13-valent pneumococcal conjugate vaccine and 23-valent pneumococcal polysaccharide vaccine in pneumococcal vaccine–naïve adults 60–64 years of age. Vaccine 2014;32:2364–74.
10. Jackson LA, Gurtman A, van Cleeff M, et al. Influence of initial vaccination with 13-valent pneumococcal conjugate vaccine or 23-valent pneumococcal polysaccharide vaccine on anti-pneumococcal responses following subsequent pneumococcal vaccination in adults 50 years and older. Vaccine 2013;31:3594–602.
11. Goldblatt D, Southern J, Andrews N, et al. The immunogenicity of 7-valent pneumococcal conjugate vaccine versus 23-valent polysaccharide vaccine in adults aged 50–80 years. Clin Infect Dis 2009;49:1318–25.
12. Miernyk KM, Butler JC, Bulkow LR, et al. Immunogenicity and reactogenicity of pneumococcal polysaccharide and conjugate vaccines in Alaska Native adults 55–70 years of age. Clin Infect Dis 2009;49:241–8.
13. Food and Drug Administration. Vaccines and Related Biological Products Advisory Committee (VRBPAC) adult indication briefing document: Prevnar 13. Silver Spring, MD: US Department of Health and Human Services; Food and Drug Administration; 2011. Available at http://www.fda.gov/downloads/advisorycommittees/committeesmeetingmaterials/bloodvaccinesandotherbiologics/vaccinesandrelatedbiologicalproductsadvisorycommittee/ucm279680.pdf.
14. Stoecker C. Incremental cost-effectiveness of modifying PPSV and PCV recommendations for adults age 50 and over. Presented at the Advisory Committee on Immunization Practices June 25, 2014 meeting, Atlanta, GA; 2014. Available at http://www.cdc.gov/vaccines/acip/meetings/downloads/slides-2014-06/pcv13-02-stoecker.pdf.
15. CDC. Updated recommendations for prevention of invasive pneumococcal disease among adults using the 23-valent pneumococcal polysaccharide vaccine (PPSV23). MMWR 2010;59:1102–6.
16. Schwarz TF, Flamaing J, Rümke HC, et al. A randomized, double-blind trial to evaluate immunogenicity and safety of 13-valent pneumococcal conjugate vaccine given concomitantly with trivalent influenza vaccine in adults aged ≥65 years. Vaccine 2011;29:5195–202.

Announcement

Now Available Online: Final 2013–14 Influenza Vaccination Coverage Estimates for Selected Local Areas, States, and the United States

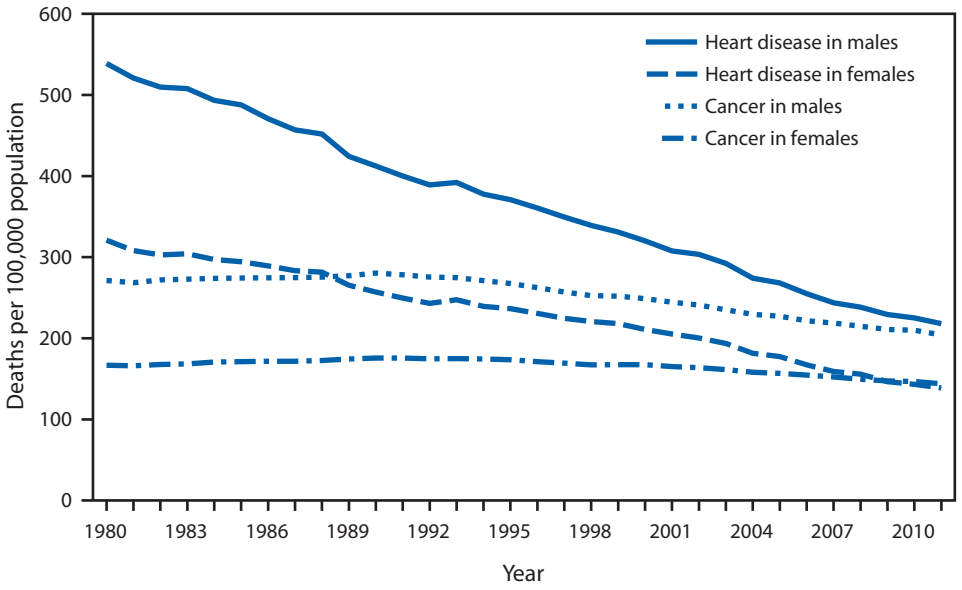
Final 2013–14 influenza season vaccination coverage estimates are now available online at FluVaxView (http://www.cdc.gov/flu/fluvaxview). The online information includes estimates of the cumulative percentage of persons vaccinated by the end of each month, from July 2013 through May 2014, for select local areas, each state, each U.S. Department of Health and Human Services region, and the United States overall.

Analyses were conducted using National Immunization Survey influenza vaccination data for children aged 6 months–17 years and Behavioral Risk Factor Surveillance System data for adults aged ≥18 years. Estimates are provided by age group and race/ethnicity. These estimates are presented in an interactive report (http://www.cdc.gov/flu/fluvaxview/interactive.htm) and complemented by an online summary report (http://www.cdc.gov/flu/fluvaxview/coverage-1314estimates.htm).

QuickStats

FROM THE NATIONAL CENTER FOR HEALTH STATISTICS

Age-Adjusted Death Rates* for Heart Disease and Cancer,† by Sex — United States, 1980–2011



* Per 100,000 population.

† As the underlying cause of death, heart disease is coded as 390–398, 402, and 404–429 for the period 1980–1998, and I00–I09, I11, I13, and I20–I51 for 1999–2011. As the underlying cause of death, cancer is coded as 140–208 for the period 1980–1998 and C00–C97 for 1999–2011, based on the *International Classification of Diseases, Ninth and Tenth Revisions*.

During 1980–2011, age-adjusted death rates for heart disease in males and females decreased steadily. The rate decreased 59.5% for males and 56.8% for females. In contrast, the rate from cancer first increased 3.4% for males and 5.3% for females during 1980–1990 and then decreased 27.2% for males and 18.0% for females by 2011. For females, the rates for cancer (147.4 per 100,000 population) surpassed the rates for heart disease (146.6) in 2009. The death rate for heart disease in males remained slightly higher (218.1) than the death rate for cancer (204.0) in 2011.

Source: National Vital Statistics System. Mortality public use data files, 1980–2011. Available at http://www.cdc.gov/nchs/data_access/vitalstatsonline.htm.

Reported by: Jiaquan Xu, MD, jax4@cdc.gov, 301-458-4086.

The *Morbidity and Mortality Weekly Report (MMWR)* Series is prepared by the Centers for Disease Control and Prevention (CDC) and is available free of charge in electronic format. To receive an electronic copy each week, visit *MMWR*'s free subscription page at *http://www.cdc.gov/mmwr/mmwrsubscribe.html*. Paper copy subscriptions are available through the Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402; telephone 202-512-1800.

Data presented by the Notifiable Disease Data Team and 122 Cities Mortality Data Team in the weekly *MMWR* are provisional, based on weekly reports to CDC by state health departments. Address all inquiries about the *MMWR* Series, including material to be considered for publication, to Editor, *MMWR* Series, Mailstop E-90, CDC, 1600 Clifton Rd., N.E., Atlanta, GA 30329-4027 or to *mmwrq@cdc.gov.*

ISSN: 0149-2195