



# Influenza Vaccination Coverage — United States, 2015–16 Influenza Season

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ISD Seminar

October 6, 2016



# Influenza Vaccination Coverage Among Health Care Personnel — United States, 2015–16 Influenza Season

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# Background

- Vaccination of health care personnel (HCP) can reduce influenza-related morbidity and mortality among both HCP and their patients and reduce absenteeism among HCP.
- The Advisory Committee on Immunization Practices (ACIP) recommends that all HCP be vaccinated against influenza during each influenza season.
  - The Healthy People 2020 target for influenza vaccination coverage among HCP is 90%.

# Data Source and Methods

- **Non-probability Internet panel survey of 2,258 HCP conducted March 28-April 14, 2016.**
- **Sample recruited via email invitation and invitation on website homepages from two sources:**
  - Professional HCP (physicians, nurse practitioners, physician's assistants, nurses, dentists, pharmacists, allied health professionals, technicians, and technologists) recruited from the WebMD Internet portal with ~2 million U.S. members.
  - Other Support HCP (assistants, aides, administrators, clerical support workers, janitors, food service workers, and housekeepers) recruited from Survey Sampling International, a general population Internet panel of >1 million U.S. households.

## Data Source and Methods (2)

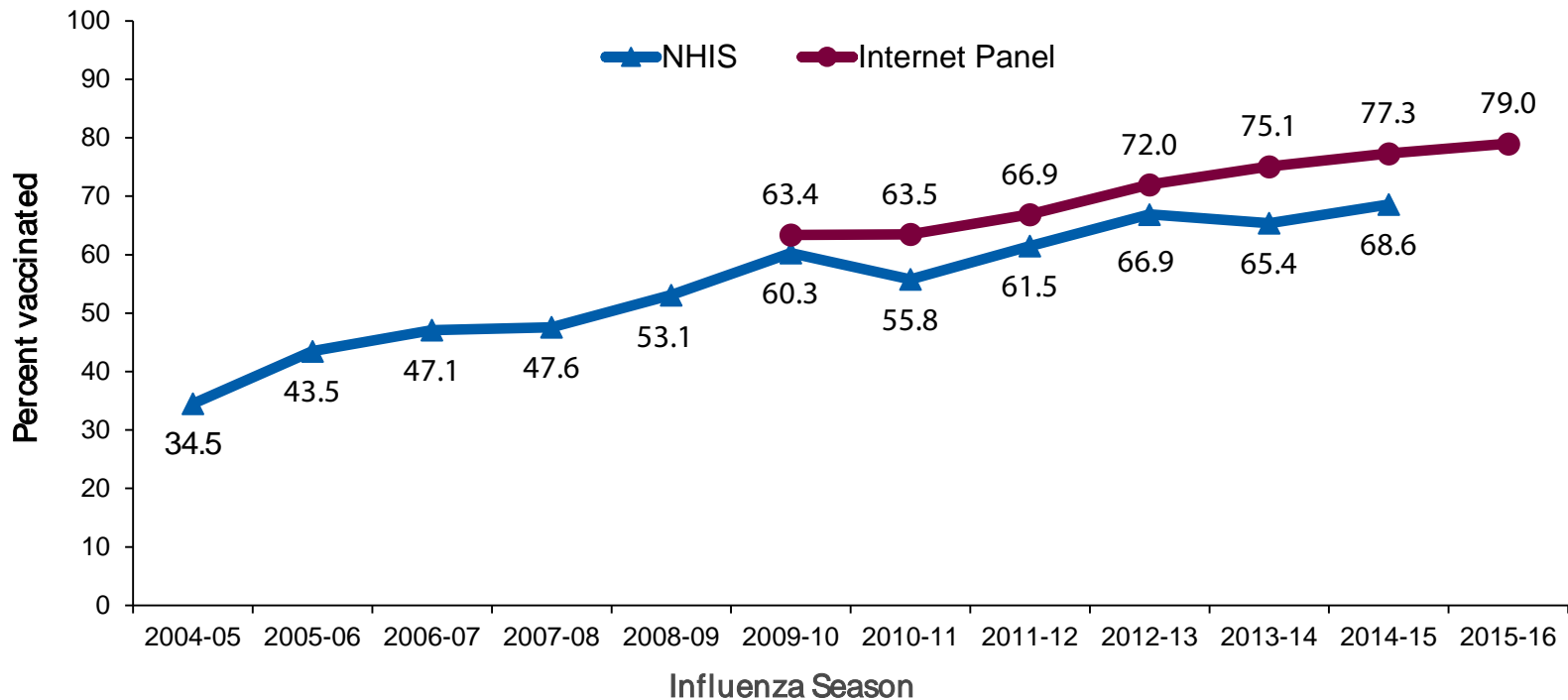
- **Survey questions included:**
  - demographic characteristics
  - occupation
  - work setting
  - self-reported influenza vaccination
  - employer vaccination policies (vaccination requirements, vaccination availability at the workplace, and promotion of vaccination including recognition, rewards, reminders, compensation, and free or subsidized vaccination).

## Data Source and Methods (3)

- Responses were weighted to the distribution of the U.S. population of HCP by:
  - occupation
  - age
  - sex
  - race/ethnicity
  - work setting
  - census region
- **No statistical testing performed since sample is non-probability based.**
  - 5 percentage points used as notable difference.

# 2015-16 Influenza Vaccination Coverage Estimates

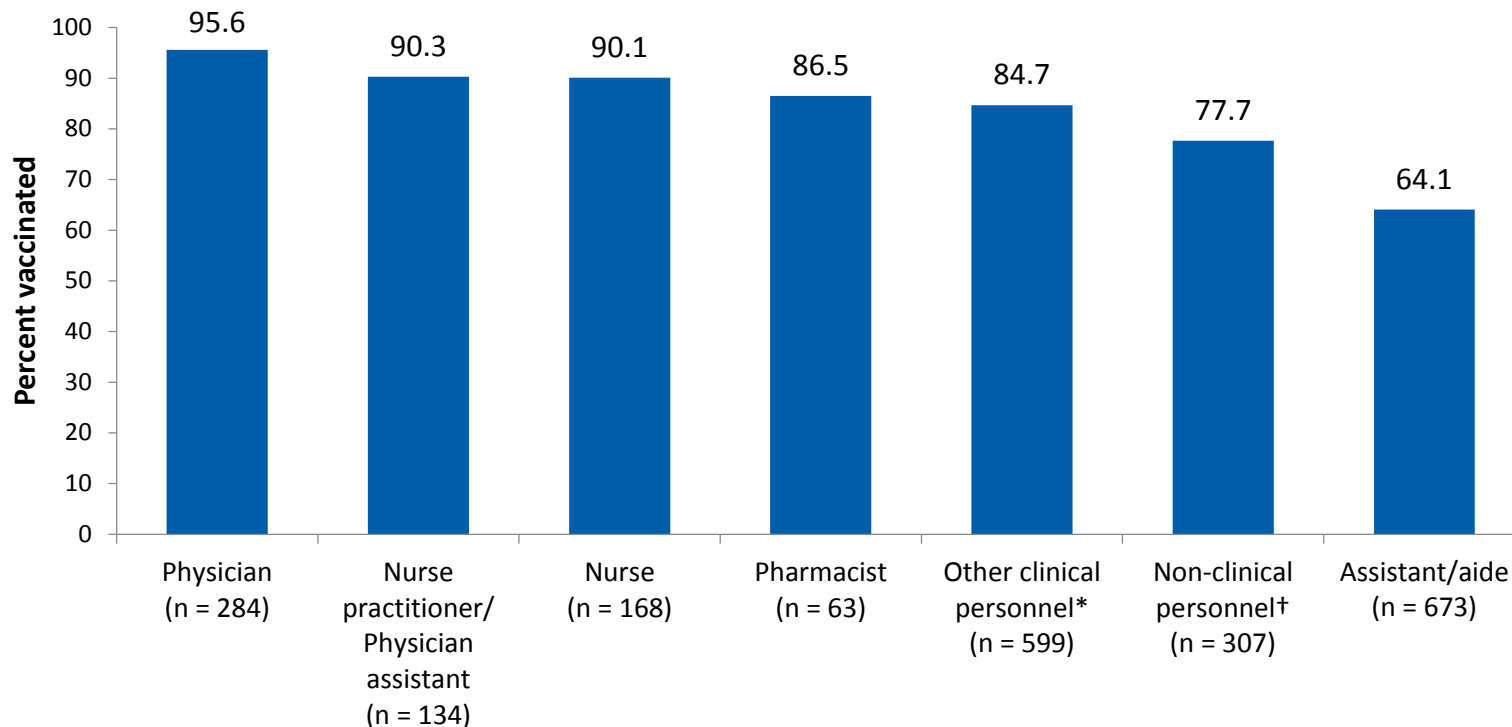
# Influenza Vaccination Coverage Among HCP, National Health Interview Survey (NHIS)\* and Internet Panel Survey, United States, 2004-05 through 2015-16 Influenza Seasons



\* Data source for HP2020 objective for HCP



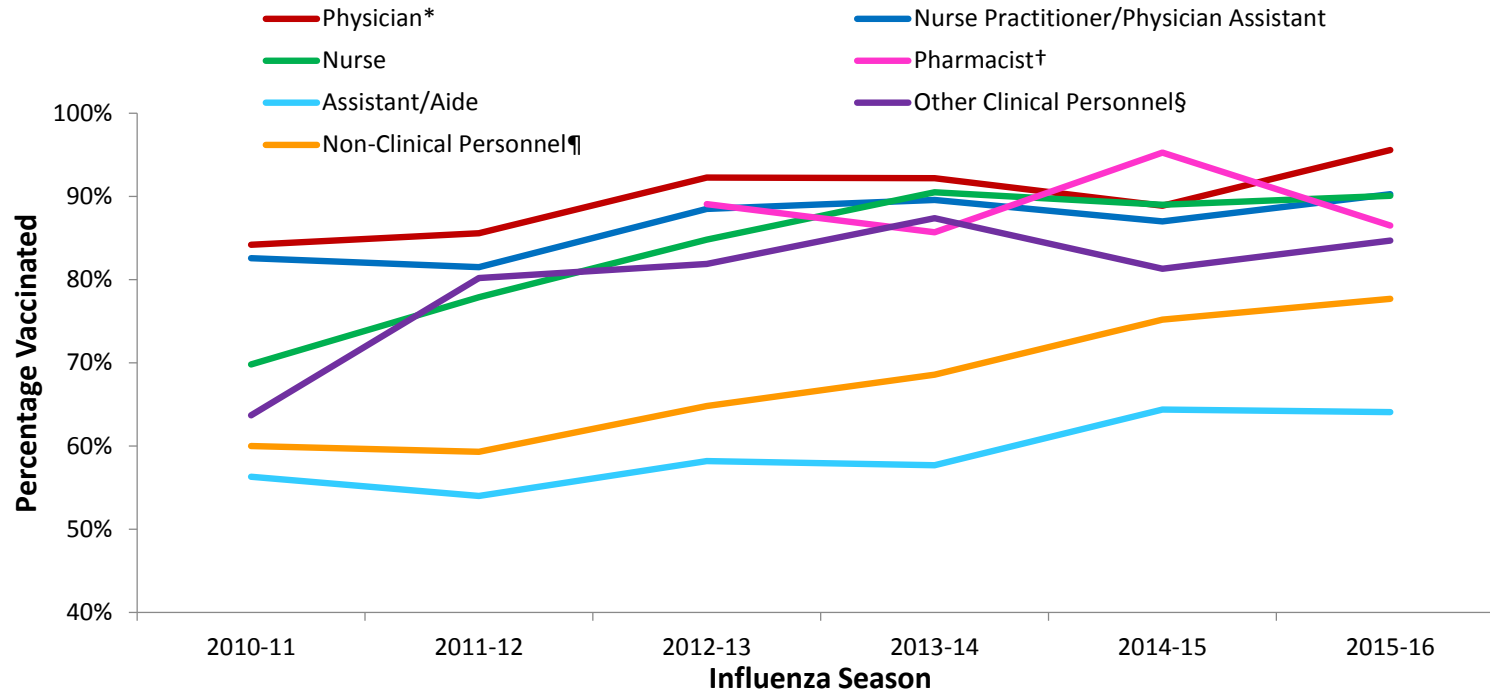
# Influenza Vaccination Coverage Among HCP by Occupation, Internet Panel Survey, United States, 2015-16 Influenza Season



\* Allied health professional, dentist, technician, or technologist

† Administrative support staff or manager and nonclinical support staff (including food service workers, housekeeping staff, maintenance staff, janitor, and laundry workers)

# Influenza Vaccination Coverage Among HCP by Occupation, Internet Panel Survey, United States, 2010-11 through 2015-16 Influenza Seasons



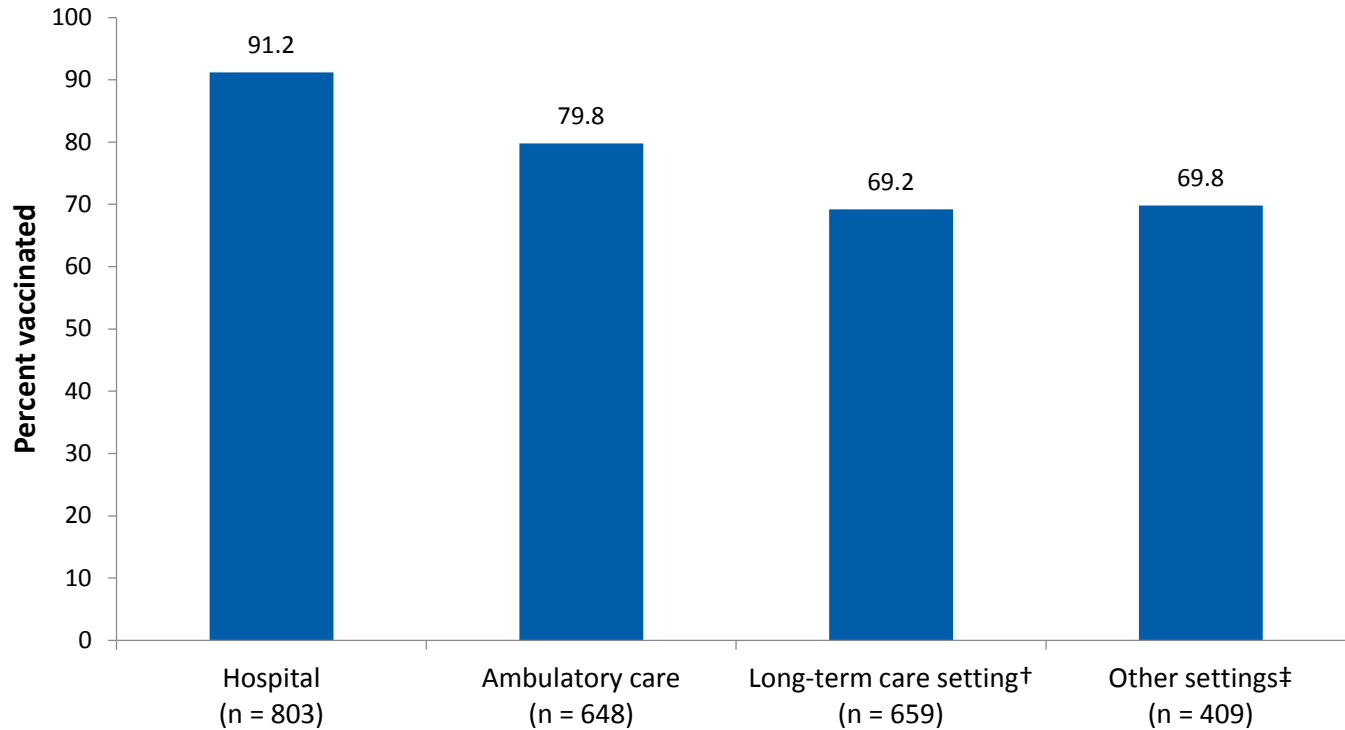
\* Included dentists in 2010-11 season.

† Individual data on pharmacists not collected prior to the 2012-13 season.

§ Allied health professionals, dentists, technicians, and technologists.

¶ Administrative support staff or manager and nonclinical support staff (including food service workers, housekeeping staff, maintenance staff, janitor, and laundry workers).

# Influenza Vaccination Coverage Among HCP by Work Setting\*, Internet Panel Survey, United States, 2015-16 Influenza Season

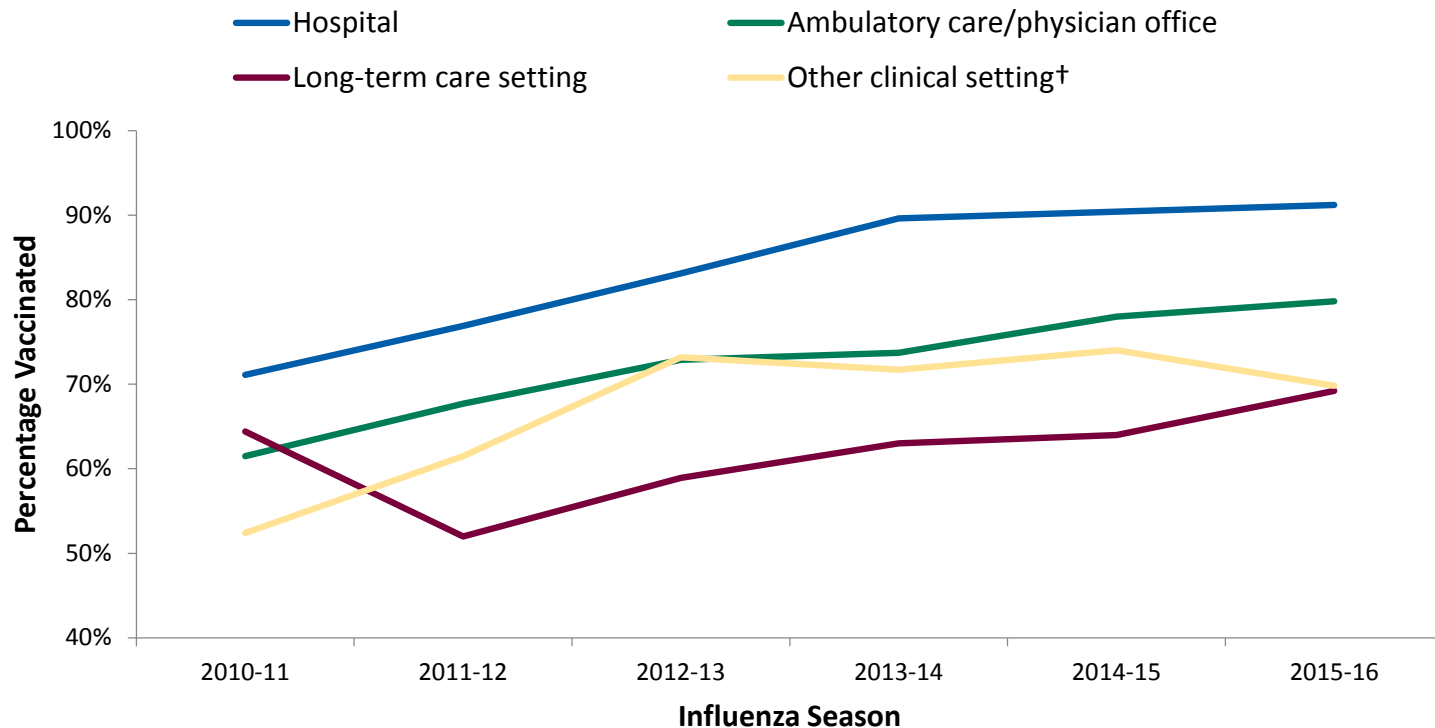


\* Respondents could select more than one work setting.

† Nursing home, assisted living facility, other long-term care facility, home health agency or home health care.

‡ Settings other than hospitals, ambulatory care setting, or long-term care facilities; includes dentist office or dental clinic, pharmacy, EMS, and other settings where clinical care or related services was provided to patients.

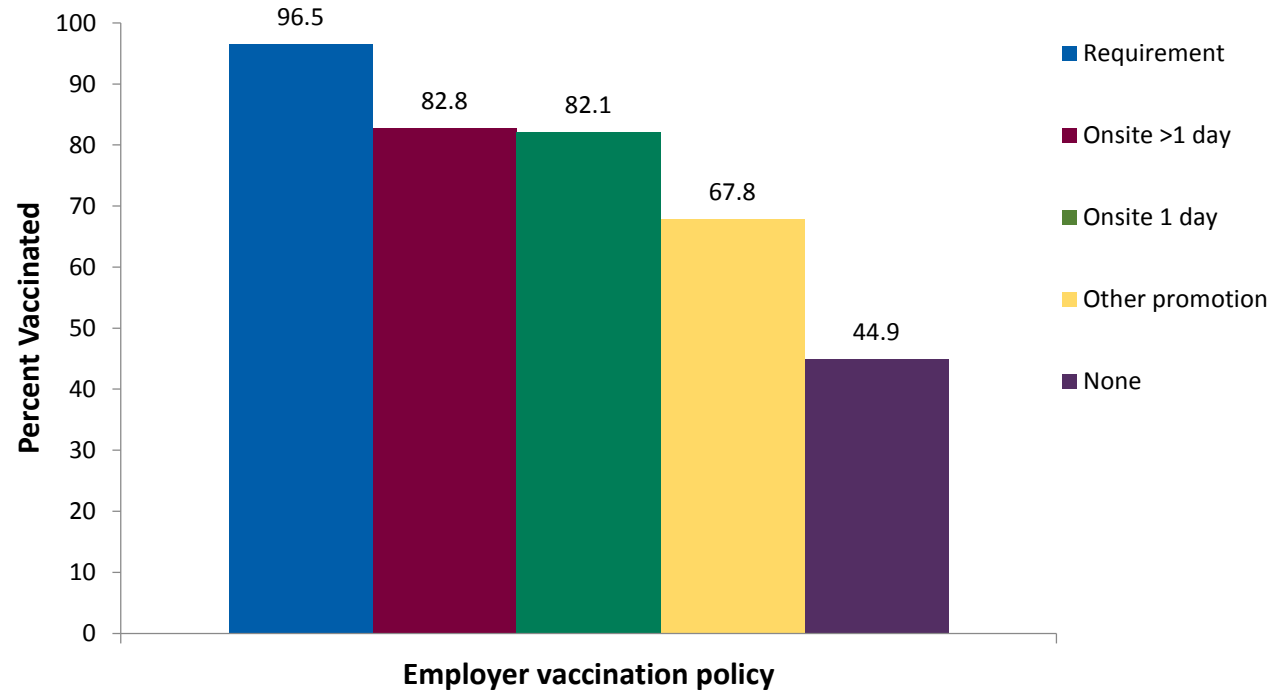
# Influenza Vaccination Coverage Among HCP by Work Setting\*, Internet Panel Survey, United States, 2010-11 through 2015-16 Influenza Seasons



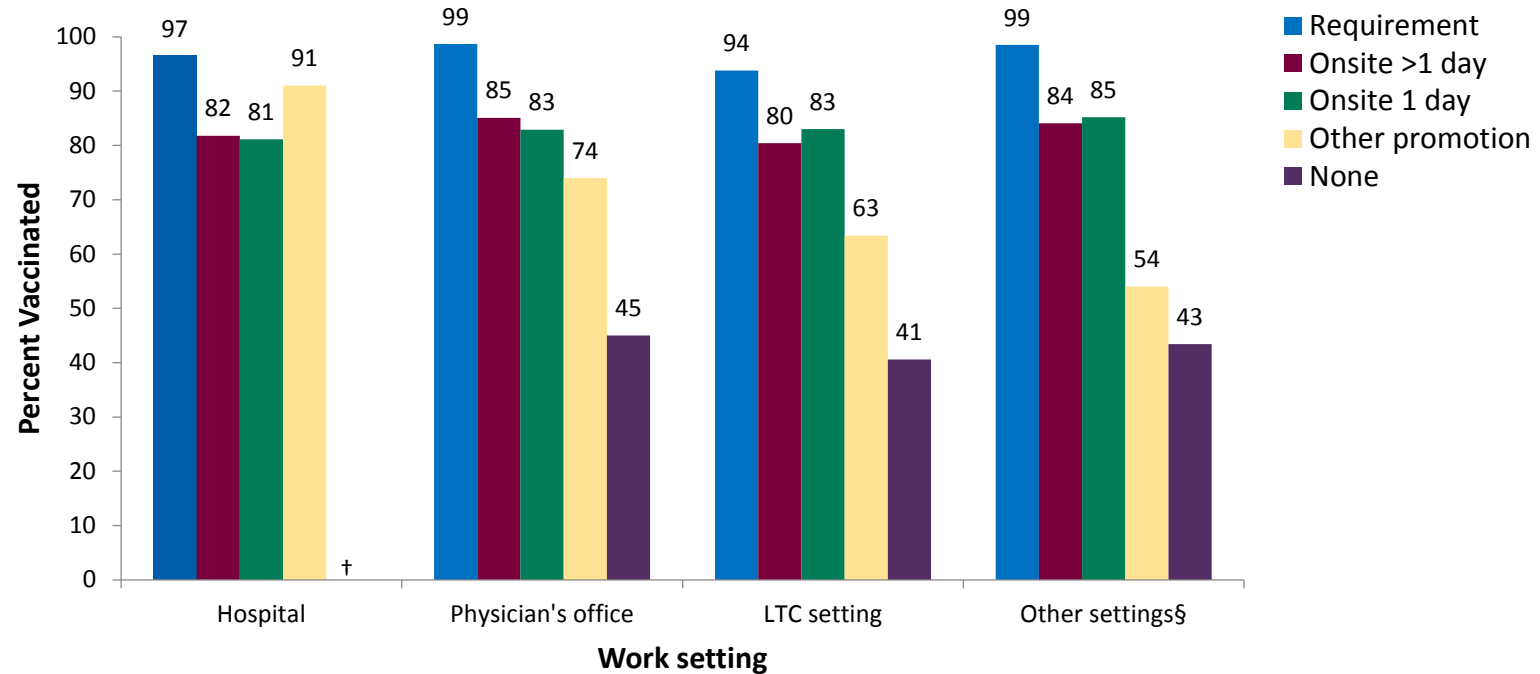
\* Respondents could select more than one work setting.

† Settings other than hospitals, ambulatory care setting, or long-term care facilities; includes dentist office or dental clinic, pharmacy, EMS, and other settings where clinical care or related services was provided to patients.

# Influenza Vaccination Coverage Among HCP, by Employer Vaccination Policy, Internet Panel Survey, United States, 2015-16 Influenza Season



# Influenza Vaccination Coverage Among HCP, by Work Setting\* and Employer Vaccination Policy, Internet Panel Survey, United States, 2015-16 Influenza Season

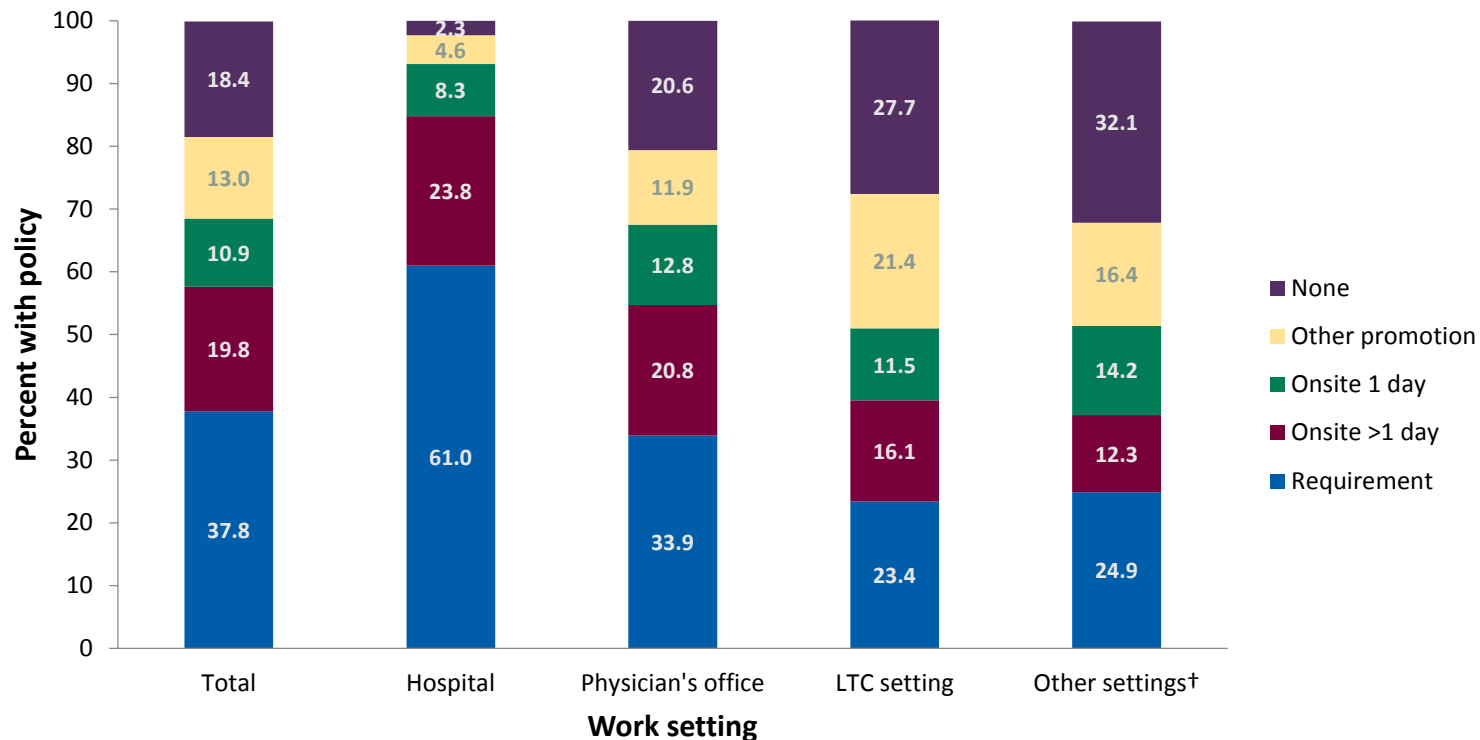


\* Respondents could select more than one work setting.

† Estimate unreliable because sample size <30.

§ Settings other than hospitals, ambulatory care setting, or long-term care facilities; includes dentist office or dental clinic, pharmacy, EMS, and other settings where clinical care or related services was provided to patients.

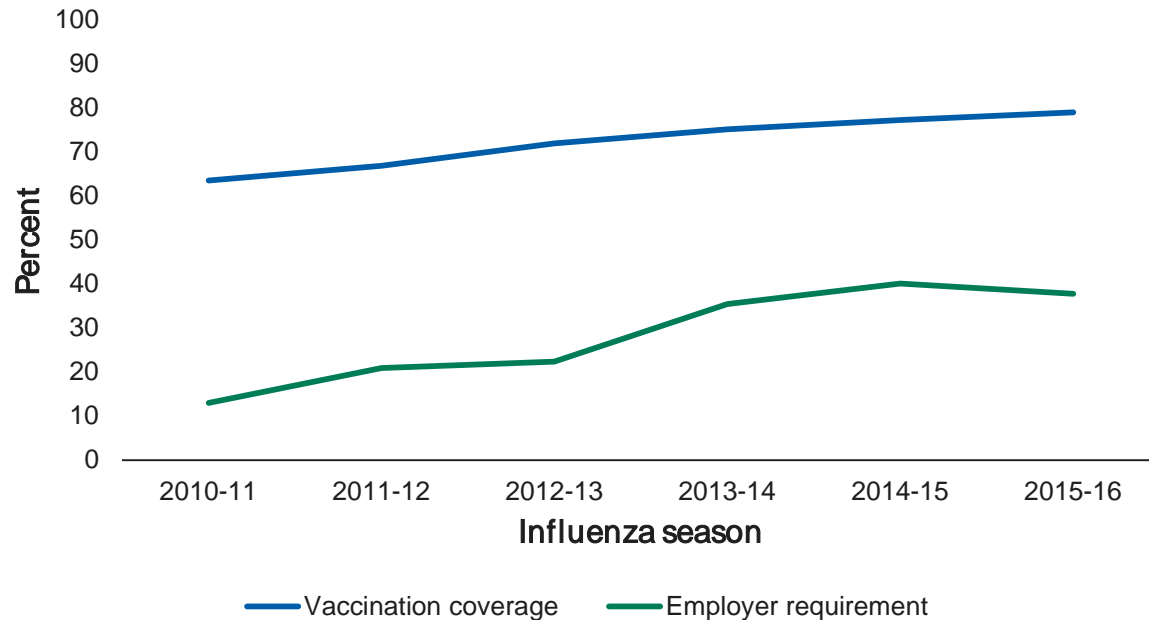
# Distribution of Employer Policy by Work Setting\*, Internet Panel Survey, United States, 2015-16 Influenza Season



\* Respondents could select more than one work setting.

† Settings other than hospitals, ambulatory care setting, or long-term care facilities; includes dentist office or dental clinic, pharmacy, EMS, and other settings where clinical care or related services was provided to patients.

# Influenza Vaccination Coverage and Employer Requirements for Vaccination Among HCP, Internet Panel Survey, United States, 2010-11 through 2015-16 Influenza Seasons





# Conclusions

- **Vaccination coverage among HCP was 79.0% in the 2015-16 influenza season.**
  - Similar to the 2014-15 season but higher than the 2009–10 through 2012-13 seasons.
- **Coverage continues to be higher among HCP working in hospitals (91.2%) and lower among HCP working in ambulatory (79.8%) and LTC settings (69.2%).**
  - Coverage in LTC settings increased by ~5 percentage points in 2015-16 compared with 2015-15.
- **Coverage was higher among professional clinical HCP and lower among non-clinical HCP and assistants/aides.**

## Conclusions (2)

- **Higher vaccination coverage among HCP was associated with employer vaccination requirements or access to vaccination at the workplace at no cost.**
  - An increased percentage of HCP reporting a vaccination requirement or onsite vaccination availability compared with earlier influenza seasons might have contributed to the overall increase in vaccination coverage during the past six influenza seasons.
  - HCP working in LTC settings were least likely to report that their employer required vaccination or made vaccination available on-site at no cost.

# Limitations

- **Sample was not randomly selected from HCP in the United States.**
  - Non-probability sample, so no statistical tests performed.
  - Results may not be representative of the HCP population in the United States.
    - HCP without internet access excluded.
  - In previous years, estimates were 3-10 percentage points higher than from those of the NHIS, a probability-based survey.
- **Results based on self-report, not verified by employment or medical records, and may be subject to recall bias.**
- **Non-coverage and nonresponse bias might remain after weighting adjustments.**

# Public Health Implications

- **Comprehensive workplace strategies should include easy access to vaccination at no cost on multiple days along with promotion of vaccination to increase HCP vaccination coverage.**
- **Employers and health care administrators should make use of the Guide to Community Preventive Services.**
  - Has found evidence to support interventions with on-site, free, and actively promoted influenza vaccinations.
- **Long-term care employers can additionally use the LTC web-based toolkit.**
  - Provides access to resources, strategies, and educational materials for increasing influenza vaccination among HCP in LTC settings.
  - Can be found at <http://www.cdc.gov/flu/toolkit/long-term-care/index.htm>.



# Influenza Vaccination Coverage Among Pregnant Women, United States, 2015-16 Influenza Season

Helen Ding, MD, MS, MSPH, Epidemiologist

ISD Seminar

Oct. 6, 2016

# Background

- **Pregnant women are at increased risk for influenza related morbidity and mortality.**
- **Influenza vaccination can protect pregnant women and their babies, especially those <6 months old who are too young to be vaccinated themselves.**
- **Since 2004, the Advisory Committee on Immunization Practice (ACIP) and the American College of Obstetricians and Gynecologists (ACOG) recommend influenza vaccination to all women who are or will be pregnant during influenza season, regardless of trimester.**

# Vaccination of Pregnant Women in Previous Influenza Seasons

- Prior to the 2009-10 influenza season, annual influenza vaccination coverage among pregnant women was generally low based on the National Health Interview Survey (NHIS).
- During the 2009-10 influenza season, vaccination coverage increased substantially to about 50% based on the National H1N1 Flu Survey (NHFS) and the Pregnancy Risk Assessment Monitoring System (PRAMS).
- The increased vaccination level was sustained during the 2010-11 through 2014-15 seasons.

# Data Source and Methods

- **Non-probability Internet panel survey, conducted twice a year.**
- **Pregnant women recruited from a general population panel ([www.surveypot.com](http://www.surveypot.com)).**
  - Approximately 1 million members.
  - Dynamic panel with members opting in and out.
  - Recruiting methods: by email invitation and Internet intercept.
- **Women 18-49 years who were pregnant any time since August 1, 2015 were eligible.**
- **Sampled women were weighted to represent the national population of pregnant women.**
  - Weighted by age group, race/ethnicity, and geographic distribution.

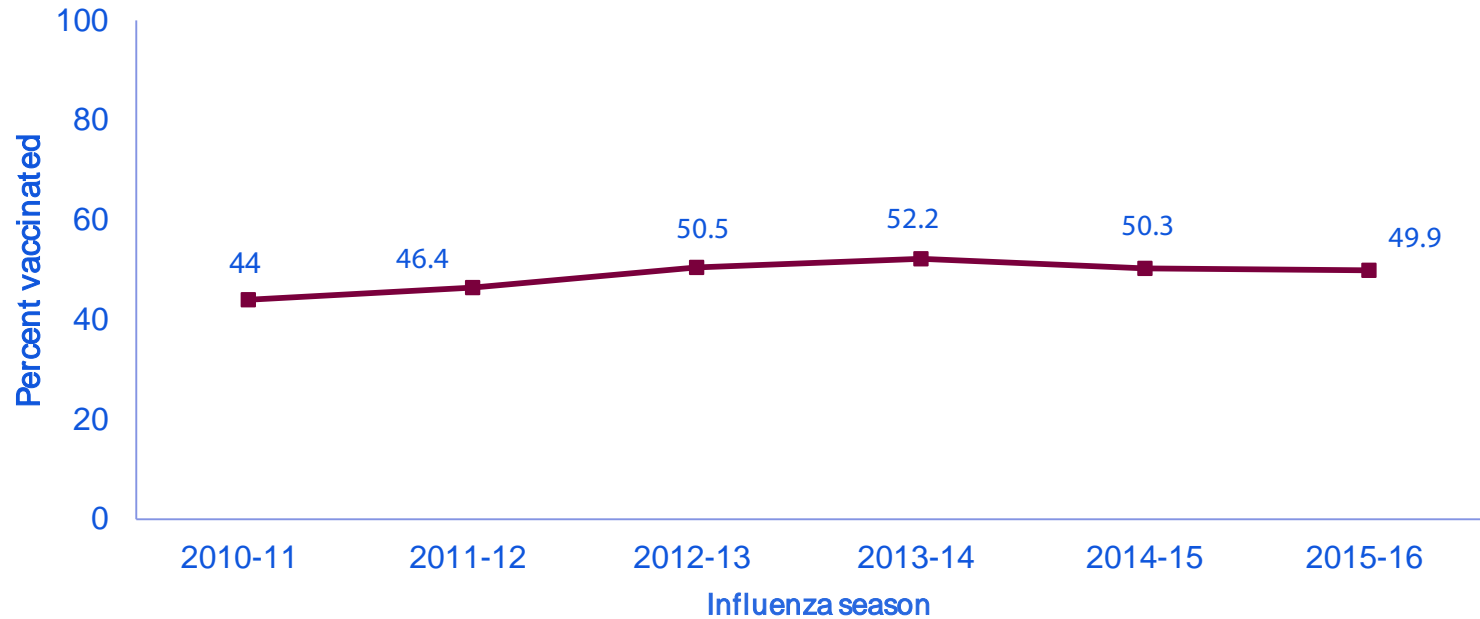


## Data Source and Methods (2)

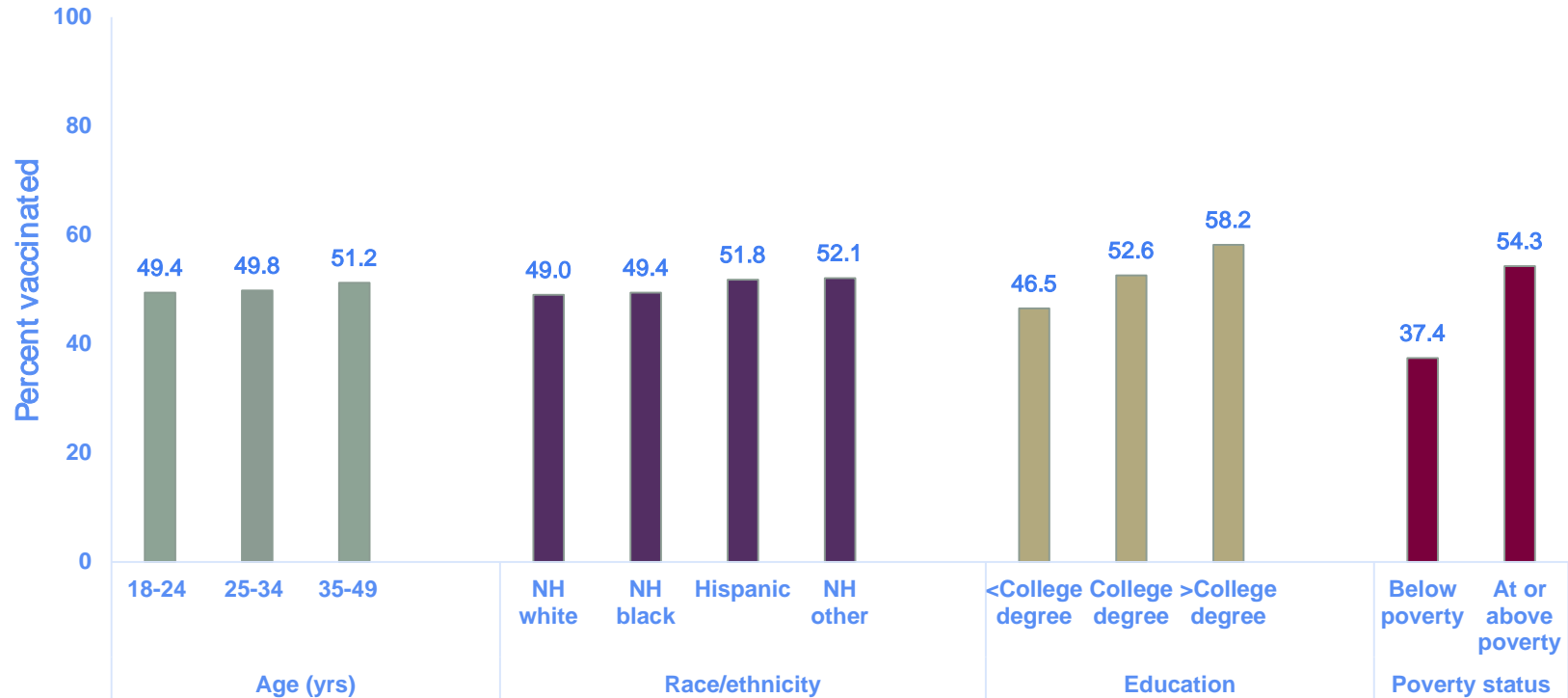
- **Survey conducted in April 2016.**
- **Study population**
  - Women who were pregnant during the peak vaccination period (October 2015 – January 2016) (n=1,692).
- **Measure of vaccination coverage**
  - Any reported vaccination received before and during pregnancy.
  - Reported vaccination between July 1, 2015 to time of interview in April 2016.
- **Measure of attitudes toward influenza vaccination**
  - Three composite variables were created for attitudes toward influenza infection, vaccination effectiveness and vaccination safety.
- **No statistical testing performed or confidence intervals computed since survey is non-probability based.**
  - Five percentage points used for a notable difference between two estimates.

# **2015-16 Influenza Vaccination Coverage Estimates**

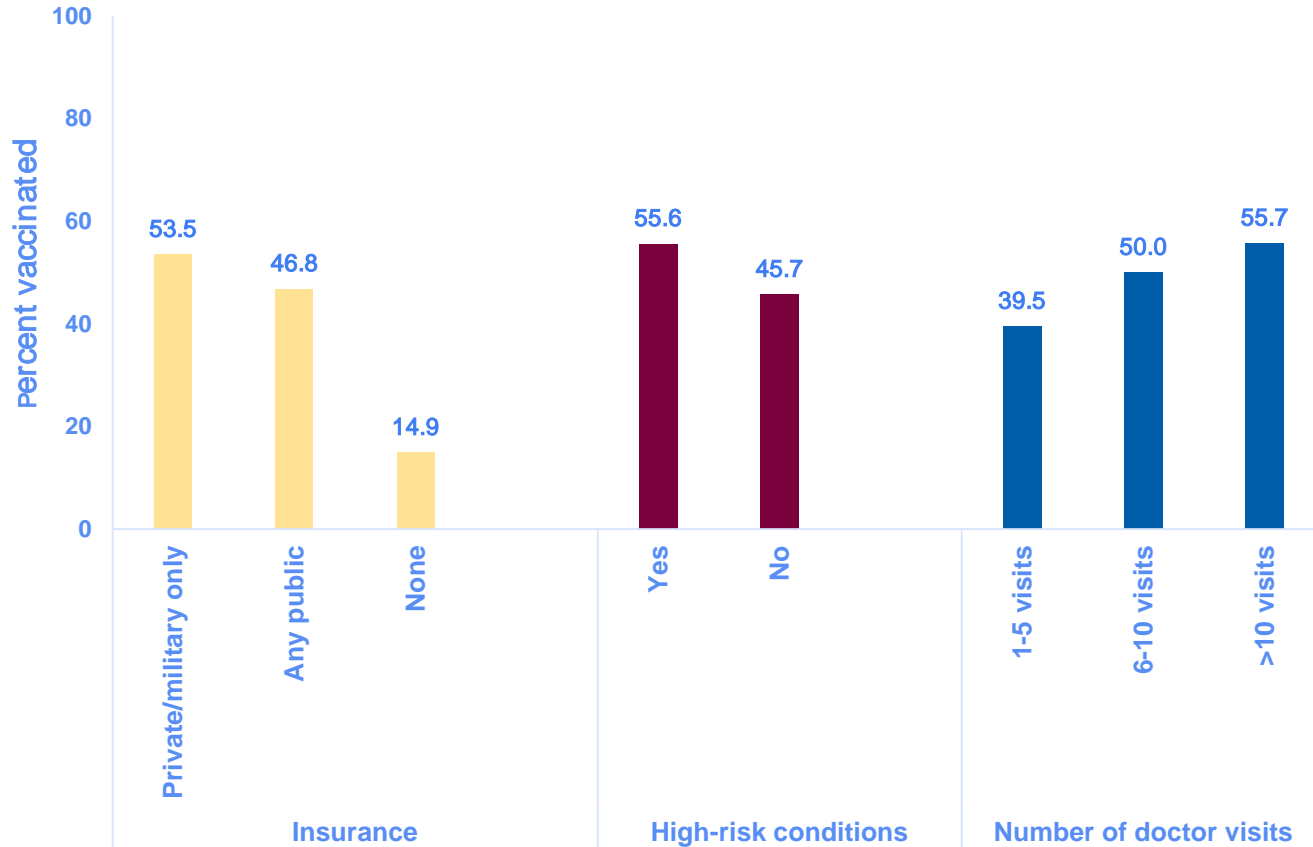
# Influenza Vaccination Coverage Before and During Pregnancy among Women Pregnant Anytime October through January, Internet Panel Survey, United States, 2010-11 through 2015-16 Influenza Seasons



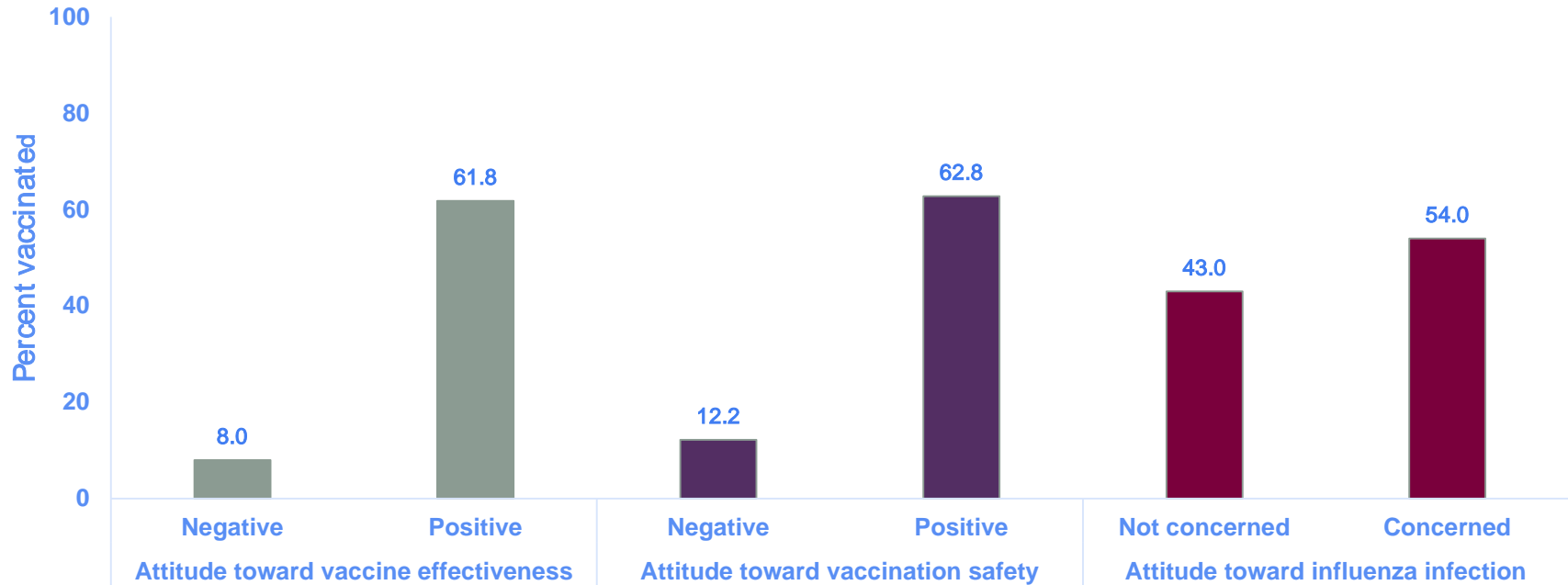
# Influenza Vaccination Coverage by Socio-demographic Characteristics, Internet Panel Survey, United States, 2015-16 Influenza Season



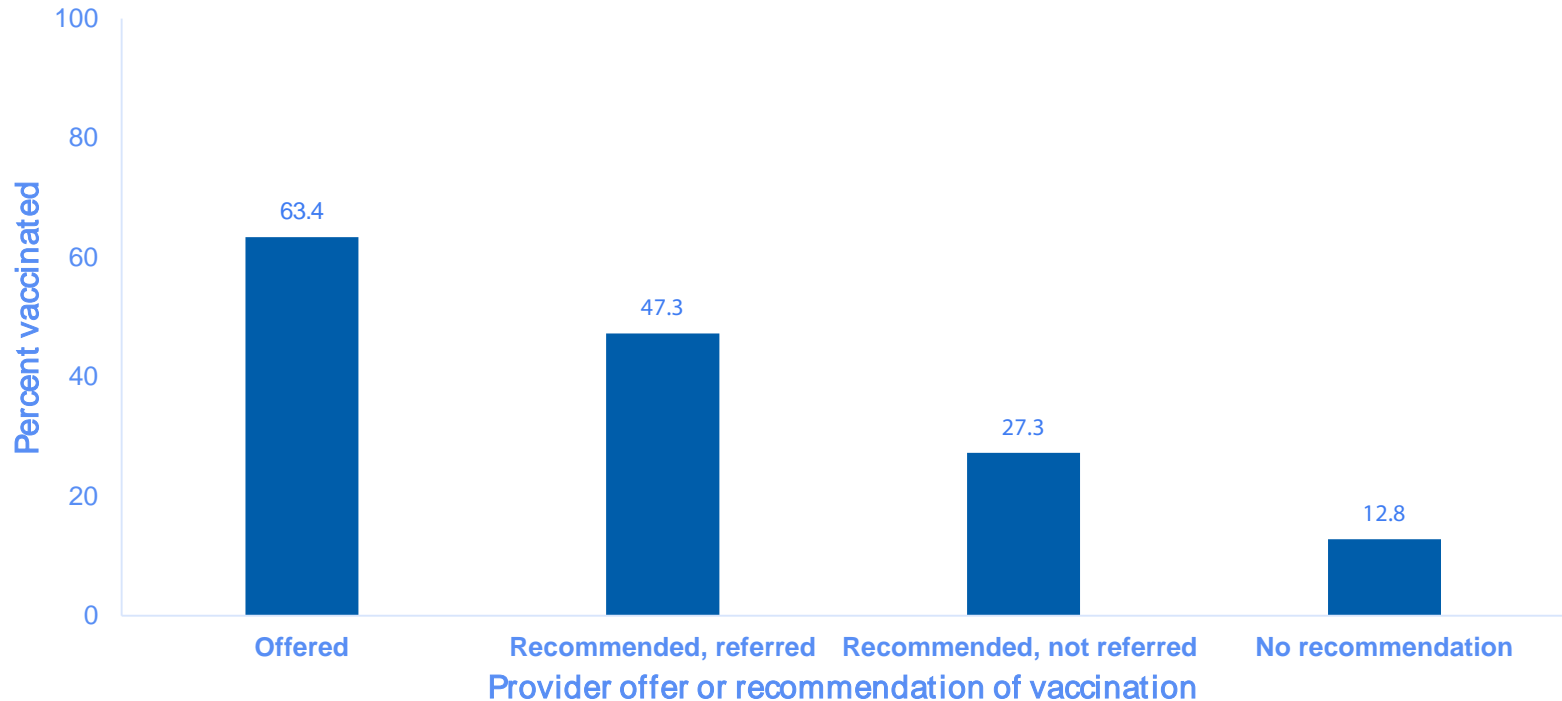
# Influenza Vaccination Coverage by Socio-demographic Characteristics, Internet Panel Survey, United States, 2015-16 Influenza Season



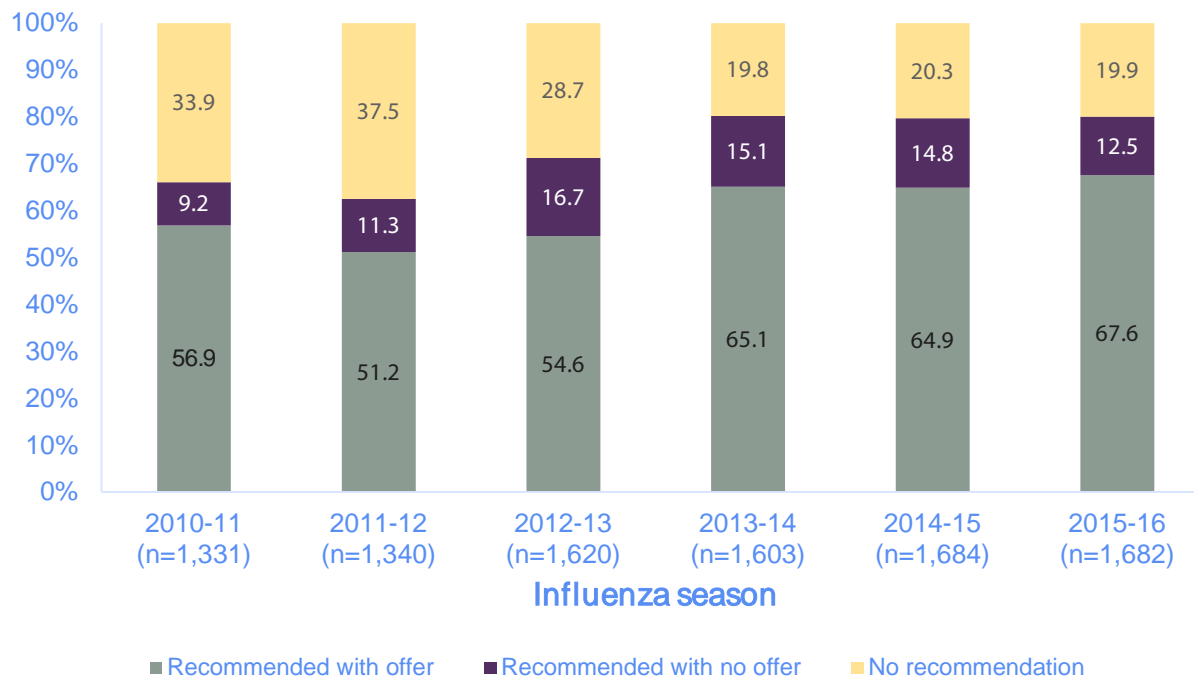
# Influenza Vaccination Coverage by Attitudes Toward Vaccination or Influenza Infection, Internet Panel Survey, United States, 2015-16 Influenza Season



# Influenza Vaccination Coverage by Provider Recommendation and Offer of Vaccination, Internet Panel Survey, United States, 2015-16 Influenza Season



# Prevalence of receiving provider recommendation and/or offer of influenza vaccination among women who visited a provider at least once since August and who were pregnant anytime between October-January, Internet Panel Survey, 2010-11 through 2015-16 influenza seasons



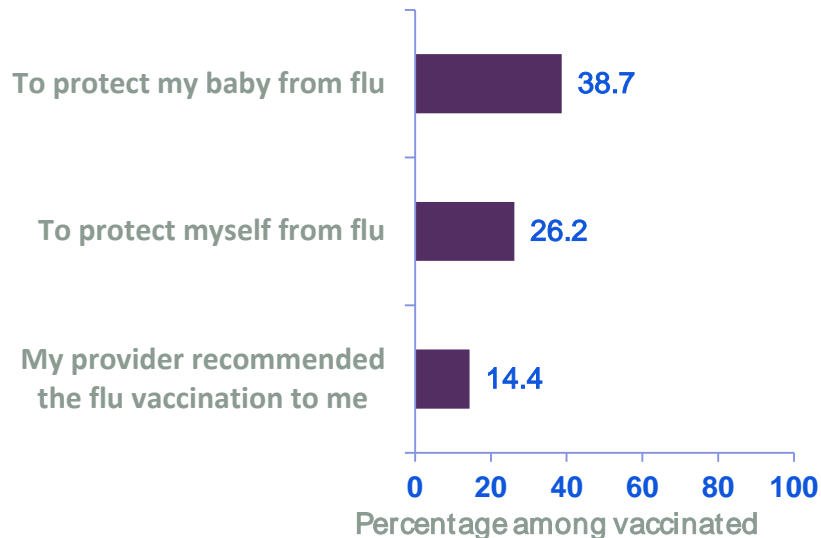


## Prevalence of Provider Recommendation and Offer by Subgroup Characteristics, Internet Panel Survey, United States, 2015-16 influenza Season

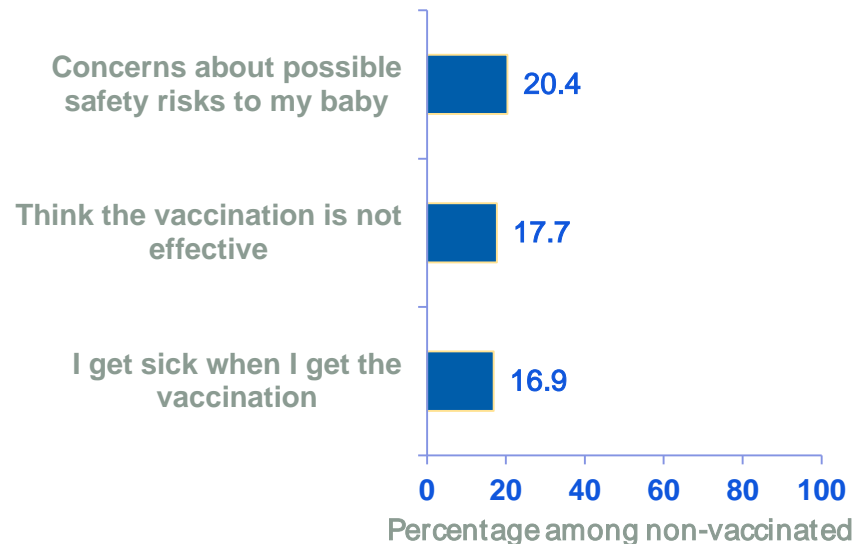
- **Women in the following groups received a lower percentage of provider recommendation and offer compared with the reference group in each category; their vaccination coverages were also lower compared with the reference group.**
  - Women with no insurance (32.7% vs. 69.3 %);
  - Women without high-risk conditions (64.5% vs. 71.8%);
  - Women with 1-5 provider visits (53.2%) and 6-10 visits (67.4%) vs.  $\geq 10$  visits (75.3%);
  - Women with a negative attitude toward vaccination effectiveness (51.7 vs. 72.1%);
  - Women with a negative attitude toward vaccination safety (47.5% vs. 74.5%);
  - Women not concerned about influenza infection (63.4% vs. 70.1%).
- **Women with a college degree or less, who are unmarried, not working, and living below poverty had a lower vaccination coverage compared with the reference group even though they received a similar proportion of provider recommendation and offer for vaccination.**

# Reasons for Receiving and Not Receiving Vaccination, Internet Panel Survey, United States, 2015-16 Influenza Season

Top three reasons for RECEIVING vaccination (n=844)

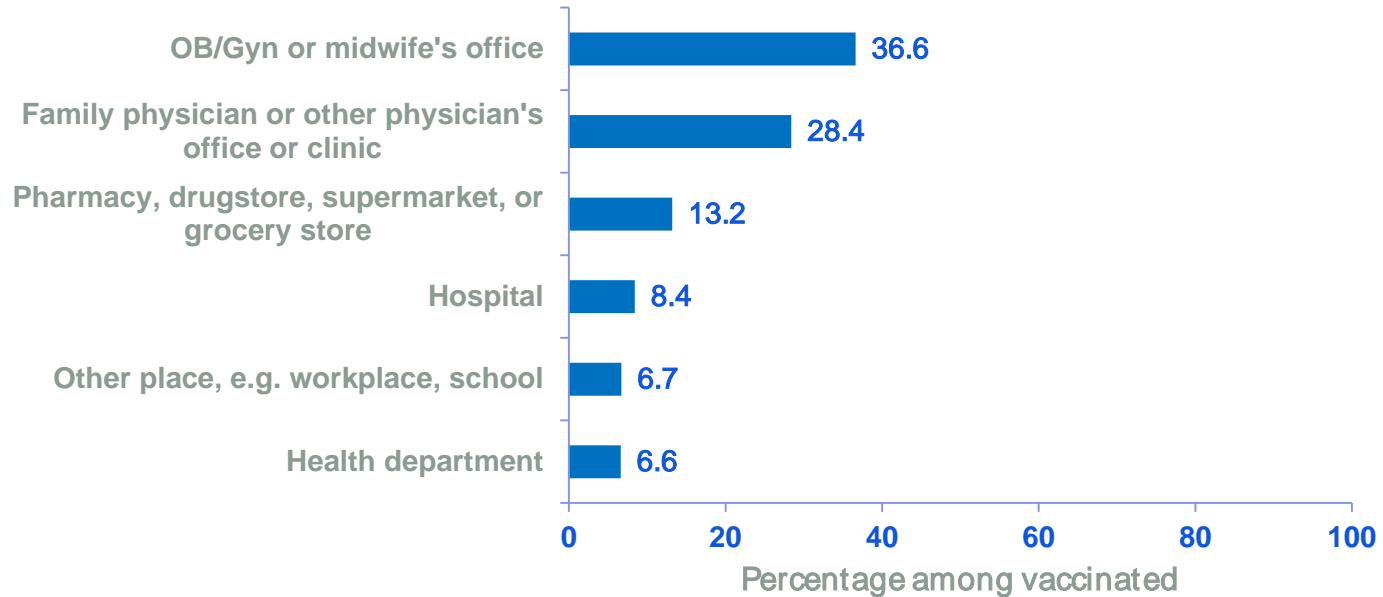


Top three reasons for NOT RECEIVING vaccination (n=778)




# Place of Influenza Vaccination, Internet Panel Survey, United States, 2015-16 Influenza Season

Among women reporting influenza vaccination (n=844)



# Conclusions

- During the 2015–16 influenza season, influenza vaccination coverage among pregnant women remained stable at approximately 50% compared with the previous four seasons.
  - In this season, we did not find the racial/ethnic disparity in vaccination coverage between non-Hispanic black and non-Hispanic white women as observed in the previous seasons.
  - The percentage of women who reported receiving a provider offer and recommendation has not increased in the last three influenza seasons.
  - A provider recommendation combined with an offer for the flu vaccination was associated with higher coverage, even among women with negative attitudes toward effectiveness and safety of flu vaccination.
- 

# Limitations

- **Sample was not randomly selected from pregnant women in the United States.**
  - Non-probability sample, so no statistical tests performed.
  - Results may not be representative of the pregnant women population in the United States.
    - Pregnant women without internet access were excluded.
- **Results based on self-report, not verified by medical records, and may be subject to recall bias.**
- **Non-coverage and nonresponse bias might remain after weighting adjustments.**
- **Composite variables for attitudes toward effectiveness and safety of influenza vaccination were not validated.**

# Public Health Implications

- **Implementing the National Vaccine Advisory Committee's Standards for Adult Immunization Practices Standards for Adult Immunization Practice, which state that all health care providers should assess, recommend, administer or refer, and document vaccinations, can reduce missed opportunities for vaccination and increase influenza vaccination coverage, protecting both the mother and the infant.**



# Influenza Vaccination Coverage in the United States, 2015-16 Influenza Season

## National Immunization Survey-Flu (NIS-Flu) and Behavioral Risk Factor Surveillance System (BRFSS)

Katherine E. Kahn, MPH  
Contract epidemiologist, Leidos

ISD Seminar  
October 6, 2016

# Background

- Influenza can be a serious disease that can lead to hospitalization and sometimes even death.
- Vaccination is the most effective strategy to prevent people from getting influenza and potentially serious related complications.
- The Advisory Committee on Immunization Practices (ACIP) recommends influenza vaccination for everyone  $\geq 6$  mos. (2010).
- Healthy People 2020 target for children and adults: 70%.



# Data Sources and Methods

- **National Immunization Survey-Flu (NIS-Flu)**
  - On-going, national list-assisted random-digit-dial landline and cellular telephone survey of households with children.
  - NIS (19-35 months), NIS Teen (13-17 years), and NIS child immunization module (6-18 months and 3-12 years).
  - Parental report: Has child received flu vaccination since July 1, 2015? (month, year).
  - Used interviews conducted October 2015 – June 2016.

## Data Sources and Methods (2)

- **Behavioral Risk Factor Surveillance System (BRFSS)**
  - On-going state-based monthly telephone survey of randomly selected persons  $\geq 18$  years among the non-institutionalized, U.S. population on health conditions and risk behaviors.
  - Self report: Flu vaccination in the past 12 months (month, year).
  - Used interviews conducted September 2015 – June 2016.

# Data Sources and Methods (3)

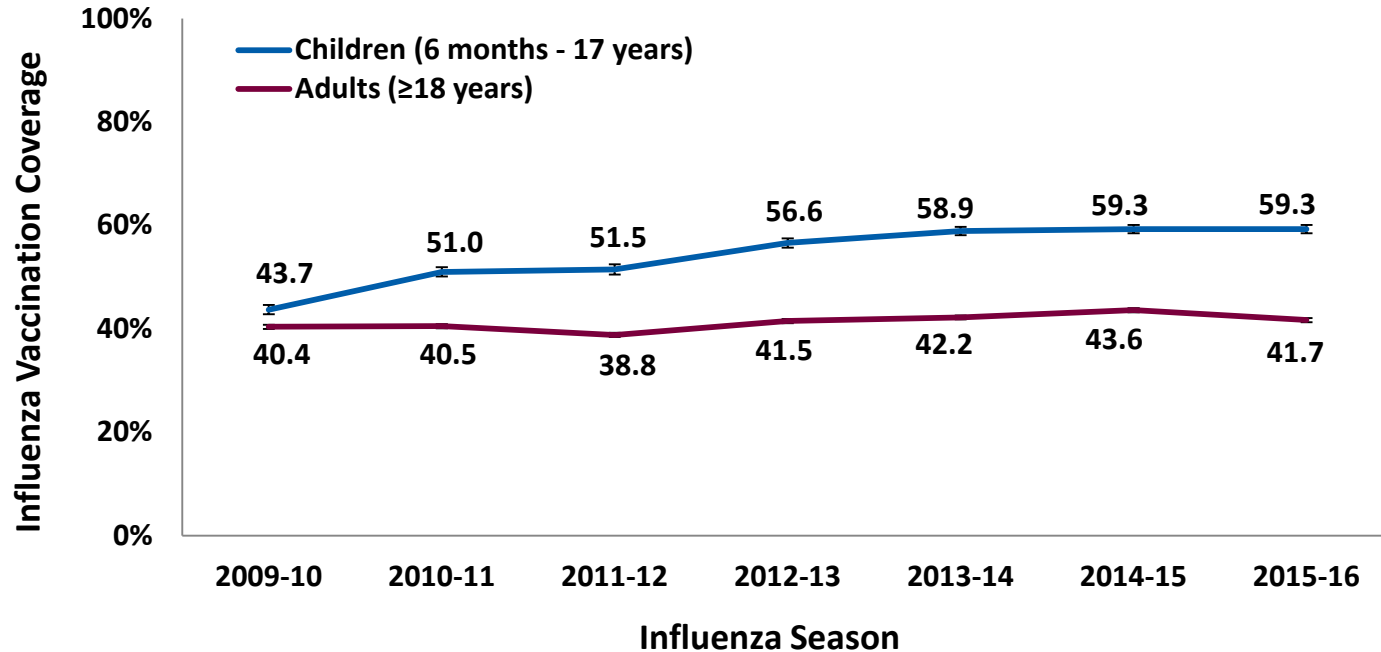
## ■ Analysis

- Kaplan-Meier survival analysis to determine cumulative monthly influenza vaccination coverage ( $\geq 1$  doses) July 2015 – May 2016.
- Coverage estimates calculated for children (6 mos. – 17 yrs.) from NIS-Flu and for adults ( $\geq 18$  yrs.) from BRFSS and then combined for  $\geq 6$  months.
- Imputations where month and year of vaccination missing.
- Data were analyzed and weighted with SUDAAN to account for complex survey design.
- T-tests ( $p < 0.05$ ) to determine differences between groups and between the 2014-15 and 2015-16 seasons.

**2015-16**

**Influenza Vaccination Coverage Estimates**

# Seasonal Influenza Vaccination Coverage, by Age Group and Season, NIS-Flu and BRFSS, United States, 2009-10 through 2015-2016 Seasons

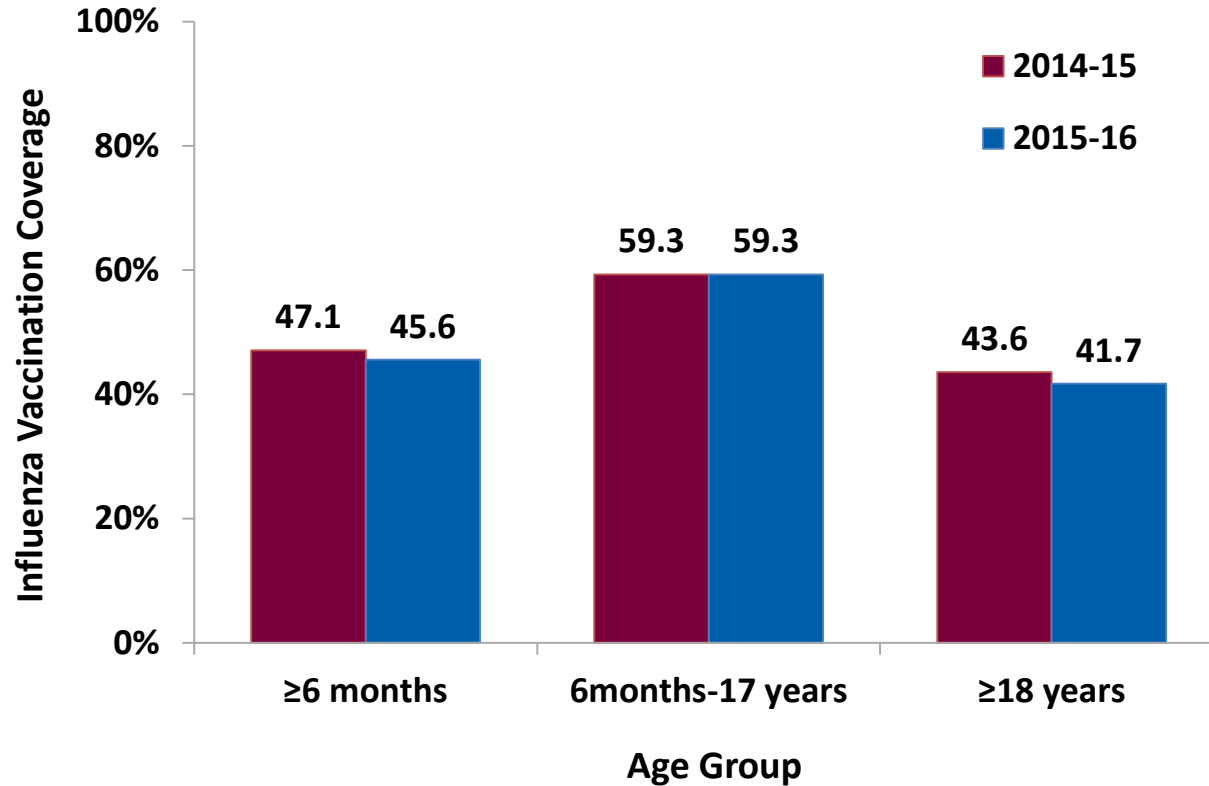


Error bars represent 95% confidence intervals around the estimates.

The 2009-10 estimates do not include the influenza A (H1N1) pdm09 monovalent vaccine.

Starting with the 2011-12 season, adult estimates reflect changes in BRFSS survey methods: the addition of cellular telephone samples and a new weighting method.

# Influenza Vaccination Coverage, by Age Group and Season, NIS-Flu and BRFSS, United States, 2014-15 and 2015-16 Seasons



## Influenza Vaccination Coverage by Age Group, Children 6 months – 17 years, NIS-Flu, United States, 2015-16 Season

Age Group	Unweighted Sample Size	%* ±95% CI†	Difference from the 2014-15 Season ±95% CI
6 months–17 years	126,846	59.3 ± 0.8	0.0 ± 1.1
6 months–4 years	38,713	70.0 ± 1.4	-0.4 ± 1.9
6–23 months	14,827	75.3 ± 1.7	0.7 ± 2.5
2–4 years	23,886	66.8 ± 1.8	-1.0 ± 2.5
5–17 years	88,133	55.9 ± 0.9	0.1 ± 1.3
5–12 years	54,825	61.8 ± 1.2	0.0 ± 1.6
13–17 years	33,308	46.8 ± 1.4	0.2 ± 2.0

\* Percentage vaccinated.

† Confidence interval half-widths.

# Influenza Vaccination Coverage by Age Group, Adults 18 years and older, BRFSS, United States, 2015-16 Season

Age Group	Unweighted Sample Size	%* ±95% CI†	Difference from the 2014-15 Season ±95% CI
≥18 years	319,167	41.7 ± 0.4	-1.9 ± 0.6‡
18-64 years	205,848	36.3 ± 0.6	-1.7 ± 0.8‡
18-64 years at high risk§	53,798	46.0 ± 1.2	-1.6 ± 1.7
18-64 years not at high risk	149,939	33.5 ± 0.6	-1.8 ± 0.8‡
18-49 years	105,988	32.7 ± 0.8	-0.8 ± 1.1
18-49 years at high risk	18,662	39.5 ± 2.0	0.2 ± 2.7
18-49 years not at high risk	86,111	31.5 ± 0.8	-1.1 ± 1.1
50-64 years	99,860	43.6 ± 0.8	-3.4 ± 1.1‡
≥65 years	113,319	63.4 ± 0.8	-3.3 ± 1.1‡

\* Percentage vaccinated.

† Confidence interval half-widths.

‡ Statistically significant difference between the 2015-16 season and the 2014-15 season by t-test (P<0.05).

§ Selected high risk conditions; includes people with asthma, diabetes, heart disease, chronic obstructive pulmonary disease, or cancers other than skin cancer.



# Influenza Vaccination Coverage by Race/Ethnicity, Children 6 months – 17 years, NIS-Flu, United States, 2015-16 Season

Race/Ethnicity*	Unweighted Sample Size	% <sup>†</sup> ±95% CI <sup>‡</sup>	Difference from the 2014-15 Season ±95% CI
White only, non-Hispanic	73,660	55.3 ± 0.9	-0.7 ± 1.3
Black only, non-Hispanic	13,717	60.9 ± 2.1	2.6 ± 3.3
Hispanic	23,568	64.7 ± 2.0	0.5 ± 2.7
Other, non-Hispanic (Total)	15,901	64.8 ± 2.4	-1.2 ± 3.3
Asian	6,002	73.5 ± 3.5	1.4 ± 4.9
Am. Indian/Alaska Native	1,867	60.7 ± 7.4	-6.3 ± 9.5
Other or multiple races	8,032	57.0 ± 3.1	-3.0 ± 4.5

\* Race/ethnicity is based on parental or self report. Persons of Hispanic ethnicity may be of any race. Persons categorized as white, black, or other or multiple races were identified as non-Hispanic. The other or multiple races category included persons reporting Asian, American Indian and Alaska Native, Native Hawaiian or other Pacific Islander, other, or multiple races. Persons identified as multiple races in the other or multiple races category had more than one race category selected.

<sup>†</sup> Percentage vaccinated.

<sup>‡</sup> Confidence interval half-widths.

## Influenza Vaccination Coverage by Race/Ethnicity, Adults 18 years and older, BRFSS, United States, 2015-16 Season

Race/Ethnicity*	Unweighted Sample Size	% <sup>†</sup> ±95% CI <sup>‡</sup>	Difference from the 2014-15 Season ±95% CI
White only, non-Hispanic	250,271	44.5 ± 0.6	<b>-2.2 ± 0.8<sup>§</sup></b>
Black only, non-Hispanic	24,782	36.6 ± 1.6	-2.1 ± 2.3
Hispanic	20,452	34.4 ± 1.8	-0.6 ± 2.5
Other, non-Hispanic (Total)	19,168	41.0 ± 2.4	-0.3 ± 3.3
Asian	6,366	44.0 ± 3.3	-0.4 ± 5.0
Am. Indian/Alaska Native	4,744	42.9 ± 4.1	2.2 ± 5.8
Other or multiple races	8,058	36.4 ± 3.9	-1.0 ± 5.1

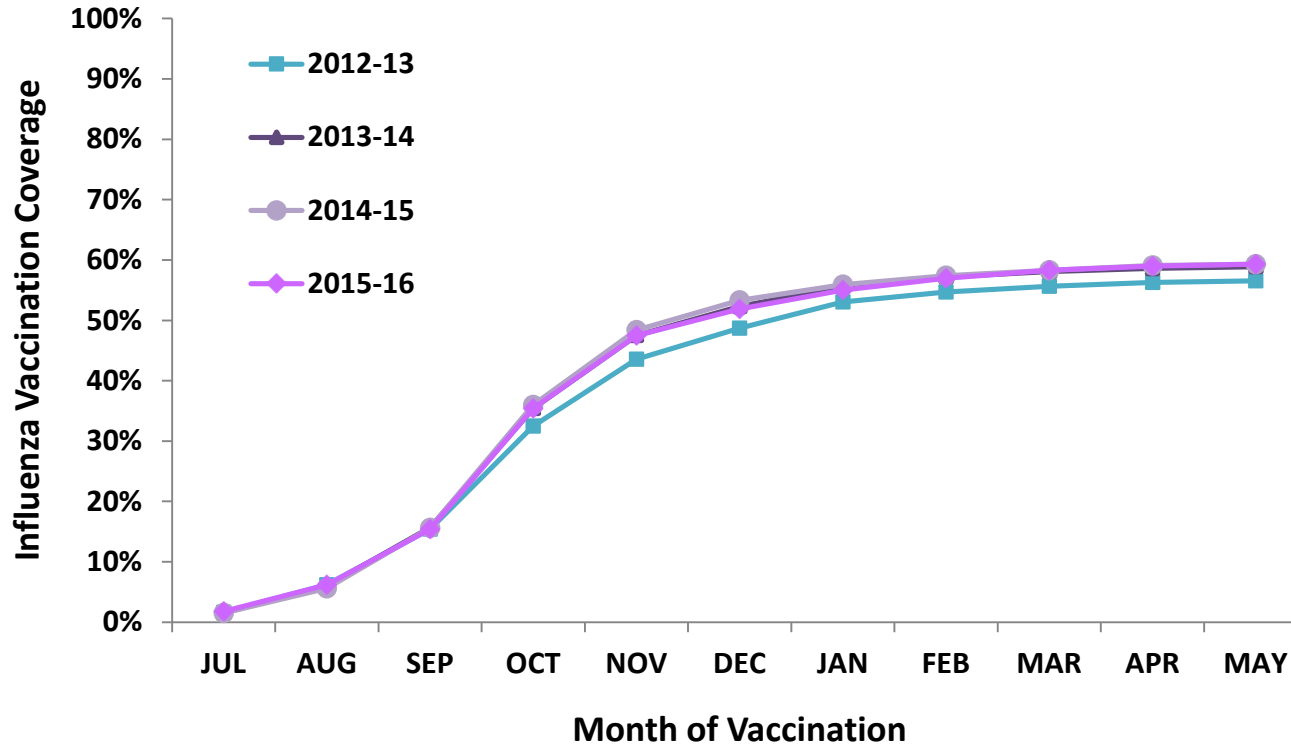
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<sup>†</sup> Percentage vaccinated.

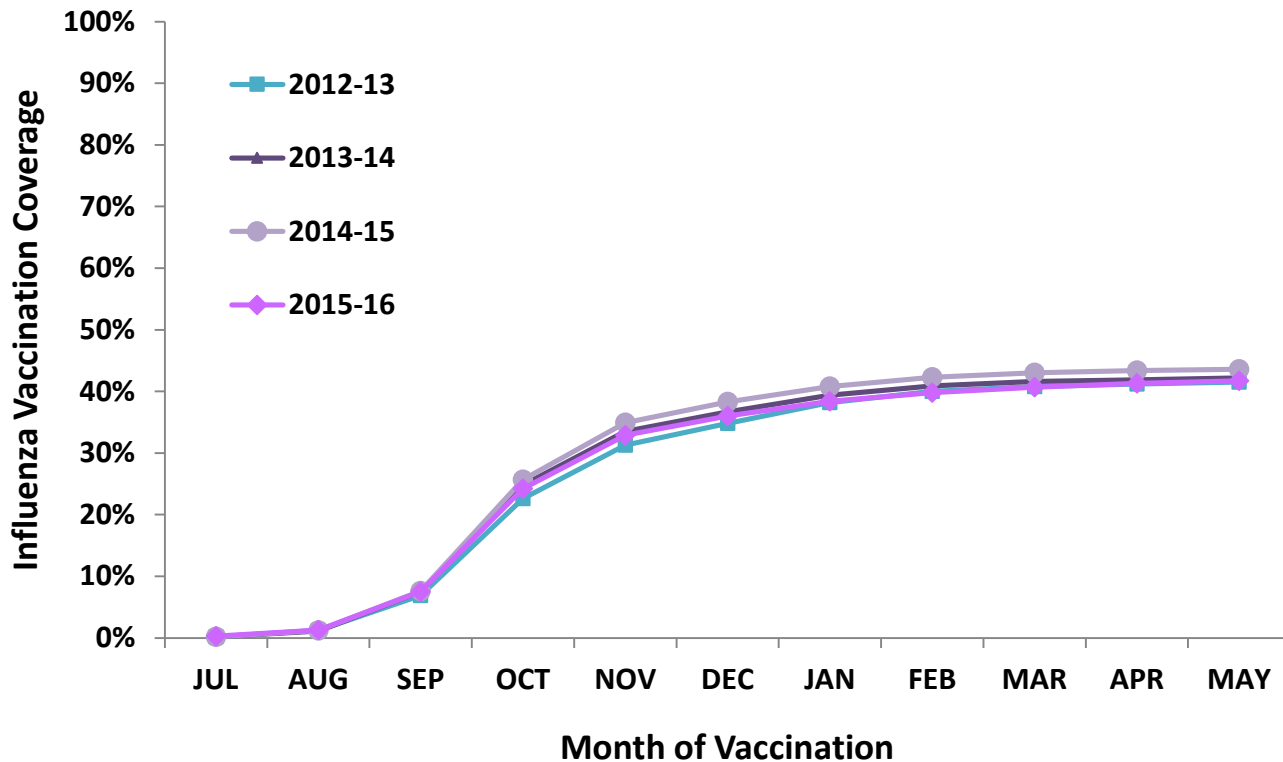
<sup>‡</sup> Confidence interval half-widths.

<sup>§</sup> Statistically significant difference between the 2015-16 season and the 2014-15 season by t-test (P<0.05).

# Cumulative Monthly Influenza Vaccination Coverage Estimates by Influenza Season, Children 6 months – 17 years, NIS-Flu, United States, 2012-13 through 2015-16 Seasons



# Cumulative Monthly Influenza Vaccination Coverage Estimates by Influenza Season, Adults 18 years and older, BRFSS, United States, 2012-13 through 2015-16 Seasons





# Conclusions

- For children, influenza vaccination coverage was similar for the 2015-16 season compared to the 2014-15 season, while there was a notable decrease in coverage for adults  $\geq 50$  years.
- For all groups, except children 6-23 months, coverage remains well below HP2020 targets (70%).
- Racial/ethnic differences in coverage remain, with different patterns for children versus adults.
- There is large state variability in coverage.

# Limitations

- **Influenza vaccination status based on parental or self report – recall bias.**
  - Coverage may be overestimated, particularly for children.
- **Response rates low – potential nonresponse bias.**
  - NIS-Flu: 53.5-57.9% for landline, 29.9-32.2% for cell phone.
  - BRFSS: 47.0% for Sep-Dec, 46.6% for Jan-Jun.
- **Full vaccination coverage (2 doses) among children <9 years recommended to receive 2 doses was not assessed.**
- **NIS-Flu and BRFSS estimates were combined despite differences in survey methodology.**

# Public Health Implications

- **It is especially important that those at higher risk of influenza complications are vaccinated each year:**
  - Older adults
  - Young children
  - Pregnant women
  - Persons with chronic conditions
- **Immunization programs are encouraged to use strategies known to increase coverage.**
  - The Guide to Community Preventive Services (<http://www.thecommunityguide.org>)
    - Standing orders, patient reminder/recall systems, provider reminders, provider assessment and feedback



# Acknowledgements

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- Yusheng Zhai

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- Charles Disogra
- Sara Donahue
- Rebecca Fink
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- Lin Liu

For more information, contact CDC  
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