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Monitoring seasonal influenza vaccination coverage among pregnant women in the United States

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Pregnant women and their infants are at increased risk for serious influenza-related complications, including premature labor, preterm birth, low birth-weight, hospitalization, and maternal and fetal death.¹⁻⁹ Maternal influenza vaccination has been shown to decrease influenza-related illness in mothers and to decrease the risk of influenza illness and influenza-related hospitalization among infants younger than 6 months of age.^{4,5,8}

Recommendations for influenza vaccination of pregnant women have changed over time. From 1966 to 1995, influenza vaccination was recommended for pregnant women who had other medical conditions that increased their risk for influenza-related complications.¹⁰ The Advisory Committee on Immunization Practices (ACIP) encouraged vaccination of women in their third trimester of pregnancy starting in the 1995-1996 influenza season and in 1997 recommended vaccination for all women in their second or third trimester of pregnancy.^{11,12} Because of the increased risk for influenza-related complications, in 2004 ACIP recommended that all

This report describes surveillance systems used for assessing influenza vaccination coverage among pregnant women in the United States. Coverage estimates and factors associated with maternal vaccination are reviewed for internet panel surveys of pregnant women and the Pregnancy Risk Assessment Monitoring System (PRAMS); new estimates are reported from the Behavioral Risk Factor Surveillance System (BRFSS) and Internet panel surveys. Influenza vaccination coverage among pregnant women improved from 11% during the 2001-2002 influenza season to approximately 38% measured by BRFSS and 50% measured by Internet panel surveys during the 2010-2011 influenza season. Coverage varied by state, ranging from 26% to 68% among the states participating in PRAMS in 2009-2010. Provider recommendation increased a woman's likelihood of vaccination nearly 6-fold. Despite increases in influenza vaccination coverage among pregnant women, approximately half remain unvaccinated. Continued efforts are needed to ensure pregnant women receive recommendations and offers of vaccination from their health care providers.

Key words: influenza, pregnancy, vaccination

women who are or will be pregnant during an influenza season should be vaccinated, regardless of trimester.¹³

The *Healthy People 2020* target for influenza vaccination coverage of pregnant women is 80%. However, prior to the 2009 H1N1 pandemic, vaccination coverage was typically below 20% as estimated using the National Health Interview Survey (NHIS).^{14,15} Historically, influenza vaccination coverage among pregnant women has been monitored using the Behavioral Risk Factor Surveillance System (BRFSS) and the NHIS. The NHIS has provided important longitudinal data and national level estimates, but the number of pregnant women respondents is small and results are typically delayed for more than a year. BRFSS and NHIS respondents are asked whether they have had an influenza vaccination in the past 12 months and whether they were pregnant at interview. The number of pregnant women included in the NHIS is too small to restrict analysis to data from selected months. Therefore, it is not possible to restrict analysis of the NHIS to women pregnant only during the influenza vaccination period. In 2012, the NHIS will be modified to ascertain women who

were pregnant during the influenza season and whether influenza vaccination occurred before, during, or after pregnancy; therefore, in the future NHIS will be able to provide more accurate estimates.

Since the 2009-2010 influenza season, 2 additional surveillance systems have been used to monitor influenza vaccination coverage among pregnant women: the Pregnancy Risk Assessment Monitoring System (PRAMS), which provides state-level coverage, and Internet panel surveys, which provide for rapid data collection and analyses and have the flexibility to rapidly incorporate additional questions about factors that may influence receipt of vaccination. Coverage estimates and factors associated with maternal vaccination are reviewed for Internet panel surveys of pregnant women and PRAMS; new results are reported from BRFSS and Internet panel surveys. The strengths and limitations of these 3 systems as well as the characteristics of the NHIS are also described.

Behavioral Risk Factor Surveillance System (BRFSS), 2001-2011

Methods

The BRFSS is a collection of state-based, random-digit, dialed telephone surveys

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TABLE 1
Characteristics of surveys used to assess influenza vaccination coverage among pregnant women in the United States

Variable	BRFSS	Internet panel surveys	PRAMS	NHIS
Recruitment method	Stratified random-digit-dialing sampling from commercial landline and cellular telephone databases ^a	Nonprobability sampling from a volunteer Internet panel	Stratified random sampling from state birth certificate registries	Complex sampling design involving stratification, clustering, and multistage sampling
Survey mode	Telephone interview	Self-administered online	Mailed survey with telephone follow-up	Face-to-face interview
Timing of pregnancy	At interview (use December-February interviews)	At interview or since August 1 of corresponding influenza season	Had a live birth within past 2–6 months	At interview
Timing of influenza vaccination	Within past 12 mo (since 2008 can determine whether during influenza season)	During influenza season	During influenza season	Within past 12 months (since 2005 can determine whether during influenza season)
Geographic level	National ^b	National	State or local ^c	National
Data collection schedule	Monthly	Twice during influenza season (November and April)	Ongoing	Monthly
Timeliness of reporting	Within 2 mo	Two wks	Within 18 mo	Within 18 mo
Typical response/completion rate ^d	55%	90%	65%	61%
Approximate sample size of pregnant women	400–800 per season using December-February interviews	1500 per survey	300–1500 per state/city	55–65 per influenza season using December-February interviews

BRFSS, Behavioral Risk Factor Surveillance System; NHIS, National Health Interview Survey; PRAMS, Pregnancy Risk Assessment Monitoring System.

^a Cellular telephones were added to BRFSS in 2011; ^b The BRFSS is a collection of state-based random-digit dialed telephone surveys that can be combined to calculate national estimates; ^c PRAMS surveys are currently administered by 37 states, New York City, and 1 tribal-state partnership, the South Dakota Tribal Project; 29 states and New York City included the influenza supplement during the 2009–2010 influenza season; ^d Completion rate reported for Internet panel surveys, which is defined as percent of those who complete the survey among those who volunteer to participate and are eligible for the survey; response rate was reported for BRFSS, PRAMS, and NHIS. Response rate for BRFSS is state median for 2010. Response rate for NHIS is from 2010. Response/completion rates may not be directly comparable.

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performed monthly in all 50 states and the District of Columbia. The surveys collect information from noninstitutionalized adults on health risk behaviors, preventive health practices, health care access, and chronic diseases (Table 1). The BRFSS sampling methodology has been previously described.¹⁶ Questions about receipt of influenza vaccination have been on the core BRFSS questionnaire since January 2001.

Data from the 2001–2011 BRFSS were analyzed by influenza season to compare influenza vaccination coverage among pregnant women 18–44 years of age with nonpregnant women of the same age and to identify trends over time. Influenza vaccination status was assessed by asking respondents whether they had a flu vaccine during the past 12 months. Preg-

nancy status was assessed in women 18–44 years of age by asking whether, to their knowledge, they were pregnant at the time of interview. To better approximate women who were pregnant during an influenza season, we restricted analyses to respondents interviewed December through February of a given season (eg, for the 2010–2011 season, analysis was restricted to respondents interviewed during December 2010 through February 2011).

To compare the coverage estimates for pregnant women with nonpregnant women, logistic regression with pregnancy status and age group (18–24, 25–34, 35–44 years) as covariates was used to calculate age-adjusted prevalence ratios and 95% confidence intervals (CIs). Tests for statistical significance

were set at $\alpha = 0.05$. The sample size of pregnant women per state is too small to calculate reliable coverage estimates; therefore, state-specific estimates were not calculated.

Results

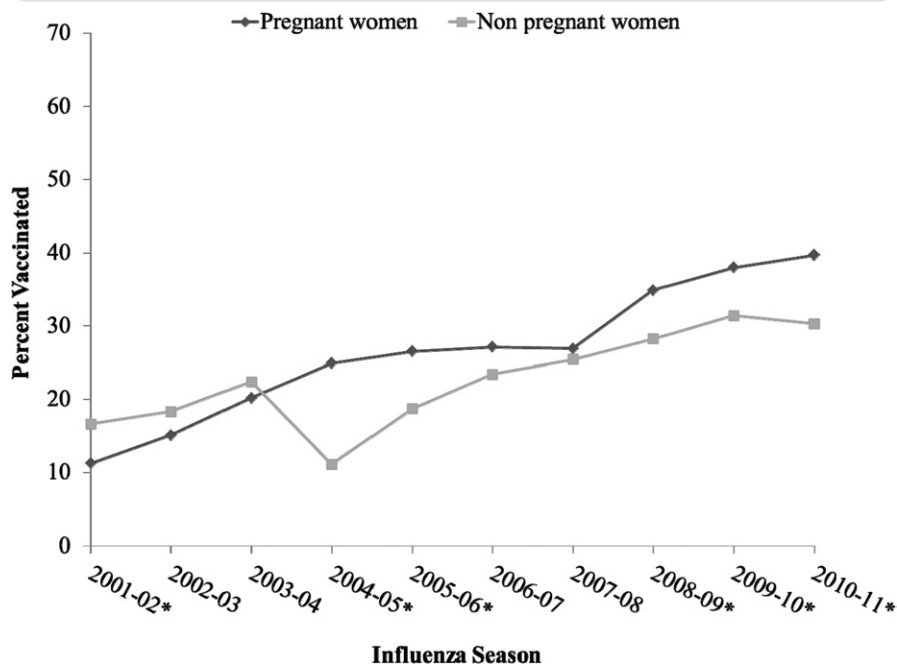
Among pregnant women aged 18–44 years of age, influenza vaccination coverage increased from 11.2% (95% CI, 8.1–15.2%) during the 2001–2002 season to 39.7% (95% CI, 31.7–48.2%) during the 2010–2011 season (Figure). The general pattern observed in influenza vaccination coverage among pregnant women was an increase in coverage from the 2001–2002 season through the 2004–2005 season, a plateau between the 2004–2005 season and the 2007–2008 season, and then an increasing trend through the

2010-2011 season (Figure). Influenza vaccination coverage among pregnant women increased from 26.9% (95% CI, 20.6–34.3) during the 2007-2008 season to 34.9% (95% CI, 29.2–41.0) during the 2008-2009 season to 38.0% (95% CI, 31.7–44.7) during the 2009-2010 season and 39.7% (95% CI, 31.7–48.2) during the 2010-2011 season. During the 2001-2002 influenza season, vaccination coverage among pregnant women was lower when compared with coverage among nonpregnant women (age-adjusted prevalence ratio 0.7, 95% CI, 0.5–1.0). Vaccination coverage was statistically significantly higher among pregnant women compared with nonpregnant women in the 2004-2005 season (age-adjusted prevalence ratio 2.3, 95% CI, 1.9–2.9) when an influenza vaccine shortage occurred and pregnant women and others at increased risk of severe influenza were prioritized for available vaccine and remained higher during the 2005-2006 season (age-adjusted prevalence ratio 1.5, 95% CI, 1.2–1.8).¹⁷ Coverage was also significantly higher among pregnant women during the 2008-2009 (age-adjusted prevalence ratio 1.3, 95% CI, 1.1–1.5), 2009-2010 (age-adjusted prevalence ratio 1.3, 95% CI, 1.1–1.5), and 2010-11 (age-adjusted prevalence ratio 1.4, 95% CI, 1.1–1.7) seasons.

Summary

The BRFSS is a useful tool for examining national trends in influenza vaccination coverage among pregnant women over time, as well as comparing influenza vaccination coverage of pregnant and nonpregnant women. However, the results from BRFSS are subject to limitations. First, self-reported influenza vaccination status is subject to recall bias, although studies of adults have shown self-report of influenza vaccination status to be fairly sensitive and specific.¹⁸ Second, as for all such population-based surveys, nonresponse and noncoverage bias may remain after weighting adjustments. Third, in our evaluation of the role of pregnancy as an indication for vaccination, we controlled for age but did not control for other potential confounders such as socioeconomic status or existence of other high-risk medical conditions. Fourth, although restricting the

FIGURE
Influenza vaccination coverage in pregnant and nonpregnant women by influenza season



Influenza vaccination coverage (unadjusted) among pregnant and nonpregnant women 18-44 years old by influenza season in the United States, Behavioral Risk Factor Surveillance System, 2001-2011. Each season includes women interviewed during December through February (eg, for the 2010-2011 season, analysis was restricted to respondents interviewed during December 2010 through February 2011). Asterisk indicates coverage estimates among pregnant women are statistically significantly different ($P < .05$) compared with estimates for nonpregnant women during the same season based on age-adjusted prevalence ratio from logistic regression model of influenza vaccination status with pregnancy status and age group as independent variables.

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analysis to women currently pregnant December-February for each season ensured that all women classified as pregnant were pregnant at some time during the influenza season, women who were pregnant at other times during the influenza season but not at the time of their interview may have been misclassified as nonpregnant. Although this may not bias estimates of vaccination coverage of pregnant women, it would tend to attenuate prevalence ratios comparing pregnant to nonpregnant women toward one. The approximate sensitivity of using women pregnant when interviewed during December-February is estimated to be 78% (11 of 14 monthly birth cohorts with pregnancy sometime during September-February would be captured by women pregnant December-February).

Vaccination coverage estimates for pregnant and nonpregnant women will be underestimated if they were vaccinated after the date of their interview in December-February. However, this is unlikely because most vaccinations typically occur by the end of November.¹⁹

Internet panel surveys, 2010-2011 and 2011-2012 seasons

Methods

Internet panel surveys were conducted during the 2010-2011 and 2011-2012 influenza seasons to provide rapid midseason and end-of-season estimates of national influenza vaccination coverage among pregnant women and to assess factors associated with receipt of vaccination (Table 1). Women aged 18-49 years who were pregnant at any time

since August 1, 2010, were recruited from the SurveySpot panel operated by Survey Sampling International. Two methods were used to recruit the pregnant women panelist for this survey. First, a message advertising the survey was placed on the main panel web site, inviting panelists to view the survey eligibility questions on the panel's requirement page. Second, an e-mail invitation was sent to a sample of panelists whose panel profiles indicated that they were women aged 18-49 years living in the United States, and interested panel members went to the panel's requirement page to answer the survey eligibility questions.²⁰

Midseason surveys were conducted November 11-22, 2010, and November 1-14, 2011. The 2010-2011 end-of-season surveys were conducted April 4-25, 2011; the end-of season survey for the 2011-2012 season is planned for April 2012. Influenza vaccination status was assessed by asking respondents whether they had an influenza vaccination since August 1. Pregnancy status questions included whether respondents were currently pregnant or pregnant at any time since August 1. All respondents were asked whether they had seen a doctor or other medical professional since August; those answering "yes" were asked whether their doctor or other medical professional had recommended or offered them an influenza vaccination since August.

The analysis of the April 2011 data was restricted to women reporting that they were pregnant at any time from October 1, 2010, through January 31, 2011; November 2010 and November 2011 results include women pregnant at any time from August 1 through their November interview date of the corresponding survey year. Samples were weighted to reflect the age and race/ethnicity distribution based on census region estimates from the US population of pregnant women.²¹ The Internet panel surveys were determined by Centers for Disease Control and Prevention (CDC) to be public health nonresearch.

Results

From the November 2010 survey, 44.8% (95% CI, 41.8–47.8%) of 1396 women

reported being vaccinated as of mid-November 2010; an additional 4.5% indicated that they definitely intended to get vaccinated during the 2010-2011 influenza season.²² The combined estimate of 49.3% of already vaccinated plus those with a definite intent was very similar to the final 2010-2011 Internet panel vaccination coverage estimate of 49.0% (95% CI, 46.2–51.7%).²⁰ Mid-season estimates for the 2011-2012 season from the November 2011 survey indicated that vaccination coverage among pregnant women was similar compared with the same time during the 2010-2011 season (43.2% vs 44.8%), indicating that vaccination coverage among pregnant women for the 2011-2012 season will likely remain similar to the 49% coverage obtained during the 2010-2011 season.²³

During the 2010-2011 season, women who reported receiving a provider recommendation for influenza vaccination were nearly 6 times as likely to report vaccination as those who reported not receiving a provider recommendation (68.8% vs 11.7%). Among respondents receiving a recommendation for influenza vaccination, those receiving an offer were more than twice as likely to be vaccinated as those who reported no offer (74.5% vs 33.5%). Similar results regarding both recommendation and offer were seen in the midseason survey conducted in November of the 2011-2012 season.²³ Women who received an offer of influenza vaccination from a health care provider were more likely to believe influenza vaccines were effective and safe for themselves and their infants when compared with women who did not receive such an offer.²⁰ During the 2010-2011 season, the most common place of influenza vaccination for pregnant women was an obstetrician-gynecologist or midwife's office (61%) followed by another doctor's office or medically related place (22%).²⁰ An obstetrician-gynecologist or midwife's office was also the most common place of vaccination reported in the November 2011 survey.²³

Summary

Internet panel surveys are a useful surveillance tool for timely national midseason and end-of-season estimates of in-

fluenza vaccination coverage among pregnant women with results available within 4 weeks of collection. These panel surveys also allow for additional influenza vaccination-related questions addressing the knowledge, attitudes, and practices of pregnant women. However, the surveys are conducted among a volunteer panel, all of whom must have access to the Internet, thus, results may not be representative of all pregnant women in the United States. Additionally, all results are based on self-report without medical record verification and are subject to recall bias. Persons receiving vaccination may be more likely to recall receiving a provider recommendation or offer. Therefore, prevalence ratios for vaccination by provider recommendation or offer may be overestimated.

Pregnancy Risk Assessment Monitoring Systems (PRAMS), 2009-2010 influenza season

Methods

PRAMS is an ongoing, population-based survey that collects data on a wide range of maternal behaviors and experiences before, during, and after pregnancy among women who recently delivered a live-born infant (Table 2). PRAMS surveys are currently administered by 37 states, New York City, and 1 tribal-state partnership, the South Dakota Tribal Project. The surveys consist of monthly stratified random samples of 100-300 women per state/city with recent live-born infants sampled from state birth certificate registries. The selected mothers are mailed a questionnaire 2-6 months after delivery, and those who do not respond by mail are contacted by telephone. The PRAMS sampling methodology has been previously described.²⁴ Supplemental questions were added to the PRAMS survey during the 2009-10 influenza season; 29 states and New York City participated in the supplement. Data from the PRAMS influenza vaccination supplement were analyzed to assess state-specific seasonal influenza vaccination coverage among pregnant women who had live births from September 2009 to May 2010. Seasonal influenza vaccination status was determined by asking respondents whether

they received a seasonal flu shot since September 2009.

Results

The estimated median seasonal influenza vaccination coverage was 47.1% in the 29 states plus New York City included in PRAMS during the 2009-2010 influenza season.²⁵ Coverage varied by state, ranging from 26.1% in Florida to 67.9% in Minnesota (Table 2).²⁵ Data from the 2010-2011 influenza season are pending.

Summary

PRAMS is the only state-specific data source to assess influenza vaccination coverage among women with live-born infants and allows for comparisons of vaccination coverage across participating states. The PRAMS survey uses the birth files for sampling women with live births, which can take several months and is primarily a mail survey with phone follow-up of nonresponders by mail. Therefore, it may be less flexible than the Internet panel survey, which can be changed in a very short period of time. However, it was possible to add supplemental questions during the 2009 H1N1 pandemic response to the PRAMS survey.

PRAMS data also have some limitations. First, results are not available until approximately 18 months after the end of the influenza season. Second, results may not be generalizable to the entire United States or to women whose pregnancy does not end in a live birth. Additionally, the women included in this analysis represent only a subset of women who were pregnant during the periods when seasonal influenza vaccines were available during the 2009-2010 season. Influenza vaccination status was self-reported and may be subject to recall bias.

Comment

Influenza vaccination coverage among pregnant women has increased substantially since the 2001-2002 season, when coverage was significantly lower among pregnant women when compared with nonpregnant women. Although multi-

TABLE 2

State-specific seasonal influenza vaccination coverage among women with live births, PRAMS, 2009–2010 influenza season^a

State	n	% ^b	95% CI
Arkansas	1055	46.7	±4.1
Colorado	1317	52.8	±3.8
Florida	927	26.1	±3.3
Georgia	614	29.9	±5.6
Hawaii	974	50.3	±4.0
Illinois	1071	47.1	±3.2
Louisiana	540	39.6	±5.2
Maine	709	64.0	±4.0
Maryland	1080	46.1	±4.5
Massachusetts	996	67.5	±4.0
Michigan	1000	44.7	±3.6
Minnesota	917	67.9	±3.3
Mississippi	862	37.2	±4.0
Missouri	973	42.8	±3.7
Nebraska	1198	65.4	±3.2
New Jersey	1053	36.8	±3.2
New York	1587	50.5	±3.1
New York City (NYC)	894	45.9	±4.1
New York without NYC	693	54.7	±4.7
Ohio	829	42.7	±4.5
Oklahoma	1432	49.1	±4.4
Rhode Island	821	63.7	±3.9
South Carolina	676	45.3	±6.5
Tennessee	650	41.2	±5.1
Texas	898	44.9	±4.1
Utah	1124	57.8	±3.2
Vermont	742	66.3	±3.4
Virginia	318	51.2	±7.3
Washington	1052	53.3	±4.0
West Virginia	1121	44.2	±3.6
Wyoming	617	55.6	±4.6
Median	973	47.1	
Minimum	318	26.1	
Maximum	1587	67.9	

n = 27,153.

PRAMS, Pregnancy Risk Assessment Monitoring System.

^a Women with live births between September 1, 2009, and May 31, 2010, with nonmissing seasonal influenza vaccination status;

^b Weighted to adjust for complex survey design and nonresponse.

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ple surveys indicate an increase in coverage, 1 in 2 pregnant women remain unvaccinated against influenza. Increasing recommendations and offers for influenza vaccination by providers of pregnant women stands to have a substantial impact on the acceptance of influenza vaccination by pregnant women. Efforts should continue to monitor the influenza vaccination rates of pregnant women and to increase the number of providers routinely recommending and offering annual influenza immunization of their pregnant patients.

Assessing influenza vaccination coverage among pregnant women is complex because of the fact that pregnant women account for only about 1% of the population and the need to assess both pregnancy and influenza vaccination status during a given influenza season.²⁶ Each data collection system described uses different methodologies and has its own strengths and limitations (Table 1).

The BRFSS has been conducted since 1984, and questions regarding influenza vaccination status have been on the core questionnaire since January 2001. Given the length of time influenza vaccination questions have been on the core BRFSS questionnaire, sufficient BRFSS sample size to allow ascertainment of women pregnant during an influenza season that has a high positive predictive value, and that other sources of national-level data on vaccination coverage in pregnant women have at most 2 years of data, the BRFSS is currently the best available tool to examine national trends in vaccination coverage among pregnant women over time and to utilize to compare with trends in coverage based on other sources of data. Because the BRFSS targets the general population with a wide range of questions about health, the BRFSS can be used to compare vaccination coverage of pregnant women with that of nonpregnant women or other high-risk groups. However, the BRFSS includes relatively low numbers of pregnant women per state, precluding seasonal state-based estimates. Another limitation of the BRFSS in assessing coverage in pregnant women is that the pregnancy status is determined at the time of interview; therefore, women who were pregnant at other times during the influ-

enza season but not at the time of their interview may have been misclassified as nonpregnant.

The Internet panel surveys described in this report are designed to provide timely midseason and end-of-season estimates of influenza vaccination coverage among pregnant women. Strengths of these surveys include that the entire cohort of women pregnant during the influenza season are potentially eligible for participation, and the timing of influenza vaccination relative to pregnancy is ascertained. Results from the Internet panel survey produce estimates similar to those obtained through BRFSS.²⁰ However, the Internet panel surveys have been conducted only since the 2010-2011 season and are not able to examine trends over a longer period of time, nor can the survey compare vaccination coverage of pregnant women with other groups. The Internet panel is also useful in assessing the knowledge, attitudes, and practices of pregnant women nationally and has flexibility for the addition or modification of questions before each survey.

PRAMS is the only state-specific data source available to assess influenza vaccination coverage among women with live-born infants. Providing state-specific results enables immunization programs to assess the effectiveness of their current efforts to vaccinate pregnant women and to modify their programs based on these results. However, because not all states are included in PRAMS, these data cannot be used to estimate national-level coverage. A further limitation is the timeliness of the data, with results for the 2011-12 data not expected to become available until mid-2013.

A potential limitation of all surveys used to estimate influenza vaccination coverage during the 2009-2010 influenza season is that estimates of vaccination coverage for seasonal influenza may be less reliable than estimates from other years because of the potential for less accurate recall regarding receipt of seasonal versus 2009 H1N1 vaccine.

Each data collection system described here has its individual strengths; examination of results from all 3 surveys is necessary to fully assess influenza vaccina-

tion coverage among pregnant women in the United States. Starting in 2012, the NHIS will ask whether women 18-49 years of age were pregnant anytime during August through March; for women reporting receipt of influenza vaccination, it will ask whether they were vaccinated before, during, or after pregnancy. Given the more complete sample frame and higher response rates of the NHIS (60.8%), this may provide another check on the validity of estimates and trends from BRFSS, PRAMS, and Internet panel surveys.²⁷

In 2008, the CDC convened a meeting of experts and key partners that focused on special considerations for pregnant women in the event of an influenza pandemic; improving uptake of seasonal influenza vaccination by pregnant women was recognized as a key factor that could improve uptake of influenza vaccination in the event of a pandemic.²⁸ During the 2009 H1N1 influenza pandemic, the CDC, the American College of Obstetricians and Gynecologists, and other partner organizations emphasized the risk of severe complications for pregnant women and their infants from both seasonal and 2009 H1N1 influenza, encouraging pregnant women to get vaccinated and promoting the role of obstetricians and gynecologists as vaccinators.^{1,26,29,30}

In response to the 2009 H1N1 pandemic and efforts over prior years, vaccination rates have increased markedly over the past decade to a high of 39.7% during the 2010-2011 season, as measured by BRFSS, and 49% for the same season, as measured by the Internet panel survey. Although it appears that we have sustained the increased coverage rates among pregnant women seen during the 2009 H1N1 pandemic, coverage still remains far below the *Healthy People 2020* target of 80%.

Common reasons reported by pregnant women for not receiving influenza vaccination during the 2010-2011 season include concerns about safety risks to themselves and their infants, side effects, and effectiveness of the vaccine.²⁰ A study of postpartum women conducted in 1 health care facility found that the 3 main reasons participants did not receive the vaccine were the belief that

the vaccine was not safe in pregnancy, the vaccine was not available in their obstetrician's office, and the vaccine was not offered to them.³¹

Results from the Internet panel survey described in this report indicate that pregnant women who received a recommendation for influenza vaccination are nearly 6 times as likely to report being vaccinated; among those receiving a recommendation, women who received an offer were twice as likely to be vaccinated when compared with women who had not received an offer. Additionally, women who receive an offer are more likely to believe influenza vaccination is effective and safe.

Additional efforts to increase provider recommendation and offer of influenza vaccination to pregnant patients are likely to have substantial impacts on influenza vaccination uptake in pregnant women. However, many barriers to obstetric providers offering influenza vaccination in their offices have been identified, including absence of appropriate storage and handling facilities, limited existing infrastructure and procedures in their offices for offering vaccines, and concerns about inadequate reimbursement.³²⁻³⁵

Reducing these barriers and increasing awareness among patients and providers about the benefits of influenza vaccination for both mother and infant are critical to further expand the uptake of influenza vaccination by pregnant women and to reduce severe illness from influenza in both mothers and infants. ■

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