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Tetanus, diphtheria and acellular pertussis (Tdap) vaccination among women of childbearing age – United States 2013

Alissa C. O'Halloran, MSPH^{1,2}, Peng-jun Lu, MD, PhD², Walter W. Williams, MD, MPH², Helen Ding, MD, MSPH^{2,4}, and Sarah A. Meyer, MD, MPH^{3,*}

¹ Leidos, Inc., Atlanta, GA

² Immunization Services Division, National Center for Immunization and Respiratory Diseases, Centers for Disease Control and Prevention, 1600 Clifton Road, NE, Atlanta, GA 30329

³ Division of Bacterial Diseases, National Center for Immunization and Respiratory Diseases, Centers for Disease Control and Prevention, 1600 Clifton Road, NE, Atlanta, GA 30329

⁴ Eagle Medical Services, LLC

Abstract

The incidence of pertussis in the United States has increased since the 1990s. Tdap vaccination of pregnant women provides passive protection to infants. Tdap vaccination is currently recommended for pregnant women during each pregnancy, but coverage among pregnant women and women of childbearing age has been suboptimal. Data from the 2013 BRFSS and 2013 NHIS were used to determine national and state-specific Tdap vaccination coverage among women of childbearing age by self-reported pregnancy status at the time of the survey. Although this study could not assess coverage of Tdap vaccination received during pregnancy because questions on whether Tdap was received during pregnancy were not asked in BRFSS and NHIS, demographic and access-to-care factors associated with Tdap vaccination coverage in this population were assessed. Tdap vaccination coverage among all women 18–44 years was 38.4% based on the BRFSS and 23.3% based on the NHIS. Overall, coverage did not differ by pregnancy status at the time of the survey. Coverage among all women 18–44 years varied widely by state. Age, race/ethnicity, education, number of children in the household, and access-to-care characteristics were independently associated with Tdap vaccination in both surveys. We identified associations of demographic and access-to-care characteristics with Tdap vaccination that can guide strategies to improve vaccination rates in women during pregnancy.

Correspondence and requests for reprints should be sent to: Alissa O'Halloran, MSPH, Immunization Services Division, National Center for Immunization and Respiratory Diseases, Centers for Disease Control and Prevention, 1600 Clifton Road, NE, Mail Stop A 19, Atlanta, GA 30329, idg3@cdc.gov, Phone: +1 404 718-8612.

* Authorship order is based on degree of involvement in the study design, analysis and interpretation of the data, and the draft and revisions of the article.

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Introduction

The incidence of pertussis in the United States has been increasing since the 1990s. In 2012, cases reached the highest reported in nearly 60 years, with 41,880 pertussis cases, including 14 infant deaths [1, 2]. In 2006, the Advisory Committee on Immunization Practices (ACIP) recommended a single dose of tetanus, diphtheria and acellular pertussis (Tdap) to adolescents 11-18 years and adults 19-64 years who have not previously received Tdap. In addition, ACIP recommended that when possible, women of childbearing age should receive Tdap before becoming pregnant as antibodies to pertussis antigens are passively transferred during pregnancy [3]. In October 2011, the ACIP recommended that unvaccinated women receive a Tdap vaccine during pregnancy, preferably during the third or late second trimester (after 20 weeks' gestation) or immediately postpartum, if not administered during pregnancy, but did not recommend Tdap vaccination of previously vaccinated pregnant women [4]. In February 2013, ACIP revised recommendations to vaccination of Tdap during every pregnancy, optimally between 27 and 36 weeks gestation to maximize the maternal antibody response and passive antibody transfer to the infant, since studies suggested that maternal antipertussis antibodies from women immunized during a recent pregnancy waned substantially during the first year after vaccination and a single dose of Tdap at one pregnancy would be insufficient to provide adequate protection to infants at birth for subsequent pregnancies [5].

Few studies have documented Tdap vaccination coverage among pregnant women since the recommendations in 2011 and 2013. One study indicated that 14.3% of pregnant women enrolled in Medicaid in Michigan from 2011-2013 received Tdap vaccination during pregnancy [6]. Coverage differed by race/ethnicity, and maternal age was a significant predictor of vaccination [6]. Another study using data from seven Vaccine Safety Datalink (VSD) sites over six years found that in 2012, 56.1% of pregnant women received Tdap vaccination before pregnancy, 13.7% during pregnancy, and 8.8% received Tdap within six weeks of pregnancy end [7]. Another study using Wisconsin claims data found that 35.0% of insured women 11-44 years who delivered between January 2013 and March 2014 received Tdap vaccination during pregnancy, and the percentage of women who received Tdap vaccination during pregnancy increased from 13.8% among women delivering during January 2013 before the updated ACIP recommendation to 51.0% among women delivering during March 2014 [8]. Most studies on Tdap vaccination coverage during pregnancy have used medical claims data with limited information on socio-demographic and access-to-care factors which may be associated with Tdap vaccination. Additionally, a recent study reported Tdap vaccination coverage was 45.5% (ever received Tdap) among privately insured women of reproductive age and researchers noted the importance of identifying strategies to routinize vaccination among women who may become pregnant [9].

Both the Behavioral Risk Factor Surveillance System (BRFSS) and the National Health Interview Survey include questions on Tdap vaccination since 2005, but neither survey asks women if they received Tdap during pregnancy. While Tdap vaccination received during pregnancy cannot be ascertained, the proportion of women of childbearing age (both currently pregnant or not pregnant at the time of the survey) who report Tdap vaccination since 2005 can be determined and information is available on socio-demographic and

access-to-care factors which may be associated with Tdap vaccination. Data from the 2013 BRFSS and 2013 NHIS were used to examine socio-demographic and access-to-care characteristics associated with Tdap vaccination among pregnant and non-pregnant women, as well as national and state-level Tdap vaccination coverage. This information may be useful in identifying and implementing strategies to improve Tdap vaccination coverage among women, especially those of childbearing age.

Methods

Data from the 2013 BRFSS and 2013 NHIS were analyzed in 2015. The BRFSS is a continuous, population-based telephone survey conducted by state health departments in collaboration with the Centers for Disease Control and Prevention (CDC) and the NHIS is a national cross-sectional household survey conducted annually by the CDC. Both surveys collect information about the health, health care, and behaviors of the noninstitutionalized U.S. civilian population using representative samples. In 2013, the median BRFSS response rate among all states, territories, and Washington, D.C. was 46.4% and the NHIS sample adult response rate was 61.2% [10, 11]. Methods from these surveys have been previously described [11-13].

Women in both surveys were asked whether they were currently pregnant at the time of interview. We included women 18-44 years in the analysis stratified by self-reported pregnancy status at the time of interview. Women who did not report pregnancy status were included in the analysis of "all women". All NHIS results were reported by less detailed demographic and access-to-care variables than those in BRFSS, since there were only 215 pregnant women in the 2013 NHIS for whom Tdap vaccination information was available and thus sample sizes for more detailed variables were very small. Also, some variables were available in the BRFSS (time since last routine checkup, ability to see a doctor due to cost) that were not available in NHIS.

In BRFSS, respondents were asked the following questions on Tdap vaccination: "Since 2005, have you had a tetanus shot?" and "Was this Tdap, the tetanus shot that also has pertussis or whooping cough vaccine?" NHIS respondents were asked the following three questions: "Have you received a tetanus shot in the past 10 years?", "Was your most recent tetanus shot given in 2005 or later?", and "Thinking back to your most recent tetanus shot, did your health care provider tell you or did the vaccine information sheet say the vaccine included pertussis or whooping cough vaccine?" Respondents who reported receiving a tetanus shot since 2005 but did not know the type were excluded from the analysis. In BRFSS, among all women 18-44 years, 37,044 reported receiving any tetanus shot since 2005, with 18,278 reporting that the vaccine was Tdap, while in NHIS, 4,836 reported receiving any tetanus shot since 2005, with 1,305 reporting that the vaccine was Tdap. A large percentage (38.8% in BRFSS and 31.3% in NHIS) were excluded from the Tdap analysis, and some subgroups had as much as 47% missing (women 18-24 years in BRFSS). Sensitivity analyses were conducted to assess the potential magnitude of bias from these exclusions, estimating a range of Tdap coverage if respondents excluded had either all received or not received Tdap.

Unadjusted coverage estimates were calculated as the weighted proportion of respondents who reported receiving Tdap. Multivariable logistic regression was used to calculate differences in predicted marginals adjusted for demographic and access-to-care variables. Separate regression models were run for BRFSS and NHIS data. Multicollinearity was assessed using condition indices and variance decomposition proportions[14]. State-level estimates among women 18-44 years were produced using BRFSS data. T-tests were used to make comparisons between groups with a significance level set at $\alpha=0.05$. All analyses were performed using SAS-callable SUDAAN software version 11.0.

Results

Sample characteristics

Among the 73,540 women 18-44 years from the BRFSS, 2,958 reported being pregnant at the time of interview, 69,364 reported not being pregnant, and 1,218 did not have a pregnancy status. The majority of women were non-Hispanic white, were a member of a married or unmarried couple, had at least some college education, were employed, reported an annual household income less than \$50,000, reported excellent/very good health, had health insurance, had a personal healthcare provider, had a routine checkup within the past year, did not report being unable to see a doctor due to cost, and had not had an influenza vaccination in the past year (Table 1). The distribution of sample characteristics differed between pregnant and non-pregnant women for age, race/ethnicity, marital status, employment, number of children living in the household, health status, insurance status, whether the respondent had a personal healthcare provider, time since last routine checkup, ability to see a doctor due to cost, and influenza vaccination in the past 12 months (Table 1).

A total of 8,244 women 18-44 years were interviewed in NHIS, with 328 pregnant and 7,903 not pregnant at the time of the survey (13 did not have a pregnancy status). The majority of women were 30-44 years, were non-Hispanic white, were a member of a married or unmarried couple, had less than a college education, were employed, reported an annual family income of at least \$35,000, lived with at least one child<18 years, reported excellent/very good/good health, had health insurance, had a personal healthcare provider, and had not been vaccinated for flu in the previous 12 months. The distribution of age, marital status, employment status, health insurance status, and whether the respondent had a personal healthcare provider differed between pregnant and non-pregnant women (Note: Results based on the NHIS are not shown in tables but are available if requested by readers).

Tdap vaccination coverage based on bi-variable analysis

Based on the BRFSS, 38.4% of all women 18-44 years, 41.8% of women pregnant at the time of the survey, and 38.2% of women not pregnant at the time of the survey reported Tdap vaccination since 2005 (Table 2). Overall, coverage did not differ significantly among pregnant and non-pregnant women. Among all women, Tdap vaccination coverage was higher among those 18-24 years compared with all other age groups. Coverage was lower among non-Hispanic blacks (31.3%) and Hispanics (32.0%) compared with non-Hispanic whites (42.3%) and lower among women who were divorced, widowed or separated (30.1%) compared with women who were married or members of an unmarried couple (39.3%)

($p<0.05$). Among women 18-44 years overall, other factors associated with higher Tdap coverage included having at least graduated high school, being employed, income of at least \$35,000 or higher, living in the Midwest, reporting perceived health as better than poor, having health insurance, a personal health care provider, and having reported a routine checkup in the past year, reporting no cost barriers to seeing a doctor, and reporting being vaccinated for influenza in the past 12 months (Table 2). Vaccination coverage was lower among women living in the South compared to the Northeast (Table 2).

Among women currently pregnant at the time of the survey, coverage was lower among non-Hispanic blacks (30.2%) and Hispanics (35.5%) compared with non-Hispanic whites (47.3%) and lower among women who were divorced, widowed or separated (17.9%) compared with women who were married or members of an unmarried couple (45.5%) ($p<0.05$). Characteristics associated with higher Tdap vaccination coverage among women pregnant at the time of the survey included having at least graduated high school or higher education, reporting income of at least \$50,000 or higher, having health insurance and a personal health care provider, reporting no cost barriers to seeing a doctor, and reporting being vaccinated for influenza in the past 12 months (Table 2). Currently pregnant women who lived with at least 3 children had lower coverage (27.5%) than women who lived with no children (41.4%) ($p<0.05$). Among women who reported not being pregnant at the time of the survey, characteristics associated with higher Tdap vaccination coverage were similar to those among all women 18-44 years. Comparing pregnant women to those not pregnant at the time of the survey, Tdap coverage was higher for non-Hispanic whites, women who were married or members of an unmarried couple, high school graduates, employed women, women in households with an annual income of \$50,000-\$74,999, and women living with 2 children. Coverage was higher among non-pregnant women than pregnant women among divorced/widowed/separated women and women living with 3 or more children (Table 2).

Based on the NHIS, 23.3% of all women 18-44 years, 25.4% of women pregnant at the time of the survey, and 23.2% of women not pregnant at the time of the survey reported having received Tdap vaccination since 2005. Overall, coverage did not differ among pregnant and non-pregnant women. Among all women, coverage was higher compared with other groups among women 18-29 years, non-Hispanic whites, women with at least a college degree, women who were employed, women in families with at least an annual income of \$35,000, insured women, those reporting a personal healthcare provider, and women who had received influenza vaccination in the past 12 months. Vaccination coverage was lower among women living in the South compared to the Northeast. Among pregnant women, coverage was higher among those with at least a college degree, those who were employed, women in families with at least an annual income of \$35,000, and those who had received influenza vaccination in the past 12 months. Coverage among women who were not pregnant at the time of the survey was similar to coverage among all women. Comparing women who were not pregnant to women who were pregnant, coverage was higher among women with an annual household income less than \$35,000. A comparison of Tdap vaccination coverage based on data from the BRFSS and NHIS using the same demographic and access to care categories was made. All the NHIS estimates are substantially lower than the respective BRFSS estimates (Note: Results based on the NHIS are not shown in tables but are available if requested by readers).

Based on the sensitivity analysis, Tdap vaccination among all women 18-44 years could have ranged from 28.9% to 53.6% based on the BRFSS and 17.3% to 43.2% based on the NHIS.

Tdap vaccination based on multivariable logistic regression and predictive marginals

Based on the BRFSS, adjusted Tdap vaccination coverage among all women 18-44 years was higher among women 18-24 years compared to women at least 25 years of age, non-Hispanic whites compared with non-Hispanic blacks and Hispanics, women with at least some college education compared with those without a high school education, women not in the work force compared with employed women, women with at least one child in the household compared with those not living with children, women living in the Midwest and West compared with the Northeast. Tdap vaccination coverage was also higher among women with health insurance compared to those without insurance, women with a personal healthcare provider compared to those without a provider, women reporting a routine checkup in the past year compared to those reporting no routine checkup in the past year, and women reporting influenza vaccination in the past 12 months compared to those not reporting influenza vaccination. Among pregnant women, adjusted Tdap coverage was lower among pregnant women 35-44 years compared with pregnant women 18-24 years, but higher among pregnant women with some college compared to those without a high school degree, pregnant women with a healthcare provider, and those with an influenza vaccination in the past 12 months. Differences in adjusted coverage by demographic and access to care characteristics were similar among non-pregnant women and all women. No issues were found with multi-collinearity based on regression diagnostics from multivariable logistic regression models using the BRFSS data. (Table 3).

Based on the NHIS, adjusted Tdap coverage was lower among all women 30-44 years than among women 18-29 years. Among all women, higher adjusted Tdap vaccination coverage was associated with non-Hispanic white race, having at least a college education, living with at least one child, having health insurance, and reporting receipt of influenza vaccination in the past 12 months. Among pregnant women, higher adjusted Tdap coverage was associated only with having received influenza vaccination in the past 12 months. Differences in adjusted Tdap coverage by demographic and access to care characteristics were similar among non-pregnant women and all women. No issues were found with multi-collinearity based on regression diagnostics from multivariable logistic regression models using the NHIS data. (Note: Results based on the NHIS are not shown in tables but are available if requested by readers).

State vaccination coverage

Based on the BRFSS, state Tdap vaccination coverage among all women 18-44 years ranged from 24.3% in Florida to 58.6% in Minnesota, with a median of 39.2%. Among the two territories, Tdap coverage was 9.8% in Puerto Rico and 25.9% in Guam (Figure 1).

Discussion

Higher Tdap vaccination coverage among younger women has been previously reported, likely a reflection of success in vaccinating adolescents [9]. Tdap coverage among adolescents 17 years in 2012, who would be 18 in 2013, was reported at 83.3% in 2012 [15]. Aggregate estimates from the BRFSS were consistently higher than national estimates obtained from the NHIS. Although aggregate estimates have been reported from the BRFSS, this survey is designed to reflect each state or area's population and not representative of national sampling as is the NHIS. In addition to different sampling frames, other methodological differences in these surveys might lead to different estimates, including survey mode, survey questions, order of survey questions, survey administration, operations and weighting [12, 16]. Despite differences in vaccination coverage estimates, many of the same factors associated with Tdap coverage among women of childbearing age were found in both surveys.

Racial/ethnic disparities were observed based on the results from BRFSS and NHIS, and such differences in Tdap vaccination as well as differences for other vaccines recommended for adult populations have been reported previously [6, 16-19]. Differences in attitudes toward vaccination, vaccine-seeking behaviors, likelihood of a provider recommendation, quality of care received, as well as other factors might contribute to differences in coverage among these groups [20-24].

Our analysis found that women living in households with at least one child were more likely to be vaccinated than women living in households without any children, although this association was not observed among the much smaller subpopulation of currently pregnant women. Higher coverage among women living with children could reflect Tdap "cocooning" strategies, that is vaccinating adults who have or who anticipate having close contact with an infant, which have been recommended since 2006 [3]. Also, women who live with children might have a greater propensity for Tdap vaccination as a result of experiences related to vaccination of these children and contact with their child's vaccination providers. Higher education was also associated with higher coverage. A previous study found that higher education was associated with Tdap vaccine awareness among all adults [25].

Our results indicate that women with health insurance, a personal provider, a recent routine checkup, and influenza vaccination in the past 12 months were more likely to report receipt of Tdap. Other studies have identified access to care as an important factor associated with receipt of Tdap and other vaccines in other adult populations [19, 26]. Having health insurance, a regular physician, and seeking medical care one or more times during the year provide opportunities for education about Tdap vaccination and other preventive services. Association of Tdap vaccination with receipt of influenza vaccine might indicate a positive attitude about vaccination and other preventive measures playing an important role in a women's decision about Tdap vaccination. In addition, one study showed that providers play an important role in a pregnant woman's decision to receive influenza vaccination; pregnant women who receive a recommendation and an offer of influenza vaccine are more likely to be vaccinated (70.5%) than women who received a recommendation but no offer (32.0%) or who received no recommendation and no offer (9.7%) [27]. A recent study from providers in

New York state found that only 80% of obstetric providers recommended Tdap to all eligible patients, and 67% provided the vaccine in their office [28].

Based on the BRFSS, state-level Tdap vaccination coverage varied widely. Variation in state-level vaccination coverage has been reported for other adult vaccines (e.g., influenza and pneumococcal vaccines) [18, 29, 30]. States with the highest/lowest Tdap coverage did not necessarily have similar rankings in coverage for other adult vaccines, but there were some patterns[18]. Florida and Nevada have consistently ranked in the bottom 5 states for influenza vaccination since the 2009-10 season, and likewise are among states with the lowest Tdap coverage among women of childbearing age[18]. Rhode Island has ranked in the top 5 states for influenza vaccination since the 2010-11 season and also has the 8th highest Tdap coverage among women of childbearing age [18]. Variation in state coverage could be due to differing medical care delivery infrastructure, population norms, and state and local immunization programs [31].

This study has limitations. First, the data sources used could not assess Tdap vaccination during the most recent pregnancy. However, identifying factors associated with Tdap vaccination among all women of reproductive age might aid in developing strategies to improve vaccination in pregnant women as well. Second, sociodemographic and access-to-care factors were based on the status at the time the respondent was interviewed and may not reflect the status when Tdap vaccination was received since vaccination could have occurred any time since 2005. Third, Tdap vaccination was based on self-report and subject to recall bias. Validity of Td and Tdap vaccination based on BRFSS were not reported; however, self report of pneumococcal vaccination based on the BRFSS was validated by medical record, and had a sensitivity of 75% and a specificity of 83%[32]. In addition, adult self-reported vaccination has been shown to be sensitive (92.1% for tetanus)[33]. A large percentage of women 18-44 years were excluded from the analysis, because of data missing on Tdap vaccination in large part due to respondents not knowing what type vaccine they received(i.e., Td or Tdap).

Conclusion

Age, race/ethnicity, education, number of children in the household, and access-to-care characteristics were associated with Tdap vaccination in both surveys. Client reminder and recall systems and education efforts on the benefit and safety of Tdap vaccination during pregnancy used with standing orders might help increase Tdap coverage among pregnant women [34]. Recommendations for Tdap vaccination from providers, particularly obstetricians/gynecologists, who are important care givers for women during pregnancy, and health care reminder systems also can help improve the uptake of Tdap vaccination in this population. Vaccination of pregnant women is the best strategy to prevent pertussis infection in newborns.

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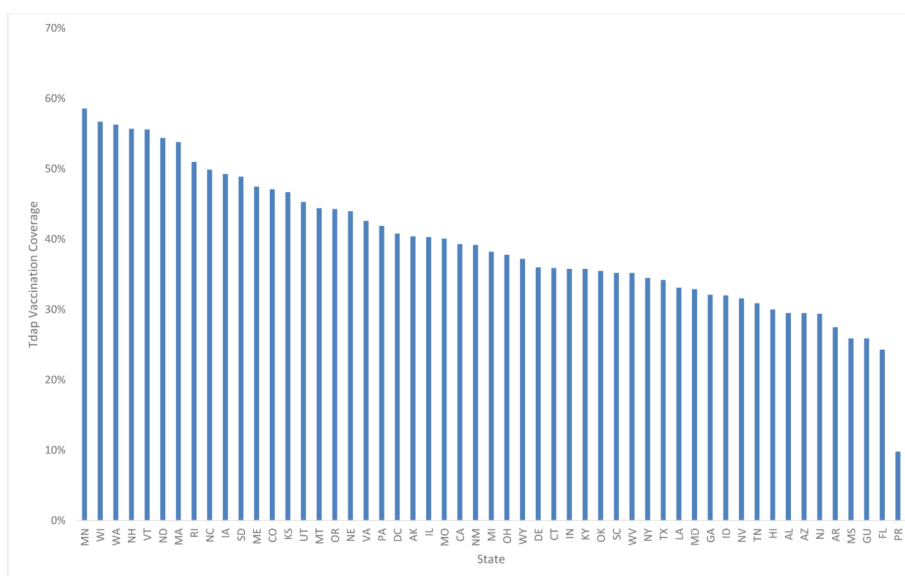


Figure 1.

Tdap vaccination coverage* among women 18-44 years[†] by state – United States, BRFSS 2013

* Tdap vaccination since 2005.

[†] Includes all women 18-44 years, including those for whom pregnancy status at the time of the survey is not available.

Table 1

Sample characteristics among women 18-44 years by pregnancy status, BRFSS 2013

Characteristic	All women*			Pregnant		Not pregnant		
	Unweighted N	Weighted %	100.0	Unweighted N	Weighted %	Unweighted N	Weighted %	100.0
Total	73,540			2,958		69,364		
Age								
18-24 years	13,193	27.4		701	31.4	12,234	27.2 [†]	
25-29 years	11,867	16.7		853	26.8	10,791	16.1	
30-34 years	15,107	20.2		854	25.7	13,994	20.0	
35-44 years	33,373	35.7		550	16.2	32,345	36.6	
Race/ethnicity								
White, non-Hispanic	49,416	55.0		1,888	50.4	46,921	55.8 [†]	
Black, non-Hispanic	7,698	13.8		255	12.4	7,282	13.8	
Hispanic	9,074	21.4		469	26.9	8,328	20.7	
Asian, non-Hispanic	2,214	6.3		95	6.1	2,050	6.2	
Other, non-Hispanic [†]	4,121	3.6		202	4.2	3,852	3.6	
Marital status								
Married or unmarried couple	41,141	50.7		2,103	65.0	38,480	50.2 [†]	
Divorced/widowed/separated	9,696	11.0		188	6.1	9,348	11.2	
Never married	22,317	38.3		662	28.8	21,250	38.6	
Education level								
Less than high school	5,457	14.1		269	17.1	5,061	13.8	
High school graduate	16,573	24.6		693	25.1	15,582	24.4	
Some college or technical school	22,451	33.9		814	30.4	21,352	34.3	
College graduate or higher education	28,787	27.4		1,179	27.4	27,281	27.5	
Employment								
Employed	47,254	58.2		1,740	53.3	44,917	58.6 [†]	
Unemployed	5,887	9.6		319	11.8	5,459	9.4	
Not in work force	19,949	32.2		893	34.9	18,761	32.0	

Characteristic	All women *				Pregnant				Not pregnant			
	Unweighted N	Weighted %	Unweighted N	Weighted %	Unweighted N	Weighted %	Unweighted N	Weighted %	Unweighted N	Weighted %	Unweighted N	Weighted %
Annual income \$												
<\$35,000	27,311	47.2	1,127	49.4	25,772	46.8						
\$35,000-\$49,999	8,827	13.1	329	12.0	8,409	13.2						
\$50,000-\$74,999	9,982	13.5	405	13.5	9,491	13.6						
\$75,000+	18,725	26.2	749	25.2	17,831	26.4						
Number of children < 18 years in household												
0	23,318	34.4	926	31.6	22,041	34.6 [†]						
1	16,358	23.7	934	31.1	15,172	23.2						
2	19,123	24.0	612	21.5	18,248	24.1						
3	14,396	17.9	478	15.7	13,714	18.0						
Region												
Northeast	12,904	17.5	498	17.6	12,143	17.6						
Midwest	19,573	20.8	793	20.1	18,538	21.0						
South	23,426	37.7	887	38.1	22,171	38.0						
West	17,637	24.0	780	24.2	16,512	23.5						
Perceived health												
Excellent/very good	43,657	56.0	1,941	59.3	41,082	56.1 [†]						
Good	21,180	31.1	819	33.0	19,961	30.9						
Fair	6,785	10.6	162	6.5	6,473	10.6						
Poor	1,761	2.3	30	1.2	1,699	2.4						
Have medical insurance												
Yes	59,505	77.6	2,613	84.6	55,981	77.4 [†]						
No	13,730	22.4	338	15.4	13,095	22.6						
Have personal healthcare provider												
Yes	55,556	71.6	2,315	75.7	52,383	71.5 [†]						
No	17,771	28.4	630	24.3	16,784	28.5						
Time since last routine checkup												
<1 year	47,240	66.0	1,997	70.1	44,427	65.6 [†]						

Characteristic	All women [*]			Pregnant			Not pregnant		
	Unweighted N	Weighted %		Unweighted N	Weighted %		Unweighted N	Weighted %	
1 year	24,446	34.0		870	29.9		23,218	34.4	
Unable to see doctor due to cost									
Yes	15,089	22.6		480	19.4		14,298	22.6 [‡]	
No	58,306	77.4		2,474	80.6		54,928	77.4	
Influenza vaccination in past 12 months									
Yes	23,862	32.1		1,136	38.6		22,643	31.8 [‡]	
No	42,564	67.9		1,588	61.4		40,791	68.2	

^{*} "All women" includes all women 18-44 years (2,958 women who reported being pregnant at the time of the survey, 69,364 women who reported not being pregnant at the time of the survey, and 1,218 women for whom pregnancy status at the time of the survey is unknown).

[‡] p<0.05 by chi-square test comparing pregnant vs non-pregnant women.

[‡] "Other" race includes non-Hispanic native Hawaiian or other Pacific Islander, non-Hispanic American Indian/Alaska Native, multiple race, or other race.

[§] Annual household income.

Table 2

Tdap vaccination coverage* among women 18-44 years by pregnancy status, demographic, and access-to-care characteristics – United States, BRFSS 2013

Characteristic	All women [†] % (95% CI)	Pregnant % (95% CI)	Not pregnant % (95% CI)
Total	38.4 (37.5-39.2)	41.8 (37.6-46.1)	38.2 (37.4-39.1)
Age			
18-24 years [‡]	45.7 (43.7-47.7)	42.5 (35.1-50.2)	45.9 (43.9-48.0)
25-29 years	39.7 (37.8-41.7) [§]	45.0 (37.3-52.9)	39.3 (37.3-41.3) [§]
30-34 years	38.6 (36.8-40.3) [§]	38.4 (31.9-45.4)	38.5 (36.7-40.4) [§]
35-44 years	33.0 (31.8-34.2) [§]	41.5 (29.6-54.4)	32.8 (31.6-34.1) [§]
Race/ethnicity			
White, non-Hispanic [‡]	42.3 (41.3-43.3)	47.3 (42.9-51.6)	42.1 (41.1-43.1)
Black, non-Hispanic	31.3 (29.1-33.6) [§]	30.2 (20.7-41.8) [§]	31.2 (29.0-33.5) [§]
Hispanic	32.0 (29.8-34.2) [§]	35.5 (26.4-45.7) [§]	31.9 (29.6-34.2) [§]
Asian, non-Hispanic	38.7 (33.8-43.9)	--	38.1 (33.2-43.3)
Other, non-Hispanic ^{**}	39.4 (35.4-43.5)	32.0 (17.6-50.9)	39.7 (35.6-43.9)
Marital status			
Married/unmarried couple [‡]	39.3 (38.2-40.4)	45.5 (40.4-50.7)	38.9 (37.8-40.0)
Divorced/widowed/separated	30.1 (28.0-32.3) [§]	17.9 (10.4-29.2) [§]	30.3 (28.2-32.6) [§]
Never married	39.7 (38.1-41.2)	38.1 (30.4-46.5)	39.7 (38.2-41.4)
Education level			
Less than high school [‡]	27.6 (25.0-30.3)	21.9 (14.3-32.0)	27.9 (25.3-30.8)
High school graduate	33.0 (31.3-34.7) [§]	40.7 (33.3-48.5) [§]	32.6 (30.9-34.4) [§]
Some college or technical school	41.2 (39.7-42.7) [§]	46.9 (37.8-56.3) [§]	41.0 (39.5-42.5) [§]
College graduate or higher education	44.5 (43.2-45.7) [§]	49.1 (43.1-55.1) [§]	44.2 (42.9-45.5) [§]
Employment			

Characteristic	All women [†] % (95% CI)	Pregnant % (95% CI)	Not pregnant % (95% CI)
Employed [‡]	38.9 (37.9-39.9)	44.8 (38.9-50.7)	38.7 (37.6-39.7)
Unemployed	33.2 (30.4-36.1) [§]	34.9 (25.0-46.3)	32.9 (30.0-35.9) [§]
Not in work force	39.0 (37.4-40.7)	39.9 (33.3-46.9)	39.0 (37.3-40.7)
Annual income ^{††}			
<\$35,000 [‡]	33.6 (32.3-34.9)	33.5 (28.1-39.5)	33.5 (32.2-34.8)
\$35,000-\$49,999	39.3 (36.7-42.0) [§]	33.7 (22.9-46.5)	39.5 (36.9-42.3) [§]
\$50,000-\$74,999	41.4 (39.3-43.6) [§]	52.2 (42.7-61.5) [§]	41.0 (38.7-43.2) [§]
\$75,000+	46.1 (44.4-47.8) [§]	55.2 (45.7-64.3) [§]	45.7 (44.0-47.4) [§]
Number of children < 18 years in household			
0 [‡]	37.6 (36.2-39.1)	41.4 (34.8-48.3)	37.4 (36.0-38.9)
1	39.4 (37.7-41.2)	45.2 (36.9-53.8)	39.1 (37.3-40.9)
2	38.6 (37.0-40.2)	47.8 (38.9-56.8)	38.2 (36.5-39.8)
3	38.2 (36.3-40.2)	27.5 (19.8-36.8) [§]	38.6 (36.6-40.6)
Region			
Northeast [‡]	39.0 (37.2-40.9)	43.3 (34.8-52.3)	38.8 (36.9-40.8)
Midwest	42.9 (41.3-44.5) [§]	41.7 (34.4-49.3)	42.9 (41.3-44.6) [§]
South	33.7 (32.5-35.0) [§]	35.9 (30.3-42.0)	33.6 (32.3-34.9) [§]
West	40.8 (38.8-42.8)	49.2 (38.6-59.8)	40.4 (38.4-42.4)
Perceived health			
Excellent or very good	42.3 (41.2-43.4) [§]	45.6 (40.3-51.0)	42.1 (41.0-43.3) [§]
Good	34.3 (32.8-35.8) [§]	37.1 (29.7-45.2)	34.1 (32.6-35.7) [§]
Fair	30.8 (28.2-33.6) [§]	30.0 (19.0-44.0)	31.0 (28.3-33.8) [§]
Poor [‡]	29.9 (24.9-35.3)	--	29.6 (24.6-35.1)
Have medical insurance			
Yes	41.8 (40.9-42.8) [§]	43.9 (39.5-48.5) [§]	41.7 (40.7-42.7) [§]

Characteristic	All women [†] % (95% CI)	Pregnant % (95% CI)	Not pregnant % (95% CI)
Have personal healthcare provider			
No [‡]	26.6 (24.9-28.3)	26.8 (17.7-38.4)	26.5 (24.8-28.2)
Yes	42.0 (41.0-43.0) [§]	45.7 (40.8-50.8) [§]	41.8 (40.8-42.8) [§]
No [‡]	29.4 (27.9-30.9)	30.2 (23.8-37.4)	29.3 (27.8-30.9)
Time since last routine checkup			
<1 year	42.9 (41.8-43.9) [§]	44.4 (39.5-49.4)	42.8 (41.7-43.9) [§]
1 year [‡]	31.3 (29.9-32.7)	36.9 (28.7-46.0)	31.0 (29.6-32.4)
Unable to see doctor due to cost			
Yes [‡]	29.5 (27.9-31.1)	31.0 (23.7-39.4)	29.3 (27.7-31.0)
No	41.0 (40.1-42.0) [§]	44.4 (39.6-49.2) [§]	40.9 (39.9-41.9) [§]
Influenza vaccination in past 12 months			
Yes	53.8 (52.4-55.3) [§]	59.4 (52.3-66.2) [§]	53.5 (52.0-55.0) [§]
No [‡]	31.0 (30.0-32.0)	29.5 (25.3-34.0)	31.0 (30.1-32.1)

* Tdap vaccination since 2005.

[†]All women" includes all women 18-44 years, including those for whom pregnancy status at time of the survey is not available.

[‡]Reference level.

[§]p < 0.05 by t-test comparing to reference level.

// p < 0.05 by t-test comparing pregnant vs. nonpregnant women.

¶ Estimate may not be reliable due to relative standard error >30% or sample size <30.

^{**}"Other" race includes non-Hispanic native Hawaiian or other Pacific Islander, non-Hispanic American Indian/Alaska Native, multiple race, or other race.

^{††}Annual household income.

Table 3

Adjusted* Tdap vaccination coverage[†] prevalence differences (PD) among women 18-44 years by pregnancy status, demographic, and access-to-care variables – United States, BRFSS 2013

Characteristic	All women [‡] Adjusted prevalence difference (95% CI)	Pregnant Adjusted prevalence difference (95% CI)	Not pregnant Adjusted prevalence difference (95% CI)
Age			
18-24 years [§]	Reference	Reference	Reference
25-29 years	-7.8 (-10.9,-4.8)	-6.8 (-17.3,3.8)	-8.1 (-11.3,-5.0)
30-34 years	-10.8 (-13.9,-7.8)	-10.0 (-21.5,1.4)	-11.1 (-14.3,-7.9)
35-44 years	-18.4 (-21.4,-15.5)	-15.7 (-28.5,-2.9)	-18.7 (-21.7,-15.7)
Race/ethnicity			
White, non-Hispanic [§]	Reference	Reference	Reference
Black, non-Hispanic	-6.5 (-9.3,-3.8)	-7.0 (-20.9,7.0)	-6.8 (-9.6,-3.9)
Hispanic	-4.9 (-7.7,-2.1)	-0.7 (-11.9,10.4)	-5.0 (-7.9,-2.1)
Asian, non-Hispanic	-4.5 (-9.9,0.8)	-8.4 (-27.8,11.1)	-4.8 (-10.2,0.7)
Other, non-Hispanic	-0.7 (-5.1,3.6)	-0.5 (-13.6,12.6)	-0.9 (-5.4,3.6)
Marital status			
Married or unmarried couple [§]	Reference	Reference	Reference
Divorced/widowed/separated	-1.4 (-4.4,1.6)	-13.2 (-28.2,1.7)	-1.3 (-4.3,1.7)
Never married	0.2 (-2.2,2.5)	1.6 (-8.5,11.7)	0.2 (-2.3,2.6)
Education level			
Less than high school [§]	Reference	Reference	Reference
High school graduate	1.1 (-2.8,5.1)	7.6 (-7.5,22.7)	0.5 (-3.5,4.6)
Some college or technical school	8.1 (4.2,12.0)	16.7 (1.8,31.5)	7.4 (3.4,11.4)
College graduate or higher education	9.7 (5.7,13.8)	11.7 (-4.7,28.0)	9.4 (5.3,13.6)
Employment			
Employed	Reference	Reference	Reference

Characteristic	All women [‡] Adjusted prevalence difference (95% CI)	Pregnant Adjusted prevalence difference (95% CI)	Not pregnant Adjusted prevalence difference (95% CI)
Annual income ^{**}	Unemployed	6.8 (-7.5,21.0)	1.1 (-2.5,4.6)
	Not in work force	2.2 (0.1,4.3) [#]	2.2 (0.1,4.4) [#]
Number of children < 18 years in household	<\$35,000	Reference	Reference
	\$35,000-\$49,999	0.8 (-2.2,3.7)	1.1 (-1.9,4.1)
	\$50,000-\$74,999	0.7 (-2.1,3.5)	0.5 (-2.4,3.4)
	\$75,000+	2.6 (-0.2,5.3)	2.3 (-0.6,5.1)
Region	0 [§]	Reference	Reference
	1	5.1 (2.7,7.5) [#]	5.2 (2.8,7.7) [#]
	2	4.4 (2.1,6.8) [#]	4.3 (1.9,6.8) [#]
	3	7.5 (4.7,10.2) [#]	8.0 (5.1,10.8) [#]
Perceived health	Northeast	Reference	Reference
	Midwest	3.2 (0.7,5.7) [#]	3.4 (0.8,6.0) [#]
	South	-2.0 (-4.4,0.3)	-1.9 (-4.3,0.5)
	West	4.2 (1.4,7.0) [#]	3.9 (1.1,6.8) [#]
Have medical insurance	Excellent/very good	4.5 (-2.3,11.2)	4.5 (-2.3,11.3)
	Good	1.3 (-5.5,8.1)	1.5 (-5.3,8.4)
	Fair	1.5 (-5.8,8.8)	1.7 (-5.7,9.1)
	Poor [§]	Reference	Reference
Have personal healthcare provider	Yes	3.3 (0.6,6.0) [#]	3.6 (0.8,6.4) [#]
	No [§]	Reference	Reference

Characteristic		All women [‡] Adjusted prevalence difference (95% CI)	Pregnant Adjusted prevalence difference (95% CI)	Not pregnant Adjusted prevalence difference (95% CI)
Time since last routine checkpoint	Yes	5.0 (2.7,7.3) ^{//}	9.1 (0.0,18.1) ^{//}	4.9 (2.5,7.2) ^{//}
	No [§]	Reference	Reference	Reference
Unable to see doctor due to cost	<1 year	6.8 (4.8,8.8) ^{//}	4.8 (-3.7,13.4)	7.0 (5.0,9.0) ^{//}
	1 year [§]	Reference	Reference	Reference
Influenza vaccination in past 12 months	Yes [§]	Reference	Reference	Reference
	No	2.0 (-0.5,4.4)	0.4 (-10.6,11.3)	2.1 (-0.4,4.6)
	Yes	18.9 (17.0,20.8) ^{//}	23.9 (16.1,31.7) ^{//}	18.5 (16.5,20.4) ^{//}
	No [§]	Reference	Reference	Reference

* Multivariable logistic regression model includes all demographic and access to care variables in the table.

[‡]Tdap vaccination since 2005.

[‡]“All women” includes all women 18-44 years, including those for whom pregnancy status at time of the survey is not available.

[§]Reference level.

^{//} p < 0.05 by t-test comparing to reference level.

^{//}“Other” race includes non-Hispanic native Hawaiian or other Pacific Islander, non-Hispanic American Indian/Alaska Native, multiple race, or other race.

^{**} Annual household income.

^{††} Estimate may not be reliable due to relative standard error >30% or sample size <30.