Published in final edited form as:
Cancer. 2013 April 1; 119(7): 1386–1392. doi:10.1002/cncr.27894.

Human papillomavirus vaccine uptake among 18–26 year old women in the United States: The National Health Interview Survey, 2010

Tabassum H. Laz, MBBS, PhD[a], **Mahbubur Rahman, MBBS, PhD, MPH**[a], and **Abbey B. Berenson, MD, PhD**[a]

[a]Center for Interdisciplinary Research in Women's Health and Department of Obstetrics & Gynecology

Abstract

Background—HPV vaccine uptake among young adult women has been reported to be very low. We conducted this study to provide an update on HPV vaccine uptake among 18–26 year old women.

Methods—We used the National Health Interview Survey 2010 data to estimate HPV vaccine coverage and their correlates.

Results—Overall, 22.7% of women initiated (≥1 dose) and 12.7% completed the vaccine (≥3 doses). Thus, about 56% of women who initiated the vaccine completed it. Multivariate logistic regression analyses showed that younger age, unmarried status, Pap test, influenza vaccine, lifetime vaccines, and HPV vaccine awareness were positively associated with receiving ≥1 and ≥3 doses. In addition, uninsured women were less likely to receive ≥1 dose (odds ratio (OR) 0.49, 95% confidence intervals (CI) 0.28–0.84), blacks (OR 0.48, 95% CI 0.23–0.99) and women with a family income <100% of the federal poverty line (OR 0.40, 95% CI 0.21–0.73) were less likely to receive ≥3 doses. Further, based on vaccine initiators, blacks were less likely than whites to complete the vaccine (OR 0.29, 95% CI 0.16–0.55). Two-thirds of unvaccinated women were not interested in future vaccination. Among those who were interested, more than 76.4% preferred to receive it free or at a lower cost while 20% would pay the full cost of the vaccine.

Conclusion—One in 8 women completed the 3-dose HPV vaccine. Educational and vaccine financing programs are needed to improve the uptake among low-income minority women who are at increased risk for cervical cancer.

Keywords

Human papillomavirus; HPV vaccine; vaccine uptake; young adult women; cervical cancer

Introduction

Human papillomavirus (HPV) oncogenic strains (16 &18) are known to be responsible for 70% of cervical cancer cases while other low-risk types (6&11) account for 90% of genital warts in women (1, 2). The United States Food and Drug administration (FDA) approved a quadrivalent HPV vaccine in 2006 which offers protection against HPV types 6, 11, 16, and

Correspondence Author: Abbey B. Berenson, MD, MMS, PhD, Department of Obstetrics and Gynecology, The University of Texas Medical Branch, 301 University Boulevard, Galveston, Texas 77555-0587, Telephone: 409-772-2417 Fax: 409-747-5129, abberens@utmb.edu.

Conflict of interest: None

18 (3) and a bivalent HPV vaccine in 2009 against HPV types 16 and 18 (4). The Advisory Committee on Immunization Practices (ACIP) recommends routine vaccination for all US girls 11–12 year age and "catch-up" vaccination for those 13–26 years old not previously vaccinated (3, 4). However, the efficacy of the vaccines is highest if given at a younger age before the onset of sexual activity (3, 4). Both vaccines have been demonstrated to have high efficacy (90%–100%) in preventing infections and precancerous lesions caused by vaccine type-HPV among sexually active adolescents and young women who are naive to those strains (5–9).

Studies based on clinical (10–13) and national (14–19) data have reported HPV vaccine uptake among young adult women since the vaccine was first approved in 2006. National studies conducted during 2007–2008 among young adult women have shown low vaccine initiation (9–12%) and completion (6.2%) (14–18) while the series completion rate among those who initiated the vaccine was 53.8% (17). The objective of this study was to estimate HPV vaccine initiation (≥1 dose), completion (≥3 doses), completion of the vaccine series among those who initiated the vaccine, and their correlates among 18–26 year old women using the National Health Interview Survey (NHIS)-2010 adult sample data.

Methods

Study population

The NHIS is an in-person annual household survey with a cross-sectional design based on a nationally representative US noninstitutionalized civilian population sampled and selected through a complex, stratified, multistage probability design. Details of the survey methods used have been published elsewhere (17, 20). In 2010, the final sample size was 27,157 adults (>18 years) with a 60.8% response rate. For this study, we obtained data on women aged 18–26 years (n=2011). All procedures were approved by the Institutional Review Board of University of Texas Medical Branch.

Data collection

This study focused on survey questions related to HPV vaccine awareness, receipt of the vaccine, number of doses, perceived barriers, and relevant socio-demographic variables based on 18–26 year old women. Receipt of unknown number of vaccine doses (n=4) was included in the ≥ 1 dose (initiation) category, and 5 (n=1) and 6 doses (n=2) were included in the ≥ 3 doses (completion) category. The denominator for receipt of ≥ 1 dose and ≥ 3 doses analyses included all 18–26 year old women, while the denominator for vaccine series completion among initiators analysis included only those who had initiated the vaccine (≥ 1 dose).

Women who have not received an HPV shot/vaccine or were refused by a doctor when they requested the shot were asked whether they were interested in getting the HPV vaccine. Those who responded "no" or "don't know" were further asked about the main reason for not getting the vaccine. Those who responded "yes" to the above question were asked whether or not they would be willing to pay $360 to $500 for the vaccines. Those who responded negatively or those who mentioned cost of the vaccine as the main barrier for not getting vaccinated were further asked whether they would be willing to get the HPV vaccine free or at a much lower cost.

Socio-demographic characteristics were also assessed. Age (18–20 vs. 21–26), race/ethnicity (non-Hispanic white, non-Hispanic black, Hispanic, and others), region of residence (Northeast, Midwest, South, and West), immigration status (US born or not), education (<high school, high school, and >high school), marital status (married, living with partner, and unmarried/single), family income (≥200%, 100% to <200%, and <100% of percentage

of the federal poverty line), and type of health insurance (private, public, and none) were categorized for the purpose of analysis. Health care utilization covariates, such as any visit to an obstetrician/gynecologist/general physician or influenza vaccination in the previous year, Pap test during the last 3 years, ≥1 lifetime vaccines (hepatitis A, B vaccine or tetanus shot in the past 10 years) and previous exposure to HPV were also assessed.

Statistical analysis

We used STATA 10 *svy* commands (STATA Corporation, College Station, TX) for data analysis by incorporating probability sampling weights in conjunction with strata and primary sampling units (psu) generated by NHIS complex survey design. Percentages and 95% confidence intervals for HPV vaccine initiation (≥ 1 dose), completion (≥ 3 doses), and completion of the vaccine series among initiators were estimated by age groups (18–20 vs. 21–26), socio-demographics, healthcare utilization, previous exposure to HPV and HPV vaccine awareness.

We used chi square tests for bivariate comparisons. Multivariate logistic regression analyses was used to examine the association between covariates of interest and the receipt of ≥ 1 and ≥ 3 doses of the HPV vaccine, and completion of the vaccine series among initiators. The variable “US born” was highly correlated with Hispanic ethnicity and was excluded from the multivariate analysis. Variables were screened and candidate variables with $P \leq .20$ with any dependent variable (uptake of ≥ 1 dose, ≥ 3 doses; and 3-dose vaccine series completion among initiators) were included in the final model.

Results

A total of 94.1% (1892/2011) of 18–26 year old women responded to the questions on HPV vaccination. Therefore, we limited our analysis to these 1892 women. Overall, 22.7% and 12.7% reported receiving ≥1 dose (n=408) and ≥3 doses (n=225), respectively. Thus, 56.2% women who initiated the vaccine completed the vaccine series (Figure 1). Eighteen year old women had the highest rate of HPV vaccine uptake of ≥1 dose (44.4%), ≥3 doses (28.6%) and vaccine series completion among initiators (64.5%).

Bivariate analyses showed that 18–20 year old women were more likely than those 21–26 years old to receive ≥1 dose and ≥3 doses of HPV vaccine (Table 1). White, US-born, single, covered by any public/private insurance and high school graduate were more likely to receive ≥1 dose and ≥3 doses of vaccine compared to their counterparts. Women who were aware of the HPV vaccine, had seen an obstetrician/gynecologist/general physician in the past year, received the influenza vaccine in the past year, and had ≥1 lifetime vaccines were more likely to receive ≥1 dose and ≥3 doses of the vaccine. In addition, women who had received a Pap test within the past 3 years were more likely to initiate the HPV vaccine. Bivariate analysis based on women who initiated the vaccine showed that black women were less likely to complete the vaccine series compared to whites, Hispanics, or Asians ($P < .001$) (data not shown). Vaccine series completion among the initiators did not differ significantly by other covariates.

After adjusting for covariates, multivariate logistic regression models showed that women 21–26 years of age were less likely than 18–20 year olds to receive ≥1 dose and ≥3 doses of the HPV vaccine (Table 2). Uninsured women were less likely than privately insured women to receive ≥1 dose of the vaccine. The likelihood of receiving ≥3 doses were less among black women than whites, and among women with a family income <100% of the federal poverty line (FPL) than those with family income ≥200% of FPL. Other characteristics positively associated with receiving both ≥1 dose and ≥3 doses of vaccine were: unmarried/single status, Pap test within the past 3 years, influenza vaccine in the past

year, one or more lifetime vaccines, and HPV vaccine awareness. A separate multivariate analysis based on women who initiated the vaccine showed that black women were less likely than whites to complete the vaccine series ($P < .001$) (data not shown).

Overall, 77.3% of 18–26 year old women were not vaccinated (n=1478). Of the unvaccinated women, 68.6% were not interested or were unsure about receiving the vaccine in the future. The main reasons cited were: "do not need the vaccine" (39.6%), insufficient knowledge about the vaccine (12.7%), concerns about its safety (12.0%), not recommended by their physician (7.2%), not sexually active (6.7%) and too old for the vaccine (3.1%) (Table 3). Only 2.6% reported expense as a barrier. Uninsured women were more likely than privately insured women to have insufficient knowledge about the vaccine ($P=.020$). Of those (31.4%) who were interested in vaccination, 20% would be willing to pay full costs for the vaccine, 76.4% would prefer to receive it free or at much lower cost, and 3.4% would not even receive the free vaccine. Privately insured women were more likely to agree to pay full vaccine cost ($P=.005$) while uninsured women were more likely to prefer receiving the vaccine free or at a much lower cost ($P=.037$) compared to their counterparts.

Discussion

In this study, we observed that the overall rate of receiving ≥1 dose (22.7% vs. 11.7%) and ≥3 doses (12.7% vs. 6.2%) of HPV vaccine among 18–26 year old women almost doubled when compared with NHIS 2008 survey results (17). Consistent with the NHIS 2008 study, the likelihood of vaccine initiation (received ≥1 dose) was significantly higher among 18–20 year old women (36.1% vs. 20.9%) compared to 21–26 year old women (17.8% vs. 7.9%) and the highest initiation rate was among 18 year old women (44.4% vs. 25.6%). This could be due to the fact that uninsured or underinsured women under 19 year of age are eligible for the federally funded Vaccine for Children (VFC) program while 19–26 year old women are not eligible for most federal and state vaccine financing programs (14, 17, 21, 22).

Although the rate of receiving ≥1 dose (initiation) of the vaccine has increased among 18–26 year olds since 2008, it is still lower than that observed among 11–17 year olds based on the NHIS 2010 study (22.7% vs. 28.9%) (23). The VFC program has been labeled as a major contributor for improving the HPV vaccine initiation rate among uninsured/underinsured adolescents under 19 years of age (24, 25). However, uptake of ≥3 doses (completion) of the vaccine among young adult women was comparable to that of adolescent girls in 2010 (12.7% vs. 14.2%) as the rate of vaccine series completion among initiators was higher among 18–26 year old women than 11–17 year old adolescents (56.2% vs. 49.2%) (23). The slightly higher rate of 3-dose vaccine completion among young adult women than adolescents may be due to higher motivation of those over age 18 years to complete the vaccine series on their own initiative rather than parents' willingness or ability (17).

HPV vaccine series completion has been reported to be essential for longer duration of protection against HPV infections (26). However, we observed that 44% of women who initiated the vaccine did not complete the series. Other studies among adolescents and young adult women also observed similar incomplete immunization rates (17, 23, 24, 27). This is inefficient for the patient and health care system as one dose has not been shown to provide immunity. Thus, after the initiation of the vaccine series, coordinated efforts from both providers and vaccine initiators are needed to complete the vaccine series (28, 29). Knowledge, motivation, positive attitudes toward vaccination, and financial resources of the recipients have been shown to be important factors in determining who receives subsequent doses after initiation (28).

We observed that uninsured women were less likely than privately insured women to initiate the vaccine. In fact, lack of insurance was labeled as a major barrier to HPV vaccination among young adult women due to the high cost of the vaccine series (11, 14, 16, 17, 30). Low vaccination rates among this population is especially concerning as their utilization of cervical cancer screening (Pap test) is also very low (31). Thus, they are at risk of invasive cervical cancer. In our study, of those willing to get the vaccine, uninsured women were more likely than privately insured women to prefer it at a lower cost. Thus, extension of the federal VFC financing program for 19–26 year old women would increase the uptake rate among this age group. Alternatively, state governments could consider providing free vaccines within the existing setting of cancer prevention programs (breast and cervical cancer screening) for low income adult women (22).

Consistent with the NHIS 2008 report (17), after adjusting for confounder, we found that receiving ≥1 dose of the vaccine did not differ significantly across racial and ethnic groups. However, black women were less likely than whites to receive ≥3 doses of the vaccine and complete the vaccine series among initiators. Similar findings were observed among young adult women within a university-based clinical system (21, 30) and in several other studies (29, 32, 33). The lower likelihood of completing vaccine series among this population is concerning given that the incidence of and mortality from cervical cancer is higher among black women than whites (34, 35). Several studies identified beliefs, attitudes, and neighborhood levels of education as possible reasons for this racial disparity in vaccine series completion (32, 33). Dempsey et al suggested that cultural mediators may be barriers to the compliance with vaccination among minority women (21). Thus, educational programs focused on increasing vaccination rates must use culturally relevant materials to improve vaccination compliance among this population.

Similar to other studies (14, 17), we also observed that unmarried and single young women were more likely than married women or women living with partner to receive ≥ 1 and ≥ 3 doses of the vaccine. This could be due to the fact that unmarried women are more likely to perceive the risk for HPV infection and the benefits of being vaccinated. Moreover, consistent with other studies (12, 17, 23, 27), we observed that preventive health behaviors including having had a Pap test in the past 3 years, influenza vaccination, and lifetime vaccines are significantly associated with receiving any and all three doses of the HPV vaccine among young adult women. This association most likely reflects overall attitudes among young women regarding preventive health services and suggests that this may be the easiest population to reach. Thus, visit for any type of preventive healthcare may provide an opportunity to discuss the importance of HPV vaccination.

This study has several limitations. First, the NHIS survey data may be subjected to recall bias as they are self-reported. Moreover, information on vaccine receipt and doses were not confirmed by provider immunization records. Second, as this survey did not assess sexual behaviors, we were unable to examine the association between these behaviors and receipt of the vaccine. Third, we could not evaluate whether the 3 doses were completed within the ACIP recommended time frame due to lack of data on vaccination dates. Finally, we are unable to infer causality as the survey was cross-sectional in design. In spite of these limitations, this study meaningfully estimated the recent uptake of this vaccine among young adult women based on a representative sample.

More than three-fourths of young adult women remained unvaccinated in the US and an additional 10% were incompletely vaccinated. Furthermore, two-thirds of the unvaccinated women were not interested in receiving the vaccine in the future, mainly due to their negative attitudes toward vaccination, inadequate knowledge, and lack of physician recommendation. Of those who were interested, the majority preferred to get it free or at a

much lower cost. Therefore, educational programs and public vaccine financing programs are needed for uninsured young women to expand HPV vaccination coverage among this age group in the US.

Acknowledgments

Funding source: The Eunice Kennedy Shriver National Institute of Child Health & Human Development (NICHD) provided support for this study with two awards: a mid-career investigator award in patient-oriented research (K24HD043659, PI: Berenson) and an institutional training grant (T32HD055163, PI: Berenson) which supported Dr. Tabassum Haque Laz as an NRSA postdoctoral fellow. The authors are solely responsible for the contents and it does not necessarily represent the official views of the NICHD or the National Institutes of Health.

References

1. Bosch FX, Burchell AN, Schiffman M, et al. Epidemiology and natural history of human papillomavirus infections and type-specific implications in cervical neoplasia. Vaccine. 2008; 26:1–16.
2. Garland SM, Steben M, Sings HL, et al. Natural history of genital warts: Analysis of placebo arm of 2 randomized phase III trials of quadrivalent human papillomavirus (types 6, 11, 16, and 18) vaccine. J Infect Dis. 2009; 199:805–814. [PubMed: 19199546]
3. Markowitz LE, Dunne EF, Saraiya M, Lawson HW, Chesson H, Unger ER. Quadrivalent human papillomavirus vaccine: Recommendations of the Advisory Committee on Immunization Practices (ACIP). MMWR Recomm Rep. 2007; 56:1–24. [PubMed: 17380109]
4. Centers for Disease Control and Prevention. FDA licensure of bivalent human papillomavirus vaccine (HPV2, Cervarix) for use in females and updated HPV vaccination recommendation from the Advisory Committee on Immunization Practices (ACIP). MMWR. 2010; 59:626–629. [PubMed: 20508593]
5. FUTURE II study group. Quadrivalent vaccine against human papillomavirus to prevent high-grade cervical lesions. N Eng J Med. 2007; 356:1915–1927.
6. Joura EA, Leodolter S, Hernandez-Avila M, et al. Efficacy of a quadrivalent prophylactic human papillomavirus (types 6, 11, 16, and 18) L1 virus-like-particle vaccine against high-grade vulval and vaginal lesions: a combined analysis of three randomised clinical trials. Lancet. 2007; 369:1693–1702. [PubMed: 17512854]
7. Garland SM, Hernandez-Avila M, Wheeler CM, et al. Quadrivalent vaccine against human papillomavirus to prevent anogenital diseases. N Eng J Med. 2007; 356:1928–1943.
8. Romanowski B, de Borba PC, Naud PS, et al. Sustained efficacy and immunogenicity of the human papillomavirus (HPV)-16/18 ASO4-adjuvanted vaccine: Analysis of a randomized placebo-controlled trial up to 6.4 years. Lancet. 2009; 374:1975–1985. [PubMed: 19962185]
9. Paavonen J, Naud P, Salmeron J, et al. Efficacy of human papillomavirus (HPV)-16/18 ASO4-adjuvanted vaccine against cervical infection and precancer caused by oncogenic HPV types (PATRICIA): final analysis of a double-blind, randomised study in young women. Lancet. 2009; 374:301–314. [PubMed: 19586656]
10. Kahn JA, Rosenthal SL, Jin Y, Huang B, Namakydoust A, Zimet GD. Rates of human papillomavirus vaccination, attitudes about vaccination, and human papillomavirus prevalence in young women. Obstet Gynecol. 2008; 111:1103–1110. [PubMed: 18448742]
11. Conroy K, Rosenthal SL, Zimet GD, et al. Human papillomavirus vaccine uptake, predictors of vaccination, and self-reported barriers to vaccination. J Womens Health. 2009; 18:1679–1686.
12. Chao C, Velicer C, Slezak JM, Jacobsen SJ. Correlates for human papillomavirus vaccination of adolescent girls and young women in a managed care organization. Am J Epidemiol. 2010; 171:357–67. [PubMed: 20047978]
13. Manhart LE, Burgess-Hull AJ, Fleming CB, Bailey JA, Haggerty KP, Catalano RF. HPV vaccination among a community sample of young adult women. Vaccine. 2011; 29:5238–5244. [PubMed: 21640775]

14. Jain N, Euler GL, Shefer A, Lu P, Yankey D, Markowitz L. Human papillomavirus (HPV) awareness and vaccination initiation among women in the United States, National Immunization Survey-Adult 2007. Prev Med. 2009; 48:426–431. [PubMed: 19100762]
15. Caskey R, Lindau ST, Alexander GC. Knowledge and early adoption of the HPV vaccine among girls and young women: Results of a national survey. J Adolesc Health. 2009; 45:453–462. [PubMed: 19837351]
16. Tylor LD, Harriri S, Sternberg M, Dunne EF, Markowitz LE. Human papillomavirus vaccine coverage in the United States, National Health and Nutrition Examination Survey, 2007–2008. Prev Med. 2011; 52:398–400. [PubMed: 21108962]
17. Price RA, Tiro JA, Saraiya M, Meissner H, Breen N. Use of Human papillomavirus vaccines among young adult women in the United States: An analysis of the 2008 National Health Interview Survey. Cancer. 2011; 117:5560–5568. [PubMed: 21732336]
18. Centers for Disease Control and Prevention. Vaccination coverage estimates from the National Health Interview Survey: United States, 2008. NCHS Health E-Stats; 2009. Available from URL: http://www.cdc.gov/nchs/data/hestat/vaccine_coverage/vaccine_coverage.pdf
19. Centers for Disease Control and Prevention. Adult vaccination coverage-United States, 2010. MMWR. 2012; 61:66–72. [PubMed: 22298302]
20. National Center for Health Statistics, National Health Interview Survey (NHIS). [Accessed June 5, 2012] Public use data release: NHIS Survey Description. 2010. Available from URL: ftp://ftp.cdc.gov/pub/Health_Statistics/NCHS/Dataset_Documentation/NHIS/2010/srvydesc.pdf
21. Dempsey A, Cohn L, Dalton V, Ruffin M. Worsening disparities in HPV vaccine utilization among 19–26 year old women. Vaccine. 2011; 29:528–534. [PubMed: 21050904]
22. Khan K, Curtis CR, Ekwueme DU, Stokley S, Walker C, Roland K, et al. Preventing cervical cancer: Overviews of the National Breast and Cervical Cancer Early Detection Program and 2 US immunization programs. Cancer. 2008; 113:3004–3012. [PubMed: 18980296]
23. Laz TH, Rahman M, Berenson AB. An update on human papillomavirus vaccine uptake among 11–17 year old girls in the United States: National Health Interview Survey, 2010. Vaccine. 2012; 30:3534–3540. [PubMed: 22480927]
24. Centers for Disease Control and Prevention. National, state, and local area vaccination coverage among adolescents aged 13–17 years- United States, 2008. MMWR. 2009; 58:997–1001. [PubMed: 19763075]
25. Centers for Disease Control and Prevention. National and state vaccination coverage among adolescents aged 13 through 17 years- United States, 2010. MMWR. 2011; 60:1117–2011. [PubMed: 21866084]
26. Merck & Co. [Accessed June 5, 2012] 2010. A program to help improve patient compliance: 3 is keyAvailable from URL: http://www.merckvaccines.com/vaccines/gardasil/compliance_one.html
27. Wong CA, Berkowitz Z, Dorell CG, Price RA, Lee J, Saraiya M. Human papillomavirus vaccine uptake among 9- to 17-year-old girls: National Health Interview Survey, 2008. Cancer. 2011; 117:5612–5620. [PubMed: 21692069]
28. Niccolai LM, Mehta NR, Hadler JL. Racial/ethnic and poverty disparities in human papillomavirus vaccination completion. Am J Pev Med. 2011; 41:428–433.
29. Chou B, Krill LS, Horton BB, Barat CE, Trimble CL. Disparities in human papillomavirus vaccine completion among vaccine initiators. Obstet Gynecol. 2011; 118:14–20. [PubMed: 21691158]
30. Schluterman NH, Terplan M, Lydecker AD, Tracy JK. Human papillomavirus (HPV) vaccine uptake and completion at an urban hospital. Vaccine. 2011; 29:3767–3772. [PubMed: 21440038]
31. Hewitt M, Devesa SS, Breen N. Cervical cancer screening among U.S. women: analysis of the 2000 National Health Interview Survey. Prev Med. 2004; 39:270–278. [PubMed: 15226035]
32. Widdice LE, Bernstein DI, Leonard AC, Marsolo KA, Kahn JA. Adherence to the HPV vaccine dosing intervals and factors associated with completion of 3 doses. Pediatrics. 2011; 127:77–84. [PubMed: 21149425]
33. Chao C, Velicer C, Slezak JM, Jacobsen SJ. Correlates for completion of 3-dose regimen of HPV vaccine in female members of a managed care organization. Mayo Clin Proc. 2009; 84:864–870. [PubMed: 19797775]

34. McDougall JA, Madeleine MM, Daling JR, Li CI. Racial and ethnic disparities in cervical cancer incidence rates in the United States, 1992–2003. Cancer Causes Control. 2007; 18:1175–1186. [PubMed: 17805982]

35. National Cancer Institute. [Accessed June 5, 2012] SEER Stat Fact Sheets-Cancer of the Cervix Uteri. Available at: http://seer.cancer.gov/statfacts/html/cervix.html

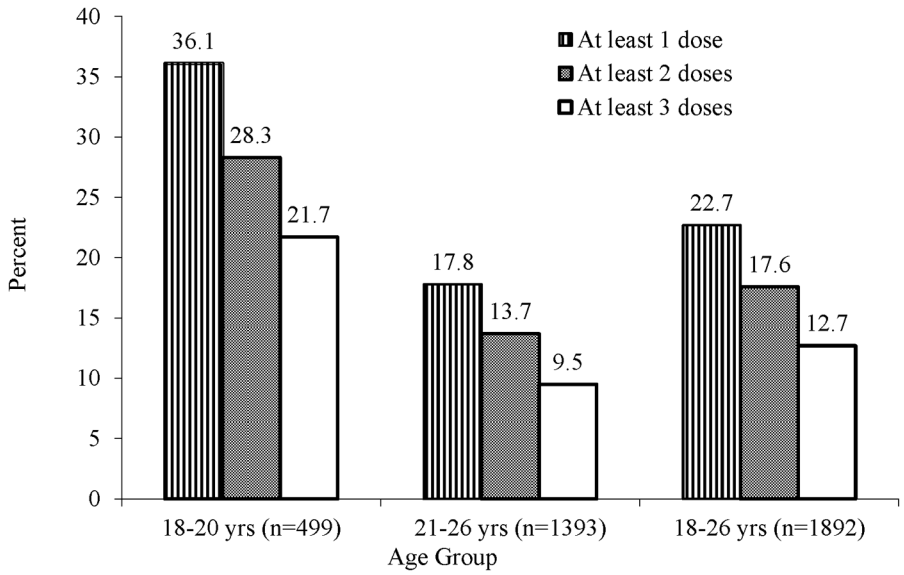

Figure 1.
Estimated human papillomavirus (HPV) vaccine uptake of ≥1 dose, ≥2 doses and ≥3 doses among 18–26 year old women

Table 1

HPV vaccine uptake by characteristics among 18–26 year old women

Factor	Total [a]	Received ≥ 1 dose		Received ≥ 3 doses	
	n=1892	Wgtd % (95% CI)	*p* [b]	Wgtd % (95% CI)	*p* [b]
Demographics					
Age			<.001*		<.001*
18–20 y	499	36.1 (31.4–40.8)		21.6 (17.6–25.7)	
21–26 y	1393	17.8 (15.6–20.0)		9.5 (7.8–11.2)	
Race/ethnicity			.008*		<.001*
White	924	24.9 (22.0–27.8)		14.9 (12.5–17.3)	
Black	374	18.8 (14.6–23.0)		5.9 (3.6–8.3)	
Hispanic	456	18.1 (14.3–21.9)		9.6 (6.6–12.6)	
Asian and other [c]	138	19.5 (12.0–26.9)		15.8 (8.9–22.7)	
Region			.065		.196
Northeast	244	21.2 (15.6–26.7)		10.8 (6.6–14.9)	
Midwest	442	24.4 (20.1–28.6)		14.0 (10.6–17.4)	
South	702	19.8 (16.5–23.1)		11.3 (8.6–13.9)	
West	504	26.5 (22.0–31.0)		14.9 (11.2–18.6)	
Born in US			.005*		.011*
Yes	1597	23.6 (21.3–25.9)		13.4 (11.6–15.3)	
No	293	15.1 (10.4–19.7)		7.1 (4.1–10.2)	
Education			<.001*		<.001*
Less than HS	184	10.1 (5.1–15.0)		6.3 (2.1–10.5)	
HS graduate/GED	417	18.0 (13.8–22.1)		8.4 (5.4–11.5)	
Some college/college degree	1289	25.4 (22.8–28.1)		14.7 (12.6–16.8)	
Marital status			<.001*		<.001*
Married	362	12.3 (8.7–16.0)		5.8 (3.2–8.4)	
Living with partner	240	12.9 (8.1–17.8)		7.3 (3.4–11.3)	
Unmarried/single	1290	27.4 (24.6–30.1)		15.7 (13.4–17.9)	
Family income (% of the federal poverty line)			.237		.078
≥200%	688	24.2 (20.7–27.7)		14.6 (11.7–17.5)	

Factor	Total [a]	Received ≥ 1 dose		Received ≥ 3 doses	
	n=1892	Wgtd % (95% CI)	*p* [b]	Wgtd % (95% CI)	*p* [b]
100% to <200%	399	19.1 (14.8–23.5)		11.1 (7.6–14.7)	
<100%	644	22.2 (18.6–25.8)		11.0 (8.3–13.8)	
Insurance coverage			<.001*		<.001*
Private	894	28.2 (25.0–31.4)		17.1 (14.4–19.8)	
Public	504	20.1 (16.1–24.3)		9.9 (6.9–12.9)	
None	486	12.7 (9.5–16.0)		5.6 (3.6–7.8)	
Health care utilization					
Visit to OB/GYN/General physician in the past year			<.001*		<.001*
Yes	1441	25.4 (22.9–27.9)		14.3 (12.3–16.3)	
No	449	12.7 (9.3–16.2)		7.0 (4.3–9.7)	
Pap test in the past 3 years			.010*		.086
Yes	1424	23.9 (21.5–26.3)		13.4 (11.5–15.4)	
No	456	19.0 (14.8–23.2)		10.5 (7.2–13.8)	
Influenza vaccine in the past year [d]			<.001*		<.001*
Yes	323	31.0 (25.4–36.6)		17.7 (13.0–22.3)	
No	798	14.7 (12.0–17.4)		9.2 (6.9–11.4)	
One or more lifetime vaccines [e]			<.001*		<.001*
Yes	1515	25.4 (23.0–27.9)		14.4 (12.5–16.4)	
No	315	8.7 (5.3–12.2)		3.4 (1.4–5.4)	
Previous exposure to HPV					
Ever had abnormal Pap test results/ HPV infection			.059		.577
Yes	284	30.8 (24.9–36.7)		16.9 (12.0–21.8)	
No	1212	24.5 (21.9–27.2)		14.1 (12.0–16.3)	
HPV vaccine awareness					
Ever heard of HPV vaccine					
Yes	1359	28.9 (26.2–31.5)	<.001*	16.4 (14.2–18.6)	<.001*
No	526	3.1 (1.4–4.9)		1.1 (0.1–2.0)	

HPV, human papillomavirus; CI, confidence interval; HS, high school; GED, graduate equivalency diploma; Wgtd, weighted

[a], Numbers do not add up to 1892 due to missing data

Cancer. Author manuscript; available in PMC 2014 April 01.

[b], Chi-square test was used (* $P < .05$ considered statistically significant)

[c]Included non-Hispanic American Indian Alaska Native, not releasable, and multiracial

[d], Included H1N1 and/or seasonal flu shot and/or nasal spray

[e], Lifetime vaccines included hepatitis A and B vaccine ever, and tetanus shot in the past 10 years

Table 2

Factors associated with HPV vaccine uptake among 18–26 year old women

Factor	Received ≥ 1 dose OR(95% CI) [a]	Received ≥ 3 doses OR(95% CI) [a]
Demographics		
Age		
18–20 y	Ref	Ref
21–26 y	0.30 (0.19–0.45)*	0.31 (0.19–0.52)*
Race/ethnicity		
White	Ref	Ref
Black	0.94 (0.54–1.62)	0.48 (0.23–0.99)*
Hispanic	1.29 (0.75–2.22)	0.70 (0.34–1.43)
Asian and other [b]	1.07 (0.49–2.35)	1.67 (0.72–3.87)
Region		
Northeast	Ref	Ref
Midwest	1.01 (0.54–1.87)	1.76 (0.77–4.02)
South	0.68 (0.37–1.27)	1.67 (0.73–3.84)
West	1.37 (0.74–2.53)	2.21 (0.97–5.03)
Marital status		
Married	Ref	Ref
Living with partner	0.93 (0.40–2.14)	0.62 (0.18–2.14)
Unmarried/single	3.10 (1.71–5.60)*	3.78 (1.74–8.20)*
Family income (% of the federal poverty line)		
≥200%	Ref	Ref
100% to <200%	0.76 (0.46–1.25)	0.77 (0.43–1.40)
<100%	0.64 (0.39–1.03)	0.40 (0.21–0.73)*
Insurance coverage		
Private	Ref	Ref
Public	0.81 (0.48–1.36)	0.88 (0.45–1.71)
None	0.49 (0.28–0.84)*	0.52 (0.26–1.04)
Health care utilization		
Pap test in the past 3 years		
No	Ref	Ref
Yes	1.84 (1.09–3.10)*	2.44 (1.28–4.64)*
Influenza vaccine in the past year [c]		
No	Ref	Ref
Yes	2.32 (1.58–3.40)*	1.69 (1.06–2.70)*
One or more lifetime vaccines [d]		
No	Ref	Ref
Yes	1.98 (1.00–3.91)*	3.04 (1.04–8.85)*
HPV vaccine awareness		
Ever heard of HPV vaccine		

Factor	Received ≥ 1 dose OR(95% CI) [a]	Received ≥ 3 doses OR(95% CI) [a]
No	Ref	Ref
Yes	8.80 (4.12–18.80)*	6.86 (2.41–19.54)*

HPV, human papillomavirus; OR, odds ratios; CI, confidence interval

[a] Multivariate logistic regression analyses were used ; covariates with a *P* value >.200 was excluded from the final multivariate model (* P <.05 considered statistically significant)

[b], Included non-Hispanic American Indian Alaska Native, not releasable, and multiracial

[c], Included H1N1 and/or seasonal flu shot and/or nasal spray

[d], Lifetime vaccines included hepatitis A and B vaccine ever, and tetanus shot in the past 10 years

Table 3

Main reasons for not being interested in vaccination among unvaccinated women (18–26 years) by insurance coverage and family income

Reason [a]	Insurance coverage Wgtd %					Family income (% of federal poverty line) [d] Wgtd %			
	Total [b] (n=988)	Private (n=445)	Public (n=263)	None (n=276)	*p* [c]	≥200% (n=363)	100%–<200% (n=206)	<100% (n=324)	*p* [c]
Do not need	39.6	39.5	37.0	41.8	.475	42.2	39.5	36.2	.393
Do not know enough	12.7	10.2	14.5	16.2	.020*	10.5	13.7	15.3	.086
Worried about safety	12.0	14.8	10.6	8.1	.192	11.2	12.6	13.3	.859
Doctor did not recommend	7.2	7.8	8.6	4.9	.606	8.7	6.8	5.5	.571
Not sexually active	6.7	8.3	4.6	5.8	.076	5.5	7.2	8.1	.495
Too old for vaccine	3.1	2.6	2.1	5.3	.624	4.0	1.9	2.5	.495
Already have vaccine	2.9	2.6	4.1	2.5	.637	2.4	3.1	3.3	.907
Too expensive	2.6	1.4	2.1	5.3	.125	1.9	2.8	3.0	.498
Others [d]	11.2	12.1	13.7	6.9	.019*	12.6	10.1	10.0	.283
Do not know	1.8	0.7	2.7	3.2	.006*	0.8	2.2	3.0	.063

Wgtd; weighted

[a], All responses of the reasons were mutually exclusive

[b], Included unvaccinated women who were not interested in vaccination or responded “don’t know” to this information.

[c], Chi-square test was used (* P <.05 considered statistically significant)

[d], Women with unknown family income (n=94) were excluded

[e], Included “don’t know about the place to get vaccine”, “spouse/family member against it”, and “other”