Published in final edited form as:

Vaccine. 2013 November 12; 31(47): 5544–5548. doi:10.1016/j.vaccine.2013.09.017.

Well-woman visit of mothers and human papillomavirus vaccine intent and uptake among their 9-17 year old children

Mahbubur Rahman, MBBS, PhD, MPH^a, Lee B. Elam, BS^a, Michael I. Balat, MS^a, and Abbey B. Berenson, MD, PhD^a

^aDepartment of Obstetrics and Gynecology and the Center for Interdisciplinary Research in Women's Health

Abstract

Objective—To examine the association between attending a well-woman clinic in the prior 2 years and obtaining the human papillomavirus (HPV) vaccine for their 9-17-year-old child.

Methods—Women (n=1256) who attended reproductive health clinics during September 2011-February 2013 and had 1 children 9-17 years of age were asked to complete a self-administered questionnaire containing questions on demographic characteristics, prior well-woman visits, HPV awareness, and HPV vaccine intent and uptake among their adolescent children.

Results—Nearly 78% of women reported having undergone a well-woman visit during the past 2 years. Bivariate analysis showed that the HPV vaccine initiation (23.9% vs. 14.0%, $P=.004$) and completion (13.6% vs. 6.7%, $P=.011$) among 9-17 daughters differed between mothers who did or did not have a well-woman visit during the past 2 years. However, intent to vaccinate them (47.2% vs. 53.3%, $P=.173$) did not differ between these two groups. With regard to 9-17 year old sons, vaccine initiation (10.1% vs. 9.6%, $P=.871$), completion (4.6% vs. 2.4%, $P=.273$) and intent to vaccinate (47.3% vs. 52.1%, $P=.311$) did not differ between these two groups. Multivariable logistic regression analyses confirmed the findings of these bivariate analyses after adjusting for confounder variables.

Conclusion—The well-woman visit may be a missed opportunity for physicians to educate their patients about the benefits of HPV vaccination for their adolescent children in general and sons in particular. Intervention studies are warranted to assess the benefits of using this setting to improve HPV vaccine uptake in the US.

Keywords

Human papillomavirus vaccine; vaccine uptake; vaccine intent; well-woman visit

© 2013 Elsevier Ltd. All rights reserved.

Correspondence Author: Mahbubur Rahman, MBBS, PhD, MPH, Center for Interdisciplinary Research in Women's Health, Department of Obstetrics & Gynecology, University of Texas Medical Branch, John Sealy Annex, Room No. 3.108.D, Galveston TX 77555-0587, Phone: 409-772-2978, Fax: 409-747-5129, marahman@utmb.edu.

This study was presented at the 21st Annual Congress of Women's Health, Washington DC, March 22-24, 2013

Conflict of interest: None

Publisher's Disclaimer: This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final citable form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

Introduction

Over 25% of US women and 20% of men are infected with the human papillomavirus (HPV) [1, 2]. This virus is responsible for 99.8% of cervical cancer cases and 90% of genital warts as well as cancer of the anogenital and head and neck regions in females [3-6]. In most cases, HPV infections are asymptomatic in males, but persistent infection with non-oncogenic HPV types (6 and 11) can cause genital warts and oncogenic types (mainly 16 and 18) can cause anal, penile, and oropharyngeal cancers [7, 8]. Two vaccines are now available which can protect against four HPV strains (6, 11, 16 and 18) responsible for 70% of cervical cancer cases and 90% of genital warts [4, 9], but initiation at a young age is critical as prevalence of HPV infection increases every year between 14 to 24 years of age [1]. As a result, the Advisory Committee on Immunization Practices (ACIP) recommended that the vaccine be administered at 11-12 years of age before most adolescents become sexually active [10]. However, vaccine uptake remains below 30% among 11-17 year old females [11] and almost negligible among similar age-group males (2.0%) residing in the US [12, 13].

Studies on correlates of HPV vaccine intent and uptake among adolescent girls have shown that maternal acceptability of vaccination [14] and provider recommendations [15-18] are two of the strongest predictors. As parental consent is needed to administer this vaccine to minors [19] and mothers shoulder most of the responsibility for their children's healthcare [20, 21], maternal factors are especially critical in the decision to vaccinate children at an appropriate age.

Well-women visits are the backbone of preventive health services offered to women and often result in an excellent physician-patient relationship between the gynecologist and their female patients due to repetitive visits over time [22]. Although the components and frequency of the examination vary with age, the overall goal remains to prevent and detect medical problems in the early stage. These include conducting Pap smears and recommending mammograms [23]. Considering the burden of HPV and its related morbidities, this setting could also be used to encourage women with adolescent children to obtain the HPV vaccine for their child. This idea is supported by two prior studies which observed a positive association between the mother having a Pap test and the daughter receiving the HPV vaccine [24, 25]. However, these studies are limited by the fact that the majority of women had a family income >\$50,000 per year and information on HPV vaccine uptake among their sons was not obtained. The purpose of this study was to fill this gap in the literature by examining among a sample of low-income women whether attending a well-woman visit was associated with HPV vaccine intent and uptake among both their sons and daughters.

Methods

We conducted a self-administered questionnaire survey from Sept 2011 to Feb 2013 among women who sought care at one of three Regional Maternal Child Health Program Clinics located in Galveston, Beaumont and Angleton, Texas. Mothers with one or more children between the ages of 9 and 17 years were asked to participate. Five research coordinators and one medical student recruited women to participate in the survey. Of 4020 women who attended the reproductive health clinics during that time, 1318 met the eligibility criteria. Of these, 42 women declined to participate and 1276 completed the survey questionnaire. We excluded 20 surveys (10 incomplete, 9 invalid, 1 missing) due to incomplete or invalid responses. Thus, the final sample size was 1256. Although women with personal means or private insurance are welcome at these clinics, almost all patients receive some type of government assistance for their healthcare.

In the case of multiple sons/daughters, information on only the oldest son or daughter in the target age group (9-17 y) was sought. Information on one son and one daughter was sought when a woman had both a son and a daughter in that age group. The questionnaire was self-administered and available in either English or Spanish. Patients were paid \$5.00 for their time and participation. All procedures were approved by the Institutional Review Board of University of Texas Medical Branch.

The self-administered questionnaire asked about their age, race/ethnicity, household income, education, partner's education status, marital status and gravidity. The questionnaire also included questions on well-woman visits during the past 2 years, awareness about HPV and HPV vaccine, history of sexually transmitted infection, abnormal Pap smears, atypical precancerous cervical cells, or cervical cancer, HPV vaccine uptake among their 9-17 year old children, and intention to vaccinate them during the next year. HPV awareness and HPV vaccine awareness were assessed using two questions: "Have you ever heard of human papillomavirus?" and "Have you ever heard of the HPV vaccine called Gardasil?" The response options were "yes" and "no". HPV vaccine uptake was assessed by asking "Which of the following best describes your daughter's current situation? The response options were: 1) She has completed the series of 3 shots for the HPV vaccine, 2) She has started (but not completed) the series of 3 shots for the HPV vaccine, 3) She has already scheduled an appointment with a doctor to receive the HPV vaccine and 4) She has not received the HPV vaccine or scheduled an appointment to receive the HPV vaccine. We combined the first two responses to identify HPV vaccine initiation and used the first response to identify HPV vaccine completion. A statement with a Likert scale was used to examine the intention to vaccinate their children: "I want my daughter vaccinated against the HPV within the next year". Response options were: "strongly disagree", "disagree", "neutral", "agree", and "strongly agree". "Agree" and "strongly agree" were combined to identify the intent to vaccinate. Two similarly worded questions were also asked for mothers who had a son.

Statistical Analyses

Bivariate comparisons were performed using the chi-square test, Fisher's exact test, or Student's t test as appropriate. Multivariable logistic regression models were used to examine the association between well-woman visits of mothers and HPV vaccine intent and uptake among their 9-17 year old children after adjusting for confounders. Any variables that were unevenly distributed by well-woman visit status were controlled for in the multivariable models. Candidate variables with $P \leq .10$ were included in the initial multivariable models while variable with $P > 0.10$ were excluded from the final model. All analyses were performed using STATA 12 (Stata Corporation, College Station, TX).

Results

Among the 1256 women with at least one 9-17 year old child, 484 (38.5%) had at least one daughter within the target age group, 452 (36.0%) had at least one son and 320 (25.5%) had both a daughter and a son. Most women belonged to the 30-39 year old age group (59.8%; Table 1). Distribution among racial/ethnic groups was representative of the clinics' patient bases: 51.1% were Hispanic (N=642); 28.4% were black (N=357); 19.1% were white (N=240); and 1.4% belonged to other race/ethnicities (N=17). Most women were currently married or cohabitating (55.1%), and about half of them had part/full time work. Characteristics by well-woman visit status showed that participants with the history of a well-woman visit during the past 2 years were younger, had slightly higher annual household incomes (< 15,000: 62% vs. 53%) and HPV awareness, and were more likely to have sexually transmitted infection (STI) testing and abnormal Pap smears. They were less likely to be white and current smokers. However, women with and without a well-woman

visit did not differ by education, employment status, gravidity, internet use, history of STD and diagnosis of atypical, precancerous cervical cells, or cervical cancer.

Overall, 78.3% (983/1256) of women reported a well-woman visit during the past 2 years. Bivariate analysis showed that, compared to those who did not have a well-woman visit during the past 2 years, women who had well-woman visit were more likely to initiate (23.9% vs. 14.0%, $P=.004$) and complete (13.6% vs. 6.7%, $P=.011$) the HPV vaccine series among their 9-17 year old daughter although intent to vaccinate them within the next 12 months did not differ (47.2% vs. 53.3%, $P=.173$) (Table 2). Vaccine initiation (10.1% vs. 9.6%, $p=.871$), completion (4.6% vs. 2.4%, $p=.273$) and intent to vaccinate (47.3% vs. 52.1%, $P=.311$) did not differ with regard to similar age-group son between these two groups.

Variables that met the screening criteria for inclusion in the multivariable models were age, race/ethnicity, income, partner's education level, smoking status, HPV awareness, HPV vaccine awareness, STD testing and history of an abnormal Pap smear. As HPV awareness and HPV vaccine awareness were highly collinear, we used HPV vaccine awareness as it predicted vaccine uptake and intent behaviors more strongly than HPV awareness. Variables with $P<0.1$ were kept in all final models. Thus, all final models were adjusted by HPV vaccine awareness, household income and history of abnormal Pap smear. Adjusted odds ratios for the final models are presented in Table 3. Based on multivariable logistic regression analyses, well-woman visit status of mothers was associated with HPV vaccine initiation and completion among their 9-17 year old daughters. However, it was not associated with intent to vaccinate them after adjusting for confounders. Further, well-woman visit of mothers was not associated with vaccine initiation, completion of the vaccine series and intent to vaccinate their 9-17 year old sons.

Discussion

Physicians usually do not discuss HPV vaccination when performing a well-woman examination on patients over age 26 as they are not eligible to receive the vaccine [23]. However, mothers of adolescent children do require information on this topic so that they can make an informed decision on behalf of their child. It was expected that women who had a well-woman visit recently would be somewhat knowledgeable about HPV vaccine as they undergo Pap testing periodically. In this study, however, this knowledge was enough to improve the HPV vaccine initiation and completion among 9-17 year old daughters, but it did not impact the vaccine initiation and completion among their eligible sons. Since physician recommendation is one of the most important predictors of HPV vaccine initiation, [15-18] use of this setting may be an opportunity to increase HPV vaccine uptake among adolescents. This topic could be raised when discussing the need for regular cancer screening, such as Pap tests or mammograms.

Two prior studies have observed a positive association between obtaining a Pap test and receiving the HPV vaccine for their daughters [24, 25]. However, these studies differed from the current investigation in that most of their participants had an annual household income > \$50,000. For example, Chao et al [24], observed a positive association between mothers' Pap test histories and daughters' HPV vaccine initiation and completion among participants based on a managed care organization in California. Monnat et al [25] also observed a similar association based on a nationally representative population. Thus, these studies along with our study add to the literature that history of attending a well-woman clinic among mothers is associated with daughter's HPV vaccine initiation and completion irrespective of their income level. In addition, our study also adds that well-woman visit does not impact HPV vaccine initiation and completion rates among their sons.

Study limitations include a cross-sectional design which prevented us from establishing a causal relationship between well-woman visits and HPV vaccine intent and uptake. In addition, the self-reported information may be subject to under-reporting and recall bias. Furthermore, this study was limited to low-income women seeking reproductive health care and may not be generalizable to other populations.

Researchers, practitioners and policy makers have been trying, with little success, to raise HPV awareness and vaccine uptake among adolescents over the last several years. As a result, the majority of US adolescents are still unvaccinated or incompletely vaccinated years after the dissemination of ACIP recommendations [12]. This study observed that current preventive services provided at well-woman visits do not have any impact on HPV vaccine intent and uptake among the patient's 9-17 year old sons. Given that HPV vaccine uptake is low in the US, these routine visits may provide an opportunity for counseling about the need for their adolescent children to obtain the HPV vaccine. Future intervention studies are needed to shed more light on the feasibility of using this setting to raise HPV vaccine awareness and ultimately, to improve vaccine uptake rates. This setting may be especially helpful in reaching low-income minority families who are disproportionately affected by cervical cancer [26] and more difficult to access than those with higher incomes.

Acknowledgments

Federal support for this study was provided by the Eunice Kennedy Shriver National Institute of Child Health & Human Development (NICHD) (K24 HD04365, Berenson). The content is solely the responsibility of the authors and does not necessarily represent the official views of the NICHD or the National Institutes of Health.

References

1. Dunne EF, Unger ER, Sternberg M, McQuillan G, Swan DC, et al. Prevalence of HPV infection among females in the United States. *JAMA*. 2007; 297:813–9. [PubMed: 17327523]
2. Dunne EF, Nielson CM, Stone KM, Markowitz LE, Giuliano AR. Prevalence of HPV infection among men: A systematic review of the literature. *J Infect Dis*. 2006; 194:1044–57. [PubMed: 16991079]
3. Walboomers JM, Jacobs MV, Manos MM, Bosch FX, Kummer JA, et al. Human papillomavirus is a necessary cause of invasive cervical cancer worldwide. *J Pathol*. 1999; 189:12–9. [PubMed: 10451482]
4. Bosch FX, de Sanjose SS. Human papillomavirus and cervical cancer – burden and assessment of causality. *J Natl Cancer Inst Monogr*. 2003; 31:3–13. [PubMed: 12807939]
5. Greer CE, Wheeler CM, Ladner MB, Beutner K, Coyne MY, et al. Human papillomavirus (HPV) type distribution and serological response to HPV type 6 virus-like particles in patients with genital warts. *J Clin Microbiol*. 1995; 33:2058–63. [PubMed: 7559948]
6. Center for Disease Control and Prevention. [January 25, 2013] Genital HPV: The Facts. 2010. (http://www.cdc.gov/std/hpv/the-facts/HPV_English_2011_508.pdf)
7. Giuliano AR, Tortolero-Luna G, Ferrer E, Burchell AN, de Sanjose S, Kjaer SK, et al. Epidemiology of human papillomavirus infection in man, cancers other than cervical and benign conditions. *Vaccine*. 2008; 26(suppl.10):K17–28. [PubMed: 18847554]
8. Lacey CJ, Lowndes CM, Shah KV. Chapter 4: Burden and management of non-cancerous HPV-related conditions: HPV-6/11 disease. *Vaccine*. 2006; 24(suppl. 3):S3/35–S3/41. [PubMed: 16950016]
9. 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]
10. 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(RR-2):1–24.

11. 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; 30:3534–40. [PubMed: 22480927]
12. Laz TH, Rahman M, Berenson AB. Human papillomavirus vaccine uptake among 9-17 year old males in the United States: The National Health Interview Survey, 2010. *Hum Vaccin Immunother*. 2013 Jan 7.9 Epub ahead of print.
13. Reiter PL, McRee AL, Kadis JA, Brewer NT. HPV vaccine and adolescent males. *Vaccine*. 2011; 29(34):5595–602. [PubMed: 21704104]
14. Zimet GD, Perkins SM, Sturm LA, Bair RM, Juliar BE, Mays RM. Predictors of STI vaccine acceptability among parents and their adolescent children. *J Adolesc Health*. 2005; 37:179–86. [PubMed: 16109336]
15. Dorell C, Yankey D, Kennedy A, Stokley S. Factors That Influence Parental Vaccination Decisions for Adolescents, 13 to 17 Years Old: National Immunization Survey-Teen, 2010. *Clin Pediatr (Phila)*. 2013; 52:162–70. [PubMed: 23221308]
16. Reiter PL, Brewer NT, Gottlieb SL, McRee AL, Smith JS. Parents' health beliefs and HPV vaccination of their adolescent daughters. *Soc Sci Med*. 2009; 69:475–80. [PubMed: 19540642]
17. McRee AL, Reiter PL, Brewer NT. Vaccinating adolescent girls against human papillomavirus - Who decides? *Prev Med*. 2010; 50:213–4. [PubMed: 20153358]
18. 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; 45:453–62. [PubMed: 19837351]
19. Bartholome WG. Informed consent, parental permission, and assent in pediatric practice. *Pediatrics*. 1995; 96(5pt 1):981–982. [PubMed: 7478854]
20. Kaiser Family Foundation. Women, work, and family health: A balancing act. Washington, DC: The Henry J Kaiser Family Foundation; 2003. p. 4293 Available at: http://www.kff.org/womenshealth/loader.cfm?url=/commonspot/security/getfile.cfm&PageID_1 [February 21, 2013]
21. Dilorio C, Pluhar E, Belcher L. Parent-child communication about sexuality: A review of the literature from 1980–2002. *J HIV/AIDS Prev Educ Adolesc Child*. 2003; 5:7–32.
22. Boulware LE, Marinopoulos S, Phillips KA, Hwang CW, Maynor K, et al. Systematic review: the value of the periodic health evaluation. *Ann Intern Med*. 2007; 146:289–300. [PubMed: 17310053]
23. Well-woman visit. Committee opinion No.534. American College of Obstetricians and Gynecologists. *Obstet Gynecol*. 2012; 120:421–4. [PubMed: 22825111]
24. Chao C, Slezak JM, Coleman KJ, Jacobsen SJ. Papanicolaou screening behavior in mothers and human papillomavirus vaccine uptake in adolescent girls. *Am J Public Health*. 2009; 99:1137–42. [PubMed: 19372507]
25. Monnat SM, Wallington SF. Is there an association between maternal pap test use and adolescent human papillomavirus vaccination? *J Adolesc Health*. 2013; 52:212–8. [PubMed: 23332487]
26. Glick SB, Clarke AR, Blanchard A, Whitaker AK. Cervical cancer screening, diagnosis and treatment interventions for racial and ethnic minorities: a systematic review. *J Gen Intern Med*. 2012; 27:1016–32. [PubMed: 22798213]

Glossary

MR	Participated in the conception and design of the study, analyzed the data, and wrote the manuscript
LBE	Participated in the data collection, study coordination, interpretation of the results and revision of the manuscript
MIB	Participated in the data collection, study coordination, interpretation of the results and revision of the manuscript

ABB Participated in the conception and design of the study, interpretation of the results, critical analysis and revision of the manuscript

Highlights

Association between well-woman visit of mothers and HPV vaccine uptake among their adolescent children was examined.

HPV vaccine uptake among daughters, but not among sons, was higher among women who had well-woman visit in the past 2 yrs.

Well-woman visit may be a missed opportunity for physicians to educate about the benefits of adolescent HPV vaccination.

Table 1

Sample characteristics of mothers with a child 9 – 17 years old by well-woman visit status

		n (%) or mean ($\pm$ SD)		
		Characteristics by well-woman visit status		
	Overall characteristics (n=1256) [†]	No (n=273)	Yes (n=983)	P value
Age, n (%)				.016
<30	180 (14.3)	31 (11.4)	149 (15.2)	
30 – 39	751 (59.8)	154 (56.4)	597 (60.7)	
40 or above	325 (25.9)	88 (32.2)	237 (24.1)	
Race/ethnicity, n (%)				<.001
White	240 (19.1)	78 (27.6)	162 (16.5)	
Black	357 (28.4)	68 (24.9)	289 (29.4)	
Hispanic	642 (51.1)	122 (44.7)	520 (52.9)	
Other	17 (1.4)	5 (1.8)	12 (1.2)	
Marital status, n (%)				
Single, never married	249 (19.9)	49 (18.1)	200 (20.4)	.301
Married or cohabitating	689 (55.1)	145 (53.5)	544 (55.6)	
Separated/divorced/widow	312 (25.0)	77 (28.4)	235 (24.0)	
Education, n (%)				.672
Did not graduate high school	547 (43.6)	117 (42.9)	430 (43.8)	
High school graduate or GED	392 (31.2)	91 (33.3)	301 (30.7)	
College degree or some college	316 (25.2)	65 (23.8)	251 (25.6)	
Education of partner, n (%)				.046
Did not graduate high school	435 (35.0)	87 (32.0)	348 (35.9)	
High school graduate or GED	346 (27.9)	82 (30.2)	264 (27.2)	
College degree or some college	188 (15.1)	31 (11.4)	157 (16.2)	
Does not have a partner	273 (22.0)	72 (26.5)	201 (20.7)	
Employment status, (%)				.313
Does not work	689 (54.9)	142 (52.2)	547 (55.7)	
Employed (full/part time)	566 (45.1)	130 (47.8)	436 (44.4)	
Annual household income, n (%)				.015
Less than \$15,000	496 (40.1)	125 (46.6)	371 (38.3)	
\$15,000-29,999	542 (43.8)	97 (36.2)	445 (45.9)	
\$30,000 or above	200 (16.2)	46 (17.2)	154 (15.9)	
Internet user (%)	741 (59.1)	159 (58.2)	582 (59.3)	.747
Current smoker, n (%)	282 (22.5)	81 (29.9)	201 (20.5)	.001
Gravidity, mean ($\pm$ SD)	3.4 (1.2)	3.4 (1.2)	3.4 (1.2)	.840
Heard about HPV, n (%)	908 (72.3)	183 (67.0)	725 (73.8)	.028
Heard about HPV vaccine, n (%)	619 (49.3)	119 (43.6)	500 (50.9)	.033
Ever tested for a STI, n (%)	666 (53.2)	125 (46.1)	541 (55.2)	.008
Ever diagnosed with a STI, n (%)	188 (15.1)	37 (13.8)	151 (15.5)	.500
Ever diagnosed with HPV, n (%)	93 (7.5)	14 (5.2)	79 (8.1)	.110

n (%) or mean ($\pm$ SD)				
	Overall characteristics (n=1256) [†]	Characteristics by well-woman visit status		
		No (n=273)	Yes (n=983)	P value
Ever had abnormal pap smears, n (%)	372 (29.8)	66 (24.4)	306 (31.3)	.027
Ever diagnosed with precancerous cervical cells, or cervical cancer	117 (9.4)	27 (10.0)	90 (9.2)	.707

[†] Numbers do not add up to 1256 due to missing data

SD=Standard Deviation; GED=General Education Diploma; HPV=Human papillomavirus; STI=Sexually transmitted Infection

Table 2

HPV vaccine initiation, completion and intent to vaccinate among 9-17 year old children by well-woman visit status of mother during past 2 years

	<u>Had well-woman visit during the past 2 years</u>		<i>P</i> value
	Yes	No	
<i>Vaccine initiation</i>			
9-17 year old daughter	146 (23.9)	27 (14.0)	.004
9-17 year old son	61 (10.1)	16 (9.6)	.871
<i>Vaccine completion</i>			
9-17 year old daughter	83 (13.6)	13 (6.7)	.011
9-17 year old son	28 (4.6)	4 (2.4)	.273
<i>Intent to vaccinate</i> [*]			
9-17 year old daughter	215 (47.2)	88 (53.3)	.173
9-17 year old son	258 (47.3)	76 (52.1)	.311

P value was based on chi square test or Fisher's exact test

^{*} Denominator is based on women who did not initiate HPV vaccine series

Table 3

HPV vaccine initiation, completion and intent to vaccinate: odds ratios of having well-woman visit during the past 2 years versus did not

	Crude odds ratio (95% CI)	P value	Adjusted odds ratio (95% CI)	P value
<i>Vaccine initiation</i>				
9-17 year old daughter	1.93 (1.23-3.02)	.004	1.93 (1.21-3.08)	.006
9-17 year old son	1.05 (0.59-1.87)	.871	0.90 (0.49-1.64)	.735
<i>Vaccine completion</i>				
9-17 year old daughter	2.18 (1.18-4.00)	.012	2.03 (1.09-3.77)	.025
9-17 year old son	1.96 (0.68-5.67)	.214	1.66 (0.57-4.87)	.353
<i>Intent to vaccinate</i>				
9-17 year old daughter	0.78 (0.55-1.12)	.174	0.72 (0.50-1.03)	.075
9-17 year old son	0.83 (0.57-1.19)	.312	0.77 (0.53-1.13)	.179

Based on logistic regression analysis; Six separate logistic regression models were built based on six dependent variables listed in the 1st column.

Dependent variable: Vaccine initiation, completion and intent to vaccinate for daughter and son separately

Exposure variable: Well-woman visit during the past 2 years (yes=1, no=0)

Confounders: Variables having association with well-woman visit at the level of $P < .1$ were entered in the initial multivariate models.

Variables included in the initial multivariable models: age, race/ethnicity, income, partner's education level, smoking status, HPV awareness, HPV vaccine awareness, having a STI test in the past and diagnosed with a HPV infection, and history of an abnormal Pap smears

Confounder variables which had a P value $< .1$ with any of the dependent variables kept in all final models. Thus, all final models were adjusted by HPV vaccine awareness, income and history of abnormal Pap smears.