



Published in final edited form as:

Vaccine. 2011 June 6; 29(25): 4238–4243. doi:10.1016/j.vaccine.2011.03.076.

Knowledge and Intention to Participate in Cervical Cancer Screening after the Human Papillomavirus Vaccine

Rebecca Anhang Price, PhD^a, Jill Koshiol, PhD^b, Sarah Kobrin, PhD, MPH^c, and Jasmin A. Tiro, PhD^d

Jill Koshiol: koshiolj@mail.nih.gov; Sarah Kobrin: kobrins@mail.nih.gov; Jasmin A. Tiro: jtiro@utsouthwestern.edu

^a Work completed at: SAIC-Frederick, Inc. while a contractor to: Applied Cancer Screening Branch, Behavioral Research Program, Division of Cancer Control and Population Sciences, National Cancer Institute, 6130 Executive Boulevard EPN 4096 Bethesda, MD 20852

^b Infections and Immunoepidemiology Branch, Division of Cancer Epidemiology and Genetics, National Cancer Institute, 6120 Executive Boulevard, Bethesda, MD 20852

^c Applied Cancer Screening Research Branch, Division of Cancer Control and Population Sciences, National Cancer Institute, 6130 Executive Boulevard Bethesda, MD 20852

^d Division of Behavioral and Communication Sciences, Department of Clinical Sciences, University of Texas Southwestern Medical Center, 5323 Harry Hines Blvd, Dallas, Texas 75390

Abstract

Background—If women who receive the human papillomavirus (HPV) vaccine are unduly reassured about the cancer prevention benefits of vaccination, they may choose not to participate in screening, thereby increasing their risk for cervical cancer. This study assesses adult women's knowledge of the need to continue cervical cancer screening after HPV vaccination, describes Pap test intentions of vaccinated young adult women, and evaluates whether knowledge and intentions differ across groups at greatest risk for cervical cancer.

Methods—Data were from the 2008 Health Information National Trends Survey (HINTS) and the 2008 National Health Interview Survey (NHIS), which initiated data collection approximately 18 months after the first FDA approval of an HPV vaccine. We calculated associations between independent variables and the outcomes using chi-square tests.

Results—Of 1,586 female HINTS respondents ages 18 through 74, 95.6% knew that HPV-vaccinated women should continue to receive Pap tests. This knowledge did not vary significantly by race/ethnicity, education, income, or healthcare access. Among 1,101 female NHIS respondents ages 18 to 26 who had ever received a Pap test, the proportion (12.7%; $n = 139$) who reported receipt of the HPV vaccine were more likely than those not vaccinated to plan to receive a Pap test within three years (98.1% vs. 92.5%, $p < 0.001$).

Conclusions—US adult women possess high knowledge and intention to participate in Pap testing after HPV vaccination. The vast majority of young adult women who received the HPV

© 2011 Elsevier Ltd. All rights reserved.

Please send correspondence and reprint requests to Rebecca Anhang Price, PhD at the following present address: RAND Corporation, 1200 South Hayes Street, Room 7139, Arlington, Virginia 22202-5050, Telephone: (703) 413-1100 x5227, Fax: (703) 413-8111, ranhangp@rand.org.

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.

vaccine within its first two years on the market intend to participate in cervical cancer screening in the near future. Future studies are needed to examine whether those vaccinated in adolescence will become aware of, and adhere to, screening guidelines as they become eligible.

Keywords

human papillomavirus (HPV); cervical cancer; cancer screening; disparities

Introduction

The first human papillomavirus (HPV) vaccine was introduced in the United States in 2006. Both that quadrivalent vaccine, and the bivalent vaccine approved by the FDA in 2009, protect against HPV 16 and 18, two carcinogenic strains of HPV responsible for approximately 70% of cervical cancers.¹⁻³ However, neither vaccine confers broad protection against all high risk types of HPV. In addition, vaccine recipients may have been exposed to carcinogenic types of HPV before vaccination. Consequently, routine cervical cancer screening is recommended for both vaccinated and unvaccinated women.⁴ Some have expressed concern that women will believe that the vaccine confers complete protection against cervical cancer, and therefore, not know about or participate in required continued screening.⁵ Such misperceptions could be particularly harmful among women of lower education and income and less generous insurance coverage, who underutilize cervical cancer screening,⁶⁻¹³ and for racial and ethnic minorities and those of lower socioeconomic status, who experience a disproportionate burden of cervical cancer mortality.¹⁴⁻¹⁵

In the present study, we assess whether adult women in the general population know about cervical cancer screening requirements after the HPV vaccine; whether women who received the HPV vaccine in 2007 and 2008 intend to receive Pap tests in the future; and whether knowledge and intention vary across groups at greatest risk for poor screening adherence and cervical cancer.

As no single data source examines both knowledge and behavior related to HPV vaccination and cervical cancer screening, we conducted separate analyses of data from two national surveys, the National Cancer Institute's Health Information National Trends Survey (HINTS), which examines cancer knowledge and communication, including knowledge of cervical cancer screening guidelines; and the National Center for Health Statistics' National Health Interview Survey (NHIS), which assesses cancer-related behaviors and intentions, including both HPV vaccination and cervical cancer screening. We hypothesized that knowledge of screening requirements would vary by socioeconomic status and race/ethnicity, as previous reports have shown lower awareness of HPV among Black and Hispanic women and those of lower income and education than among White women and those with higher income and education.¹⁶ Consistent with research showing an association between HPV vaccination and health care utilization,¹⁷⁻²⁰ we further hypothesized that adult women who received the HPV vaccine in 2007 and 2008 would report higher intended Pap test participation than their unvaccinated peers.

Material and Methods

Data

Study samples and outcomes for the two datasets analyzed here are described in Table 1. Data on women's knowledge of cervical cancer screening requirements were from the HINTS 2008, a cross-sectional survey of the US adult population on health communication topics, conducted from January through April 2008. The survey sample is nationally

representative, with oversampling of Hispanics and African Americans to ensure adequate representation and stable estimates. Further details regarding the survey's development and design are available at <http://hints.cancer.gov>. HINTS 2008 was administered by mail and telephone; however, the survey item of interest was asked solely in the telephone mode, so our study analyzes telephone data only. Respondents were recruited through random digit dialing of telephone numbers from a sampling frame of all working residential telephones in the United States. Applying the American Association for Public Opinion Research's standard definitions,²¹ the screening interview response rate was 42.4% and the rate of interview completion with the selected respondent was 57.2%, corresponding to a total response rate of 24.3%. As only female respondents who had heard of HPV were asked the question regarding Pap testing after the HPV vaccine, we excluded male respondents (n = 1,587) and female respondents who had not heard of HPV (n = 557). We also excluded women with a history of cervical cancer (n = 38), and those who were older than 75 (n = 405), as cervical cancer screening guidelines differ for them.

Data on HPV-vaccinated women's intentions to participate in cervical cancer screening were from the Cancer Control Module of the NHIS 2008, conducted from January through December of that year. NHIS is an annual, in-person household survey that collects health information on the U.S. civilian, noninstitutionalized population.²² The survey employs a complex, stratified, multistage sample in order to provide nationally representative data. Hispanics and African Americans are oversampled so as to ensure adequate representation and stable estimates of minority health behaviors. Further details of NHIS are located at <http://www.cdc.gov/nchs/nhis.htm>. In 2008, 21,781 adult sample persons were surveyed, representing a response rate of 62.6%. The sample included here consisted of women who had ever received a Pap test, had not had a hysterectomy, and were ages 18 to 26 (i.e. - age-eligible for the HPV vaccine according to Centers for Disease Control and Prevention guidelines²³) (n = 1,101). Of these, 12.7% reported having received at least one dose of the HPV vaccine (n = 139).

Measures

Outcome Variables—To assess whether respondents were aware of the need to continue cervical cancer screening after receipt of the HPV vaccine, a dichotomous HINTS survey item asked: “Do you think women who get the cervical cancer vaccine or HPV shot should continue to get screened for cervical cancer with the Pap test?” (yes/no).

To assess intention to continue cervical cancer screening, a categorical NHIS survey item asked: “When do you expect to have your next Pap smear or test?” with possible responses of “a year or less from now;” “1–3 years from now;” “3–5 years from now;” “more than 5 years from now;” “when a doctor recommends it;” “never, had HPV DNA test;” “never, had HPV vaccine;” or “never, other reason.” Responses of three years or less were deemed an intention to screen on schedule, as clinical guidelines recommend that women receive Pap testing at least every three years.^{24–26}

Independent Variables—The independent variables of interest were factors that have been associated with HPV knowledge and cervical cancer screening in past studies,^{16, 27} including *sociodemographic characteristics*: age, race/ethnicity, education, income, and marital and immigration status; *health care access*: insurance coverage and usual health care provider; *personal medical history*: HPV diagnosis, abnormal Pap test results or cancer other than cervical; and *cervical cancer screening practices*: Pap test history.

Analyses

We examined the univariate associations between the independent variables and the outcomes using Chi-square tests. Multivariate analyses were not possible given the limited distribution of responses for our outcome variables, and in the NHIS data, the small sample size of vaccinated respondents. Analyses incorporated sampling weights to generate nationally representative estimates and were conducted using SUDAAN 9.0.1.

Results

Knowledge of Cervical Cancer Screening Requirements

In the HINTS sample of 1,586 women ages 18 through 74 who had heard of HPV and had no history of cervical cancer, 95.6% of respondents knew that women who receive the HPV vaccine should continue to receive Pap tests (Table 1). This high level of knowledge did not vary significantly by race or ethnicity, education, income, health insurance, presence of a usual health care provider, or previous cancer diagnosis. Women who had a history of HPV infection or had a Pap test in the previous three years were slightly more likely to know about the continuing need for Pap tests than those who had not ($p < 0.01$), although for all subgroups knowledge was greater than 89%.

Intention to Participate in Cervical Cancer Screening

In the NHIS sample of women ages 18 through 26 who had ever had a Pap test and had never had a hysterectomy ($n = 1,101$), the 12.7% of women ($n = 139$) who had received the HPV vaccine by the end of 2008 were significantly more likely to intend to receive a Pap test in the next three years than unvaccinated women (98.1% versus 92.7%, $p < 0.001$). Higher education, doctor visit within the past year, Pap test in the past year, and history of an abnormal Pap or positive HPV test were all positively associated with intention to have a Pap test in the next three years.

Among women who had received the HPV vaccine, intention to receive a Pap test in the next three years did not vary by race/ethnicity, education, income, immigration status, health insurance, or presence of a usual health care provider (Table 2). Having had a Pap test one to three years ago, and history of an abnormal Pap test or positive HPV test were marginally associated with higher intention to participate in Pap testing in the next three years ($p < 0.10$).

Discussion

Our analysis of a nationally representative sample from the 2008 Health Information National Trends Survey found that the vast majority of women are aware of the need to continue cervical cancer screening with Pap tests after receipt of the HPV vaccine. We found higher levels of knowledge regarding the need for screening after vaccination than a national survey conducted in late 2007;¹⁷ this may reflect differences in question wording and research methods between the two surveys, or slight improvements in public awareness and understanding of HPV over the course of 2008. In our data, knowledge of screening requirements varied little across income, education, or racial/ethnic groups, suggesting that subgroups of women with traditionally lower rates of cervical cancer screening are appropriately informed about the need for continued screening after HPV vaccination.

Our additional analysis of a nationally representative sample from the 2008 National Health Interview Survey found that the vast majority of young adult women who initiated the HPV vaccine series reported that they intend to receive a Pap test within the next three years, in accordance with cervical cancer screening guidelines.^{24–26} This finding is not surprising, because young adult women who are early adopters of the HPV vaccine may have been

motivated to vaccinate by the same strong orientation toward preventive care that lead them to receive other vaccines^{19–20, 28} and to participate in regular cervical cancer screening. Although women who received the HPV vaccine during its initial two years on the market were more likely to plan future Pap testing at recommended intervals than unvaccinated women, it remains to be seen whether adult women who are later adopters of the vaccine will mimic this pattern, as these women may not be as inclined toward preventive services as their early adopting peers.

It is important to note that the priority target populations for HPV vaccination are pre-adolescent and adolescent girls,²³ and that women who are vaccinated in young adulthood differ from those who are vaccinated in pre-adolescence and adolescence on several important sociodemographic and health care access characteristics. Nationwide, HPV vaccine coverage in young adult women is approximately 12%,^{20, 28} with substantially higher rates of vaccination among those with higher income,²⁰ health insurance,^{20, 28–29} and a recent physician visit.^{17, 19, 30} In contrast, national vaccination rates are substantially higher among pre-adolescents and adolescents than among adults.³¹ Factors associated with cervical cancer screening participation among the current cohort of women who vaccinated as adults, such as education, income, health insurance, and preventive care orientation, may not be correlated with HPV vaccination status in the future, as the cohort of adolescent girls who received the vaccine through public financing programs age into young adulthood. Because decisions about adolescent vaccination are primarily made by parents and may reflect the preventive orientation of the parent rather than the adolescent, cervical cancer screening intentions and practices may differ for women who were vaccinated as pre-adolescents and adolescents than for those who vaccinate in adulthood.

As the HPV vaccine and HPV DNA tests are further incorporated into cervical cancer prevention policy,³² cervical cancer screening guidelines may evolve. Policy analyses of HPV vaccine strategies suggest that widespread HPV vaccination is more cost-effective if cervical cancer screening is initiated later or screening intervals are less frequent.³³ However, Pap testing earlier and more frequently than recommended (e.g., a screening interval of less than 3 years) was common even before the introduction of the HPV vaccine,^{34–35} perhaps reflecting physicians' disagreement or slow response to rapidly changing and conflicting guidelines,³⁶ women's enthusiasm for participating in routine cancer screening,³⁷ or financial incentives for frequent screening.³⁸ Our findings may foretell patients' desire to continue screening at pre-vaccine intervals, even if updated clinical guidelines recommend less frequent screening.

Limitations

Our study is subject to several limitations. First, on NHIS 2008, only those who had ever had a Pap test were asked about their intention to participate in cervical cancer screening in the future; thus, we cannot calculate intention to participate in Pap testing among young women who have not initiated screening. However, vaccinated women were no more or less likely than unvaccinated women to have initiated Pap testing. The small subset of the general population that does not participate in cervical cancer screening stands to benefit most greatly from HPV vaccination; should unscreened women also go unvaccinated, disparities in cervical cancer outcomes could worsen as vaccine coverage increases. Our data did not allow us to explore this concern.

Second, the total number of HPV-vaccinated women in the NHIS sample is small. Sample size may have limited our ability to detect significant associations between respondent characteristics and intention to participate in future Pap tests.

Third, like many recent large surveys that sample households with landline telephones, HINTS 2008 has a modest response rate, and may under-enumerate 18 to 34 year olds, those with less than a high school education, minorities and those in low income groups.³⁹ Weighting calibrations use many of these variables and should compensate for possible biases to the extent that survey respondents are similar in cervical cancer prevention behaviors to those who were not invited or did not choose to participate.

Fourth, on HINTS 2008, only those contacted by telephone and those who had heard of HPV were asked whether they knew about continued need for cervical cancer screening after the HPV vaccine; previous analyses of HINTS data have shown that women who have heard of HPV are more likely to be younger than age 65, non-Hispanic White, and have higher income and education.¹⁶ Given the uniformity of our outcome across sociodemographic groups, however, it seems unlikely that either of these two limitations would create a systematic bias in our results.

Finally, although the HPV vaccine is recommended primarily for adolescents, HINTS data are collected only from adults, and adolescent respondents to the NHIS are not asked about their intention to participate in Pap testing in the future. Future research should examine cervical cancer screening knowledge and intentions among those who received HPV vaccines in adolescence.

Conclusions

Our study provides encouraging preliminary evidence that adult women are knowledgeable about the importance of continued cervical cancer screening after receipt of the HPV vaccine and that those vaccinated in young adulthood are likely to continue to participate in Pap testing. As time elapses, further studies will be needed to monitor cervical cancer screening knowledge and behaviors among adult women who are later adopters of the vaccine and to examine whether vaccinated adolescent females are aware of, and adhere to, screening guidelines as they become eligible.

Acknowledgments

The authors gratefully acknowledge Nancy Breen for her insightful comments on an earlier version of the manuscript, and Timothy McNeel and William Waldron of Information Management Services for their programming support.

This project has been funded in whole or in part with federal funds from the National Cancer Institute, National Institutes of Health, under Contract No. HHSN261200800001E. The content of this publication does not necessarily reflect the views or policies of the Department of Health and Human Services, nor does mention of trade names, commercial products, or organizations imply endorsement by the U.S. Government.

References

1. Medeiros LR, Rosa DD, da Rosa MI, Bozzetti MC, Zanini RR. Efficacy of human papillomavirus vaccines: a systematic quantitative review. *Int J Gynecol Cancer*. Oct; 2009 19(7):1166–1176. [PubMed: 19823051]
2. Munoz N, Kjaer SK, Sigurdsson K, et al. Impact of human papillomavirus (HPV)-6/11/16/18 vaccine on all HPV-associated genital diseases in young women. *J Natl Cancer Inst*. Mar 3; 2010 102(5):325–339. [PubMed: 20139221]
3. Romanowski B, de Borja PC, Naud PS, et al. Sustained efficacy and immunogenicity of the human papillomavirus (HPV)-16/18 AS04-adjuvanted vaccine: analysis of a randomised placebo-controlled trial up to 6.4 years. *Lancet*. Dec 12; 2009 374(9706):1975–1985. [PubMed: 19962185]
4. Saslow D, Castle PE, Cox JT, et al. American Cancer Society Guideline for human papillomavirus (HPV) vaccine use to prevent cervical cancer and its precursors. *CA Cancer J Clin*. Jan-Feb; 2007 57(1):7–28. [PubMed: 17237032]

5. Tiro JA, Saraiya M, Jain N, et al. Human papillomavirus and cervical cancer behavioral surveillance in the US. *Cancer*. Nov 15; 2008 113(10 Suppl):3013–3030. [PubMed: 18980284]
6. Centers for Disease Control and Prevention (CDC). Behavioral Risk Factor Surveillance System Survey Data. Atlanta, GA: U.S. Department of Health and Human Services; 2004.
7. National Council on Quality Assurance. The State of Health Care Quality. Washington, DC: 2006.
8. Hewitt M, Devesa SS, Breen N. Cervical cancer screening among U.S. women: analyses of the 2000 National Health Interview Survey. *Prev Med*. Aug; 2004 39(2):270–278. [PubMed: 15226035]
9. Ayanian JZ, Weissman JS, Schneider EC, Ginsburg JA, Zaslavsky AM. Unmet health needs of uninsured adults in the United States. *JAMA*. Oct 25; 2000 284(16):2061–2069. [PubMed: 11042754]
10. Hsia J, Kemper E, Kiefe C, et al. The importance of health insurance as a determinant of cancer screening: evidence from the Women's Health Initiative. *Prev Med*. Sep; 2000 31(3):261–270. [PubMed: 10964640]
11. Mandelblatt JS, Gold K, O'Malley AS, et al. Breast and cervix cancer screening among multiethnic women: role of age, health, and source of care. *Prev Med*. Apr; 1999 28(4):418–425. [PubMed: 10090871]
12. Robinson JM, Shavers V. The role of health insurance coverage in cancer screening utilization. *J Health Care Poor Underserved*. Aug; 2008 19(3):842–856. [PubMed: 18677074]
13. Swan J, Breen N, Coates RJ, Rimer BK, Lee NC. Progress in cancer screening practices in the United States: results from the 2000 National Health Interview Survey. *Cancer*. Mar 15; 2003 97(6):1528–1540. [PubMed: 12627518]
14. Freeman, HP.; Wingrove, BK. Excess Cervical Cancer Mortality: A Marker for Low Access to Health Care in Poor Communities. Rockville, MD: National Cancer Institute, Center to Reduce Cancer Health Disparities; May. 2005
15. Watson M, Saraiya M, Benard V, et al. Burden of cervical cancer in the United States, 1998–2003. *Cancer*. Nov 15; 2008 113(10 Suppl):2855–2864. [PubMed: 18980204]
16. Tiro JA, Meissner HI, Kobrin S, Chollette V. What do women in the U.S. know about human papillomavirus and cervical cancer? *Cancer Epidemiol Biomarkers Prev*. Feb; 2007 16(2):288–294. [PubMed: 17267388]
17. 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*. Nov; 2009 45(5):453–462. [PubMed: 19837351]
18. 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*. Jun; 2009 99(6):1137–1142. [PubMed: 19372507]
19. 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*. Feb 1; 2010 171(3):357–367. [PubMed: 20047978]
20. 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*. May; 2009 48(5):426–431. [PubMed: 19100762]
21. The American Association for Public Opinion Research. Standard definitions: final dispositions of case codes and outcome rates for surveys. 5. Lenexa, KS: AAPOR; 2008.
22. National Center for Health Statistics. National Health Interview Survey (NHIS) Public Use Data Release: NHIS Survey Description 2009. 2008.
ftp://ftp.cdc.gov/pub/Health_Statistics/NCHS/Dataset_Documentation/NHIS/2008/srvydesc.pdf
23. 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*. Mar 23; 2007 56(RR-2):1–24. [PubMed: 17380109]
24. Saslow D, Runowicz CD, Solomon D, et al. American Cancer Society guideline for the early detection of cervical neoplasia and cancer. *CA Cancer J Clin*. Nov-Dec; 2002 52(6):342–362. [PubMed: 12469763]
25. U.S. Preventive Services Task Force. Guide to Clinical Preventive Services. 3. Washington, DC: U.S. Department of Health and Human Services; 2003.

26. ACOG Practice Bulletin No. 109: Cervical Cytology Screening. *Obstet Gynecol.* Dec; 2009 114(6):1409–1420. [PubMed: 20134296]
27. Hiatt RA, Klabunde C, Breen N, Swan J, Ballard-Barbash R. Cancer screening practices from National Health Interview Surveys: past, present, and future. *J Natl Cancer Inst.* Dec 18; 2002 94(24):1837–1846. [PubMed: 12488477]
28. Anhang Price R, Tiro J, 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.* In press.
29. Conroy K, Rosenthal SL, Zimet GD, et al. Human papillomavirus vaccine uptake, predictors of vaccination, and self-reported barriers to vaccination. *J Womens Health (Larchmt).* Oct; 2009 18(10):1679–1686. [PubMed: 19785564]
30. Anhang Price R, Tiro J, 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. In preparation.
31. National state, and local area vaccination coverage among adolescents aged 13–17 years --- United States, 2009. *MMWR Morb Mortal Wkly Rep.* Aug 20; 2010 59(32):1018–1023. [PubMed: 20724968]
32. Scarinci IC, Garcia FA, Kobetz E, et al. Cervical cancer prevention: new tools and old barriers. *Cancer.* Jun 1; 2010 116(11):2531–2542. [PubMed: 20310056]
33. Kim JJ, Goldie SJ. Health and economic implications of HPV vaccination in the United States. *N Engl J Med.* Aug 21; 2008 359(8):821–832. [PubMed: 18716299]
34. Sirovich BE, Welch HG. The frequency of Pap smear screening in the United States. *J Gen Intern Med.* Mar; 2004 19(3):243–250. [PubMed: 15009779]
35. Saraiya M, Martinez G, Glaser K, Kulasingam S. Pap testing and sexual activity among young women in the United States. *Obstet Gynecol.* Dec; 2009 114(6):1213–1219. [PubMed: 19935021]
36. Meissner HI, Tiro JA, Yabroff KR, Haggstrom DA, Coughlin SS. Too much of a good thing? Physician practices and patient willingness for less frequent pap test screening intervals. *Med Care.* Mar; 2010 48(3):249–259. [PubMed: 20182268]
37. Schwartz LM, Woloshin S, Fowler FJ Jr, Welch HG. Enthusiasm for cancer screening in the United States. *JAMA.* Jan 7; 2004 291(1):71–78. [PubMed: 14709578]
38. Yabroff KR, Saraiya M, Meissner HI, et al. Specialty differences in primary care physician reports of papanicolaou test screening practices: a national survey, 2006 to 2007. *Ann Intern Med.* Nov 3; 2009 151(9):602–611. [PubMed: 19884621]
39. Blumberg SJ, JVL. Coverage bias in traditional telephone surveys of low-income and young adults. *Public Opin Q.* 2007; 71(5):734–749.

Table 1

Survey samples and outcomes.

	Health Information National Trends Survey (HINTS), 2008	National Health Interview Survey (NHIS), 2008
Sample	Female respondents age 18 to 75 who had heard of HPV (n = 1,586)	Female respondents age 18 to 26 who had never had a hysterectomy, ever had a Pap test and had received at least one dose of the HPV vaccine (n = 139)
Mode of Administration	Telephone	In person
Outcome of Interest	“Do you think women who get the cervical cancer vaccine or HPV shot should continue to get screened for cervical cancer with the Pap test?”	“When do you expect to have your next Pap smear or test?”

Table 2Descriptive characteristics, belief that women should receive Pap tests after HPV vaccine, HINTS 2008.^{a b}

Respondent Characteristic	Women Ages 18 to 75 Weighted % (95% Confidence Interval)	Think that women who get the HPV vaccine should continue to receive Pap tests Weighted % (95% Confidence Interval)	p
All (n = 1,586)		95.55 (94.5, 96.6)	
Sociodemographics			
Age group (years; n = 1,586)			0.07
18–29	24.6 (22.8, 26.4)	95.9 (90.3, 98.3)	
30–64	67.0 (65.2, 68.7)	95.9 (93.8, 97.3)	
65–75	8.4 (7.8, 9.1)	92.3 (89.1, 94.6)	
Race/ethnicity (n=1,540)			0.08
Non-Hispanic White	72.0 (69.8, 74.2)	95.8 (94.1, 97.0)	
Non-Hispanic Black	12.8 (10.5, 15.4)	96.4 (88.0, 99.0)	
Hispanic	9.5 (8.0, 11.4)	94.5 (83.0, 98.4)	
Other/multiple ethnicity	5.7 (4.3, 7.4)	93.2 (76.1, 98.4)	
Education (n = 1,559)			0.81
Less than high school	8.3 (6.9, 10.0)	93.3 (78.8, 98.1)	
High school graduate	26.0 (24.1, 28.1)	96.6 (92.1, 98.5)	
Some college or vocational school	36.8 (34.9, 38.7)	95.5 (92.2, 97.4)	
College graduate or more	28.9 (27.6, 30.3)	95.8 (93.4, 97.4)	
Income (n = 1,304)			0.97
<\$15,000	8.4 (6.7, 10.5)	96.4 (90.5, 98.7)	
\$15,000 – \$49,999	37.9 (34.6, 41.4)	96.2 (93.1, 97.9)	
>\$50,000	53.7 (51.1, 56.3)	96.5 (94.4, 97.9)	
Health Care Access			
Health insurance (n = 1,582)			0.81
Yes	87.2 (84.7, 89.3)	95.6 (94.0, 96.9)	
No	12.8 (10.7, 15.4)	95.0 (84.6, 98.5)	
Usual health care provider (n = 1,583)			0.19
Yes	79.3 (75.6, 82.6)	96.1 (94.4, 97.3)	
No	20.7 (17.4, 24.5)	93.6 (87.6, 96.8)	
Cervical Cancer Screening History			
Time since last Pap test (n = 1,548)			0.02
Within the past year	73.6 (70.7, 76.2)	96.5 (94.8, 97.7)	
1 to 3 years ago	15.4 (13.4, 17.5)	96.9 (91.7, 98.9)	
Over 3 years ago	11.1 (9.4, 13.0)	90.0 (82.4, 94.5)	
Last Pap was due to abnormality (n = 1,556)			0.15
Yes	5.4 (4.1, 7.1)	91.7 (77.9, 97.2)	
No	94.6 (92.9, 95.9)	96.1 (94.7, 97.1)	
Ever had HPV infection (n = 1,578)			--

Respondent Characteristic	Women Ages 18 to 75 Weighted % (95% Confidence Interval)	Think that women who get the HPV vaccine should continue to receive Pap tests Weighted % (95% Confidence Interval)	p
Yes	4.6 (3.3, 6.5)	100.0 --	
No	95.4 (93.5, 96.7)	95.3 (93.4, 96.7)	

^aHealth Information National Trends Survey

^bAmong respondents who had heard of HPV prior to the survey.

Table 3

Descriptive characteristics and intention to receive a Pap test in the next three years among HPV-vaccinated women who have ever had a Pap test: NHIS 2008.^a

Respondent Characteristic	HPV-Vaccinated Women Ages 18 to 26 Weighted % (95% Confidence Interval)	Intends to receive a Pap test in the next three years Weighted % (95% Confidence Interval)	p
All (n = 139)	--	98.1 (94.5, 99.4)	--
Sociodemographics			
Race/Ethnicity (n = 139)			0.29
Non-Hispanic White	75.9 (67.5, 82.6)	98.4 (93.0, 99.6)	
Non-Hispanic Black	10.0 (5.7, 17.1)	100.0 --	
Hispanic	10.8 (6.2, 17.9)	100.0 --	
Non-Hispanic Other / Multiple	3.4 (1.6, 7.1)	81.1 (49.4, 95.0)	
Education (n = 139)			
Less than high school	5.5 (2.7, 10.9)	100.0 --	0.54
High school graduate	20.4 (13.3, 30.0)	98.3 (88.3, 99.8)	
Some college	62.4 (53.2, 70.9)	98.0 (91.7, 99.5)	
College graduate or more	11.7 (7.4, 18.0)	97.5 (84.8, 99.6)	
Family Income as % of Federal Poverty Line (n = 135)			
200% +	57.7 (47.2, 67.6)	97.4 (90.9, 99.3)	0.22
100% - <200%	19.3 (12.3, 29.0)	100.0 --	
<100%	23.0 (15.8, 32.3)	98.2 (88.6, 99.7)	
Immigration Status (n = 139)			
Born in U.S. (Excluding territories)	97.9 (94.7, 99.2)	98.1 (94.4, 99.3)	0.38
In U.S. 10+ years	1.2 (0.4, 4.0)	100.0 --	
In U.S. <10 years	0.9 (0.2, 4.0)	100.0 --	
Health Care Access			
Health insurance (n = 137)			0.16
Yes	95.6 (89.4, 98.2)	98.0 (94.2, 99.3)	
No	4.4 (1.8, 10.6)	100.0 --	
Usual source of care (n = 139)			0.10
Yes (excludes emergency room)	89.8 (82.8, 94.1)	97.9 (93.9, 99.3)	
No	10.2 (5.9, 17.2)	100.0 --	
Cervical Cancer Screening History			
Time since last Pap test (n = 139)			
1 year ago or less	85.3 (75.8, 91.5)	97.8 (93.6, 99.2)	0.10
1 to 3 years ago	14.7 (8.5, 24.2)	100.0 --	
Ever had abnormal Pap test (n = 139)			
Yes	28.2 (21.4, 36.2)	100.0 --	0.08
No	71.8 (63.8, 78.6)	97.4 (92.4, 99.1)	

Respondent Characteristic	HPV-Vaccinated Women Ages 18 to 26 Weighted % (95% Confidence Interval)	Intends to receive a Pap test in the next three years Weighted % (95% Confidence Interval)	p
Ever told you have HPV (n = 133)			
Yes	13.8 (8.4, 21.9)	100.0 --	0.09
No	86.2 (78.1, 91.6)	97.7 (93.4, 99.2)	

^a National Health Interview Survey