HHS Public Access
Author manuscript
Vaccine. Author manuscript; available in PMC 2017 July 16.

Published in final edited form as:
Vaccine. 2017 May 09; 35(20): 2661–2667. doi:10.1016/j.vaccine.2017.03.083.

HPV vaccine awareness and the association of trust in cancer information from physicians among males

Dexter L. Cooper[*], **Natalie D. Hernandez**, **Latrice Rollins**, **Tabia Henry Akintobi**, and **Calvin McAllister**
Morehouse School of Medicine, Department of Community Health and Prevention Medicine, Prevention Research Center, United States

Abstract

Introduction—Black and Hispanic men are diagnosed with more HPV-related cancers and at later stages compared to other racial/ethnic groups. Physician communication with men about HPV vaccination may be beneficial to increasing HPV vaccinations and decreasing HPV transmission. The purpose of this study was to examine HPV and HPV vaccine awareness among men by race, and the association between trust in cancer information from physicians and ever hearing about HPV and the HPV vaccine.

Methods—U.S. adult males (age 18+) were identified from the 2014 Health Information National Trends Survey (HINTS) (n = 1203). Binomial logistic regression models assessed the influences of race/ethnicity and trust of cancer information from physicians on men having heard of HPV and the HPV vaccination.

Results—Approximately 50% of the sample had never heard of HPV and 53% had never heard of the vaccine. Black men were less likely to know that HPV is sexually transmitted compared to White and Hispanic men ($p < 0.001$). Hispanic and Black men were less likely to have heard about the HPV vaccine when compared to White men ($p < 0.001$). Additionally, Hispanic men were less likely to trust a doctor about cancer information compared to White and Black men ($p < 0.001$).

Conclusion—Findings highlight the lack of awareness about HPV among men. Furthermore, statistically significant racial/ethnic differences were found in HPV vaccine knowledge and trust in receiving cancer information from physicians. Future interventions should include community-based approaches and improved physicians' HPV-related communication to increase knowledge and uptake of the HPV vaccine.

Keywords

HPV; Men; Disparities; Physicians

[*]Corresponding author at: 720 Westview Drive S.W., Atlanta, GA 30310, United States.

Conflicts of interest: None declared.

Authorship disclosure: All authors have approved the final article.

1. Introduction

Nearly 80 million people in the U.S. are infected with at least one strain of the Human papillomavirus (HPV) making it the most common sexually transmitted infection [1]. Many concerns associated with HPV are related to women, due to the association of HPV and cervical cancer, but HPV can also cause a significant cancer concern among men. HPV infections are the cause of anogenital cancers and warts in women and men [2]. The incidence of HPV-linked cancers such as, oropharyngeal and anal cancers, are increasing among men [3].

Racial and ethnic minority men are disproportionately affected by HPV-associated cancers and are diagnosed at later stages [4,5]. Anal cancer incidence rates are highest among Black men [3]. Additionally, Hispanic men have higher rates of penile cancer than non-Hispanic men [3]. Compared to White men, a recent investigation found that a greater proportion of Black men reported ever having had symptoms of HPV, and were less knowledgeable about HPV than White men [5]. Even in male populations at greatest risk, such as HIV-infected men and men who have sex with men (MSM), previous findings have indicated HPV knowledge deficits [6,7].

HPV awareness, knowledge, and vaccine uptake among men have been low [8–10]. Currently, there are three HPV vaccines available in the U.S., varying slightly in protection, cost, and target population for men between ages 9 and 27. HPV vaccination among males has demonstrated high levels of immunogenicity and reductions in genital lesions and precancerous anogenital lesions [11]. Underuse of HPV vaccination among men in the U.S. is a missed opportunity to prevent cancer. Studies indicate that parents' decisions about HPV vaccination of their sons are determined by its perceived benefits and risks, provider knowledge and recommendation, and parental beliefs [12–14]. Parents of younger children with information about the vaccine are more likely to allow vaccination than parents without information [15,16].

There are many reasons why HPV and HPV vaccine awareness and knowledge may be low among men. Of the many factors that influence HPV vaccination, the role of health care providers is the most influential [10,17,18]. However, males receive fewer recommendations for the HPV vaccine from health care providers and men who are ethnic and racial minorities do not trust information from physicians [19,20]. Although ethnic and racial minority men experience HPV-related disparities, few studies have concurrently examined HPV knowledge, the HPV vaccine and the trust in information from health care providers among this population [5,10,21,22].

Therefore the purpose of this study is to: (1) assess awareness of men about HPV and HPV vaccine by race/ethnicity and (2) examine the association of trust in information from physicians about cancer and ever hearing about HPV and the HPV vaccine. Understanding these factors is needed to inform educational interventions that may decrease patient-provider mistrust, increase uptake of HPV vaccine and decrease disparities in HPV-related cancers among men.

2. Methods

2.1. Data

Data was obtained from the 2014 National Cancer Institute (NCI) Health Information National Trends Survey (HINTS), a national, population-based, cross-sectional survey of adults 18 years of age and older who reside in the United States and its territories. The dataset is available to the public online by accessing http://hints.cancer.gov. Survey data were collected via self-administered mail questionnaire. The HINTS provides state-level data for measuring the use of health information and healthy behaviors with a primary focus on cancer prevention and control. The total population sample was 1424 males. Since sample sizes of the other male racial/ethnic groups were small or the racial/ethnic group was not indicated, this study only included White, Black and Hispanic men ultimately reflecting a sample size of 1203.

2.2. Study variables

Dependent variables—The dependent variables in this study were whether participants ever heard of HPV and whether participants ever heard of the HPV vaccine, Gardasil. To assess whether the participants were aware of HPV, this study used the item “Have you ever heard of HPV? HPV stands for Human Papillomavirus. It is not HIV, HSV, or herpes” (*yes/no*). To assess whether the participants were aware of the HPV vaccine, this study used the item “Before today, have you ever heard of the cervical cancer vaccine or HPV shot?” (*yes/no*).

Independent variables—There was a 7-category race and ethnicity pre-recoded variable in the HINTS dataset of which the 3 groups of interest were selected out (White, Black, Hispanic). Trust in information from a physician was assessed with the item “How much would you trust information about cancer from a doctor?” (*Not at all to A little/Some/A lot*).

Control variables—Several sociodemographic variables were controlled for in the analysis including age, income, education, marital status, and health insurance status. Participants' age (in years) was treated as a continuous variable. Other variables were categorized as follows: Income *($0–$34,999/$35,000–$74,999/$75,000–$99,999/ $100,000 or more*); education (*High school or less/Some college or post high school training/College or post graduate training*); and employment status (*Employed/Unemployed/Retired*). The marital status of participants were married, divorced, widowed, separated, never married, or a member of an unmarried couple. This variable was dichotomized into *Married* (Married, Living as married) and *Unmarried* (Divorced, Widowed, Separated, Never married). To determine participants' health insurance status, we used the item “Do you have any kind of health care coverage, including health insurance, prepaid plans such as HMOs, or government plans such as Medicare?” (*yes/no*). Participants were also asked “Is there a particular doctor, nurse, or other health professional that you see most often?” (*yes/no*). To assess whether men knew that HPV could be sexually transmitted, an item asked “Do you think that HPV is a sexually transmitted disease (STD)?” (yes/no).

2.3. Analysis plan

Modal imputation was used to address missing data for dichotomous and categorical variables. Mean imputation was used to address missing data in continuous variables. The analyses for this study proceeded in two steps. First, Chi-square tests were used to assess bivariate differences between men who have heard of HPV and those who had not by race/ethnicity, and differences between men who have heard of the HPV vaccine and those who had not by race/ethnicity. Secondly, binomial logistic regression analyses were performed for having heard of HPV and having heard of HPV vaccination (shown in Tables 3 and 4, respectively). Model 1 shows only the control variables and the dependent variable. In model 2, race/ethnicity was added to the model and in model 3 trust of cancer information from the doctor was included in the model without the race/ethnicity variables. Lastly, model 4 is the full model. The models were compared using Akaike's Information Criterion (AIC) statistic for best model fit. Due to high collinearity between the dependent variable (Have you ever heard of HPV) and the independent variable (Do you think that HPV is a sexually transmitted disease), the latter was not included in the binomial logistic regression models. The data were managed and analyses were conducted using SPSS version 18.0.

3. Results

3.1. Univariate/bivariate results

Descriptive statistics are shown in Table 1. The mean age of the sample was 56.79 years (SD = 15.43). Most of the men in the sample were insured (91%), White (70%), and married or in a married-like relationship (61%). Most had college/post graduate education (43%), were employed (51%), and had a household income of $35, 000–$74,999 (32%). In addition, most of the sample indicated that they had a regular health provider (71%). However, 33% did not have knowledge that HPV was a sexually transmitted disease, 51% had never heard of HPV, and 53% were not aware of the HPV vaccine.

Table 2 shows the descriptive statistics by race/ethnicity, HPV knowledge, and level of trust of cancer information from a doctor.

White men (76.1%) were most likely to have a regular provider ($p < 0.001$), and to have heard of the HPV vaccine (50.1%) ($p < 0.001$). Black men (45.2%) were the least likely to know that HPV is transmitted sexually ($p < 0.001$) and both Black (35.3%) and Hispanic men (34.3%) were less likely to have heard of the HPV vaccine compared to White men ($p < 0.001$).

With respect to the level of trust, Hispanic men (58.6%) were the least likely to trust information about cancer from a doctor. Men who had some or a lot of trust in cancer information from a doctor were more likely to have heard of the HPV vaccine, married, insured, have a regular provider, have a college or higher education, and have an income of 100,000 or more compared to men who did not trust cancer information from a doctor a little or not at all ($p < 0.001$). Additionally, men who were retired and men whose income was $35,000–$74,000 were more likely to trust information about cancer from doctors a lot. Men who were not employed, had a high school education or less, and low-income were more likely to not trust information about cancer from a doctor at all or a little.

3.2. Binomial logistic regression analyses

Table 3 shows the results from binomial logistic regression analyses for predicting having heard of HPV. Models 1 and 2 with only the control variables and race/ethnicity, respectively, are similar in variables that are significant in predicting having heard of HPV. Having a regular provider, at least some college/post high school training, a household income of $100,000 or more, ages 9– 27 in the home, and mean age were all predictive of having heard of HPV. In Model 3, having a regular provider was no longer significant suggesting that the level of trust in information from the doctor modified having a regular provider. In addition, the AIC shows that this model is better than Model 1. Model 4, the full model, proved to be the best fit of all the models according to the AIC. Men who had some college/post high school training and college/post graduate had 43.8% and 97.6% higher odds, respectively, of having heard of HPV than men with a high school or less education. Men who lived in households with an income of $100,000 or more had 71.4% higher odds than men who lived in households with income less than $34,999, and men who lived with family member(s) between ages 9 and 27 had 33.9% higher odds of having heard of HPV.

Table 4 shows the results from a binomial logistic regression analyses for predicting having heard of the HPV vaccine. Model 2 shows that Black men had 34.8% less odds and Hispanic men had 43.6% less odds of hearing heard of the HPV vaccine than White men. This was a better fit model than model 1 according to the AIC statistic. Model 3 shows that when including the “trust of cancer information from the doctor” variable, the model was similar to model 1 and less parsimonious. Model 4, the full model, was the best fit model, according to the AIC statistic. This model shows that when controlling for demographic variables, insurance status, and having a regular provider, Black and Hispanic men are 35% and 43%, respectively, less likely to have heard of the HPV vaccination.

4. Discussion

This study demonstrated findings that are similar to other studies indicating that men have low levels of knowledge and awareness about HPV and the HPV vaccine [23–25]. These studies indicated that, overall, men have not heard of HPV, particularly men of minority ethnic groups. About half of the men (49%) heard about HPV and 45% lacked awareness of the HPV vaccine. The current study extends the literature by highlighting the disparities in knowledge about (1) HPV among a cohort of solely men (2) disparities in knowledge about the HPV vaccine by race/ethnicity, and (3) the level of trust these men have in cancer information from physicians. Analyses showed that White men had greater odds of having heard of the HPV vaccine and knowing that HPV is transferred through sexual activity when compared to Black and Hispanic men.

While this study represented analysis identifying noteworthy racial/ethnic disparities, more attention on increasing the HPV knowledge and awareness of specific sub-groups, such as male sexual minorities and HIV-infected men, is vital, representing other layers of identity that are often underrepresented in awareness, prevention and knowledge promotion strategies. Other potential subgroups of men who may be at increased risk of HPV infection and perceived to be “low risk” include men who were married early, newly divorced men who are dating again, men who have had few partners, or men who use contraception regularly. Awareness of HPV and the HPV vaccine ultimately contribute to uptake of the HPV vaccine [26]. It is imperative to revise the messaging around HPV vaccination. HPV research largely focuses on cervical cancer prevention through HPV vaccination, essentially feminizes HPV [10,27] and erroneously characterizes HPV as an infection that do not effect men who have sex with men (MSM) or men who have sex with women only (MSW) [28,29]. MSM are at an increased risk of developing anal cancer from HPV infection and have poorer knowledge about HPV compared to women [24,30,31]. Furthermore, MSW are less knowledgeable about HPV than MSM [32]. Emerging research examining the benefits of HPV vaccine in adult males further emphasizes the significance of prioritizing related dissemination and awareness strategies for this population [33]. Other investigations, however, indicate that Black and Hispanic adolescent males and their parents place more importance on HPV vaccinations compared to White adolescent males and their parents [34,35]. Due to the well-recognized burden of health disparities that exist in HPV-associated cancers and uncompromised access to cancer screening and prevention services later in life particularly among racial and ethnic minorities, primary prevention, like the vaccine, is critical [4].

Results of this study demonstrate that racial and ethnic minority men represent unique priority populations for increased awareness and intervention towards HPV vaccination. The differences in HPV knowledge may be a result of Black and Hispanic men lacking a regular provider that may inform them about HPV. The disparity in HPV knowledge may also be due to the level of trust of information from physicians. Analysis in this study indicated that Hispanic men were the least trusting of information about cancer from physicians. The lack of trust in providers expressed by older Hispanic men may be a critical issue for their own health but it may also deter relaying HPV-related information to younger males.

Other studies have shown a lack of trust in physicians among Black men as well [36,37] which may lead to a lack of trust in medical information and medical non adherence. This study suggests that an increase in provider recommendations, through culturally tailored strategies may increase HPV vaccinations among men.

Given that men generally lacked knowledge about HPV and lacked trust in information from physicians, other culturally appropriate avenues to increase HPV knowledge and awareness for this group should be explored. Though the recommended age for HPV vaccination is between ages 9 and 27, the lack of knowledge about HPV and HPV vaccine among males of all ages is an issue that may perpetuate a recurring cycle of increased risk for HPV infection. In this study, Black and Hispanic men were more likely to live with someone who was between the recommended ages. Educating male parents about HPV vaccine increases the likelihood of early vaccination [34,38] among Blacks and Latinos, and people that discuss vaccinations within social networks have been linked to an increase in the likelihood to make the decision to receive vaccination [35]. Therefore, the onus for disseminating HPV information should not be only on the provider. Men who are above the recommended age may be in a unique and significant position to optimize awareness of risks and increase vaccinations.

Health organizations and institutions should partner with community organizations and community leaders to assist in community-based participatory research to disseminate information about HPV infection prevention that is racially, culturally, age, and gender appropriate to address HPV knowledge and vaccination adherence disparities [39]. Interventions that involve both clinical and non-clinical community linkages may be a cost-effective way to build trusting relationships between men in the community, providers and other health professionals. Community health workers may also be a conduit for HPV vaccine information, however it would be important to have providers willing to partner to ensure that the proper information and messages are delivered to prioritized communities and to enhance trust between providers and potential patients.

4.1. Limitations

This study has acknowledged limitations that should be addressed in subsequent studies. First, this is a cross-sectional study, which is only a snapshot of the sample population. Therefore, while the study showed the association between the independent variables and the dependent variables, a causal relationship could not be confirmed. Second, the data collected was self-reported. Racial/ethnic groups have been found to have respondent bias (i.e. social desirability) resulting in an analysis that is less accurate [40]. Additionally, the number of Black and Hispanic men in the sample was relatively low compared to White men. Literature indicates differences in HPV associated cancers among MSM and MSW, however, the HINTS dataset did not ask about sexual orientation. Therefore, possible differences in knowledge about HPV and HPV vaccine by sexual orientation could not be measured. HPV vaccine is a recent prophylactic made available and recommended to males. With continued research and HPV vaccine education, it is possible that men in this 2014 dataset may have a lower level of awareness than men have today. Finally, the sample for this study had a higher education and income level than the national average, which may skew the findings in a direction that is more favorable with respect to HPV and vaccination knowledge and trust of cancer information from a physician.

5. Conclusion

HPV knowledge and awareness should be increased among males to decrease the risk of infection that may lead to the development of HPV-related cancers. Specifically, Black and Hispanic men are less aware than White men about HPV and HPV vaccination, setting the stage for health disparities. Higher levels of distrust of information from physicians among Hispanic men and Black and Hispanic men's lack of a regular health provider indicate that community-based educational methods should be used.

Acknowledgments

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for profit sectors.

This research used data from the Health Information National Trends Survey from the National Institutes of Health. This project was supported through research infrastructure grants including the Centers for Disease Control and Prevention (CDC) Health Promotion and Disease Prevention Research Center (Grant # 1U58DP005945-01), the National Institute on Minority Health and Health Disparities (NIMHHD) (Grant #S21MD000101) and the National Center for Advancing Translational Sciences of the National Institutes of Health under Award Number

UL1TR000454. The content is solely the responsibility of the authors and does not necessarily represent the official views of the NIMHHD, NCATS, NIH or the CDC.

Thanks to Dr. Assia Miller, McKing Consultants' statistician, for comments and suggestions in the development of this manuscript.

References

1. Satterwhite CL, Torrone E, Meites E, et al. Sexually transmitted infections among US women and men: prevalence and incidence estimates, 2008. Sex Transm Dis. 2013; 40(3):187–93. [PubMed: 23403598]
2. Viens LJ, Henley SJ, Watson M, et al. Human papillomavirus-associated cancers – United States, 2008–2012. MMWR Morb Mortal Wkly Rep. 2016; 65(26):661–6. [PubMed: 27387669]
3. Jemal A, Simard EP, Dorell C, et al. Annual report to the nation on the status of cancer, 1975–2009, featuring the burden and trends in human papillomavirus (HPV)-associated cancers and HPV vaccination coverage levels. J Natl Cancer Inst. 2013; 105(3):175–201. [PubMed: 23297039]
4. Burger EA, Lee K, Saraiya M, et al. Racial and ethnic disparities in human papillomavirus-associated cancer burden with first-generation and second-generation human papillomavirus vaccines. Cancer. 2016; 122(13):2057–66. [PubMed: 27124396]
5. Daley EM, Marhefka S, Buhi E, et al. Ethnic and racial differences in HPV knowledge and vaccine intentions among men receiving HPV test results. Vaccine. 2011; 29(23):4013–8. [PubMed: 21459176]
6. Fenkl EA, Schochet E, Jones SG, da Costa BR. Evaluation of an HPV/anal cancer screening awareness program for HIV-infected men who have sex with men. J Assoc Nurses AIDS Care: JANAC. 2015; 26(4):492–7. [PubMed: 25682353]
7. Fenkl EA, Jones SG, Schochet E, Johnson P. HPV and anal cancer knowledge among HIV-infected and non-infected men who have sex with men. LGBT Health. 2015
8. Brewer NT, Fazekas KI. Predictors of HPV vaccine acceptability: a theory-informed, systematic review. Prev Med. 2007; 45(2–3):107–14. [PubMed: 17628649]
9. Daniel-Ulloa J, Gilbert PA, Parker EA. Human papillomavirus vaccination in the United States: uneven uptake by gender, race/ethnicity, and sexual orientation. Am J Public Health. 2016; 106(4): 746–7. [PubMed: 26890185]
10. Newman PA, Logie CH, Doukas N, Asakura K. HPV vaccine acceptability among men: a systematic review and meta-analysis. Sex Transm Infect. 2013; 89(7):568–74. [PubMed: 23828943]
11. Petaja T, Keranen H, Karppa T, et al. Immunogenicity and safety of human papillomavirus (HPV)-16/18 AS04-adjuvanted vaccine in healthy boys aged 10–18 years. J Adol Health Off Publ Soc Adoles Med. 2009; 44(1):33–40.
12. Radisic G, Chapman J, Flight I, Wilson C. Factors associated with parents' attitudes to the HPV vaccination of their adolescent sons: a systematic review. Prev Med. 2017; 95:26–37. [PubMed: 27932052]
13. Voss DS, Wofford LG. Human papillomavirus vaccine uptake in adolescent boys: an evidence review. Worldviews Evidence-Based Nursing. 2016; 13(5):390–5.
14. Joseph NP, Shea K, Porter CL, et al. Factors associated with human papillomavirus vaccine acceptance among Haitian and African-American parents of adolescent sons. J Natl Med Assoc. 2015; 107(2):80–8. [PubMed: 27269494]
15. Tisi G, Salinaro F, Apostoli P, et al. HPV vaccination acceptability in young boys. Ann dell'Istituto superiore di sanita. 2013; 49(3):286–91.
16. Mortensen GL. Parental attitudes towards vaccinating sons with human papillomavirus vaccine. Dan Med Bull. 2010; 57(12):A4230. [PubMed: 21122463]
17. Gilkey MB, Moss JL, Coyne-Beasley T, Hall ME, Shah PD, Brewer NT. Physician communication about adolescent vaccination: how is human papillomavirus vaccine different? Prev Med. 2015; 77:181–5. [PubMed: 26051197]

18. Perkins RB, Clark JA. What affects human papillomavirus vaccination rates? A qualitative analysis of providers' perceptions. Women's Health Issues Off Publ Jacobs Inst Women's Health. 2012; 22(4):e379–86.
19. Gilkey MB, Moss JL, McRee AL, Brewer NT. Do correlates of HPV vaccine initiation differ between adolescent boys and girls? Vaccine. 2012; 30(41):5928–34. [PubMed: 22841973]
20. Richardson A, Allen JA, Xiao H, Vallone D. Effects of race/ethnicity and socioeconomic status on health information-seeking, confidence, and trust. J Health Care Poor Underserved. 2012; 23(4): 1477–93. [PubMed: 23698662]
21. Gerend MA, Madkins K, Phillips G, Mustanski B. Predictors of human papillomavirus vaccination among young men who have sex with men. Sex Transm Dis. 2016; 43(3):185–91. [PubMed: 26859806]
22. Thomas TL, Stephens DP, Johnson-Mallard V, Higgins M. Young hispanic men and human papillomavirus vaccination choices. J Transcultural Nursing Off J Transcultural Nursing Society/ Transcultural Nursing Soc. 2016; 27(2):103–8.
23. Marlow LA, Zimet GD, McCaffery KJ, Ostini R, Waller J. Knowledge of human papillomavirus (HPV) and HPV vaccination: an international comparison. Vaccine. 2013; 31(5):763–9. [PubMed: 23246310]
24. Reimer RA, Schommer JA, Houlihan AE, Gerrard M. Ethnic and gender differences in HPV knowledge, awareness, and vaccine acceptability among White and Hispanic men and women. J Community Health. 2014; 39(2):274–84. [PubMed: 24150246]
25. Blake KD, Ottenbacher AJ, Finney Rutten LJ, et al. Predictors of human papillomavirus awareness and knowledge in 2013: gaps and opportunities for targeted communication strategies. Am J Prev Med. 2015; 48(4):402–10. [PubMed: 25700651]
26. 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(5):426–31. [PubMed: 19100762]
27. Liddon N, Hood J, Wynn BA, Markowitz MD. Acceptability of human papillomavirus vaccine for males: a review of the literature. J Adolesc Health. 2010; 46(2):113–23. [PubMed: 20113917]
28. Dahlstrom KR, Burchell AN, Ramanakumar AV, et al. Sexual transmission of oral human papillomavirus infection among men. Cancer Epidemiol Biomarkers Prevent: Publ Am Assoc Cancer Res Cosponsored Am Soc Prevent Oncol. 2014; 23(12):2959–64.
29. Grabowski MK, Kong X, Gray RH, et al. Partner human papillomavirus viral load and incident human papillomavirus detection in heterosexual couples. J Infect Dis. 2016; 213(6):948–56. [PubMed: 26597261]
30. Wheldon CW, Daley EM, Buhi ER, Nyitray AG, Giuliano AR. Health beliefs and attitudes associated with HPV vaccine intention among young gay and bisexual men in the Southeastern United States. Vaccine. 2011; 29(45):8060–5. [PubMed: 21864615]
31. Nadarzynski T, Smith H, Richardson D, Jones CJ, Llewellyn CD. Human papillomavirus and vaccine-related perceptions among men who have sex with men: a systematic review. Sex Transm Infect. 2014; 90(7):515–23. [PubMed: 24787367]
32. Gutierrez B Jr, Leung A, Jones KT, et al. Acceptability of the human papillomavirus vaccine among urban adolescent males. Am J Men's Health. 2013; 7(1):27–36. [PubMed: 22892147]
33. Makiyama K, Hirai R, Matsuzaki H. Gardasil vaccination for recurrent laryngeal papillomatosis in adult men: first report: changes in HPV antibody titer. J Voice Off J Voice Found. 2016
34. Galbraith KV, Lechuga J, Jenerette CM, Moore LA, Palmer MH, Hamilton JB. Parental acceptance and uptake of the HPV vaccine among African-Americans and Latinos in the United States: a literature review. Soc Sci Med. 1982; 2016(159):116–26.
35. Perez S, Shapiro GK, Brown CA, Dube E, Ogilvie G, Rosberger Z. ‘I didn't even know boys could get the vaccine’: parents' reasons for human papillomavirus (HPV) vaccination decision making for their sons. Psycho-Oncol. 2015
36. Carpenter WR, Godley PA, Clark JA, et al. Racial differences in trust and regular source of patient care and the implications for prostate cancer screening use. Cancer. 2009; 115(21):5048–59. [PubMed: 19637357]

37. Kennedy BR, Mathis CC, Woods AK. African Americans and their distrust of the health care system: healthcare for diverse populations. J Cultur Divers. 2007; 14(2):56–60.

38. Parker AM, Vardavas R, Marcum CS, Gidengil CA. Conscious consideration of herd immunity in influenza vaccination decisions. Am J Prev Med. 2013; 45(1):118–21. [PubMed: 23790997]

39. Halbert CH, Weathers B, Delmoor E, et al. Racial differences in medical mistrust among men diagnosed with prostate cancer. Cancer. 2009; 115(11):2553–61. [PubMed: 19296516]

40. Burgess DJ, Powell AA, Griffin JM, Partin MR. Race and the validity of self-reported cancer screening behaviors: development of a conceptual model. Prev Med. 2009; 48(2):99–107. [PubMed: 19118570]

Table 1

Descriptive statistics

	Mean/proportion	Standard deviation	Minimum	Maximum
Dependent variables				
Heard of HPV	0.49	–	0	1
Have not heard of HPV	0.50	–	0	1
Aware of HPV vaccine	0.45	–	0	1
Not aware of HPV vaccine	0.53	–	0	1
Independent variables				
Trust Physician				
A little/not at all	0.07	–	0	1
Some	0.22	–	0	1
A lot	0.69	–	0	1
White non-Hispanic	0.70	–	0	1
White non-Hispanic	0.14	–	0	1
Hispanic	0.16	–	0	1
Control variables				
Insured	0.91	–	0	1
Not insured	0.09	–	0	1
Regular provider	0.71	–	0	1
No regular provider	0.27	–	0	1
Married	0.61	–	0	1
Not married	0.37	–	0	1
Employed	0.51	–	0	1
Not Employed	0.14	–	0	1
Retired	0.32	–	0	1
Income				
$0–34,999	0.30	–	0	1
$35,000–$74,999	0.32	–	0	1
$75,000–$99,999	0.13	–	0	1
$100,000 or more	0.24	–	0	1
High School or less	0.25	–	0	1
Some college/post high school training	0.32	–	0	1
College/post graduate	0.43	–	0	1
*Knows HPV is a STD	0.65	–	0	1
*Does not know HPV is a STD	0.33	–	0	1
Age 9–27 in home	0.37	–	0	1
Age 9–27 not in home	0.62	–	0	1
Age (continuous)	56.79	15.43	18	95

N = 1203.

*Note: indicates lower number of participants for the item (n = 594) due to a skip pattern within the questionnaire.

Table 2

Chi-square analyses, by race and level of trust of cancer information from doctor.

	Race/Ethnicity				Level of Trust				
		White(N = 838) Mean/%	Black(N = 167) Mean/%	Hispanic (N = 198) Mean/%	p-value	Not at all/ A little (N = 80)Mean/%	Some (N = 64) Mean/%	A lot(N = 859) Mean/%	p-value
Dependent variables									
Have heard of HPV	50.7	43.7	48.5	0.246	41.3	45.5	51.3	0.080	
Heard of HPV vaccine	50.1	35.3	34.3	**<0.001**	30.0	42.8	47.7	**0.006**	
Independent variables									
Trust information from doctor									
A lot	71.0	74.3	58.6	**<0.001**	–	–	100.0		
Some	22.2	16.8	25.3	0.001	–	100.0	–		
A little/Not at all	5.0	7.2	13.1	**<0.001**	100.0	–	–		
Race/Ethnicity									
Non-Hispanic White	–	–	100.0		52.5	70.5	71.0	0.003	
Non-Hispanic Black	–	100.0	–		15.0	10.6	14.8	0.219	
Hispanic	100.0	–	–		32.5	18.9	14.2	<0.001	
Control variables									
Knows HPV is an STD[a]	66.6	45.2	76.0	**<0.001**	33.3	33.3	32.7	0.937	
Married	64.3	43.7	62.1	**<0.001**	47.5	61.4	62.3	0.034	
Employment Status									
Employed	49.9	49.1	59.6	**0.040**	45.0	54.2	51.1	0.341	
Not Employed	10.7	26.3	17.2	**<0.001**	26.3	15.5	12.3	0.002	
Retired	37.4	19.2	19.7	**<0.001**	22.5	28.0	34.0	0.033	
Insured	93.6	83.8	84.8	**<0.001**	75.0	92.4	91.7	<0.001	
Have a regular provider	76.1	66.5	55.6	**<0.001**	42.5	62.9	76.7	<0.001	
Education									
High School Graduate or less	20.8	31.7	36.9	**<0.001**	43.8	25.4	23.1	<0.001	
Some college/post high school training	30.2	34.1	35.9	0.232	31.3	33.7	31.1	0.722	
College/post graduate	48.3	34.1	25.3	**<0.001**	21.3	40.2	45.3	<0.001	

	Race/Ethnicity				Level of Trust				
		White(N = 838) Mean/%	Black(N = 167) Mean/%	Hispanic (N = 198) Mean/%	p-value	Not at all/ A little (N = 80)Mean/%	Some (N = 64) Mean/%	A lot(N = 859) Mean/%	p-value
Income									
$0–34,999	24.5	45.5	42.9	**<0.001**	52.5	33.3	27.5	<0.001	
$35,000–$74,999	31.6	34.7	32.8	0.722	23.8	26.5	34.8	0.010	
$75,000–$99,999	14.4	8.4	10.6	0.058	8.8	12.5	13.5	0.465	
$100,000 or more	29.5	11.4	13.6	**<0.001**	10.0	26.9	23.6	0.007	
Age 9–27 in home	30.7	49.1	53.0	**<0.001**	46.3	35.2	36.6	0.186	
Age	54.0	58.6	51.6	**<0.001**	55.0	56.8	57.0	0.549	
	(SD = 14.04)	(SD = 5.30)	(SD = 15.65)		(SD = 16.32)	(SD = 14.95)	(SD = 15.49)		

NOTES: bold denotes statistical significance at p = 0.05 using chi-squared tests for dichotomous variables and ANOVA for continuous variables. Tests are between differences between racial/ethnic groups.

[a]Indicates lower number of participants for the item (n = 594) due to a skip pattern within the questionnaire.

Table 3

Binomial logistic regression models predicting having heard of HPV.

	Model 1		Model 2 (race/ethnicty included)		Model 3 (trust variable included)		Model 4 (full model)	
	OR (95% CI)	**p-value**	**OR (95% CI)**	**p-value**	**OR (95% CI)**	**p-value**	**OR (95% CI)**	**p-value**
Study variables								
Trust information from doctor[a]								
Some					1.041 (0.631, 1.716)	0.876	1.04 (0.630, 1.717)	0.879
A lot					1.314 (0.834, 2.072)	0.240	1.33 (0.842, 2.103)	0.222
Race/ethnicity[b]								
Black			0.776 (0.537, 1.122)	0.178			0.762 (0.527, 1.103)	0.150
Hispanic			0.955 (0.672, 1.359)	0.800			0.977 (0.686, 1.393)	0.898
Control variables								
Insured[c]	1.486 (.955, 2.314)	0.079	1.467 (0.942, 2.284)	0.090	1.478 (0.947, 2.307)	0.085	1.458 (0.934, 2.275)	0.097
Married[d]	0.899 (0.684, 1.181)	0.443	0.888 (0.674, 1.168)	0.395	0.901 (0.686, 1.184)	0.455	0.888 (0.674, 1.168)	0.395
Regular provider[e]	**1.352 (1.011, 1.808)**	**0.042**	**1.350 (1.008, 1.807)**	**0.044**	1.294 (0.963, 1.737)	0.087	1.291 (0.960, 1.735)	0.091
Employed[f]	1.266 (0.873, 1.838)	0.214	1.242 (0.855, 1.804)	0.256	1.255 (0.864, 1.823)	0.234	1.227 (0.843, 1.785)	0.285
Retired[f]	1.145 (0.749, 1.752)	0.531	1.108 (0.723, 1.699)	0.637	1.119 (0.730, 1.713)	0.606	1.078 (0.702, 1.656)	0.731
Education								
Some college/post high school training[g]	**1.448 (1.043, 2.009)**	**0.027**	**1.446 (1.041, 2.008)**	**0.028**	**1.439 (1.036, 1.999)**	**0.030**	**1.438 (1.034, 1.999)**	**0.031**
College/post graduate[g]	**2.004 (1.439, 2.791)**	**<0.001**	**1.997 (1.431, 2.788)**	**<0.001**	**1.979 (1.420, 2.759)**	**<0.001**	**1.976 (1.415, 2.761)**	**<0.001**
Income								
$35,000–$74,999	1.209 (0.872, 1.676)	0.255	1.201 (0.866, 1.667)	0.273	1.177 (0.848, 1.635)	0.330	1.17 (0.842, 1.627)	0.349
$75,000-$99,999[h]	1.275 (0.825, 1.969)	0.274	1.247 (0.804, 1.932)	0.324	1.255 (0.811, 1.941)	0.308	1.228 (0.791, 1.905)	0.360
$100,000 or more[h]	**1.774 (1.187, 2.652)**	**0.005**	**1.722 (1.145, 2.592)**	**0.009**	**1.762 (1.177, 2.637)**	**0.006**	**1.714 (1.137, 2.582)**	**0.010**
Age 9–27 in home[i]	**1.313 (1.001, 1.724)**	**0.049**	**1.344 (1.020, 1.770)**	**0.036**	1.308 (0.996, 1.718)	0.053	**1.338 (1.015, 1.763)**	**0.039**
Age	**0.970 (0.959, 0.981)**	**<0.001**	**.970 (0.959, 0.981)**	**<0.001**	**.970 (0.959, 0.981)**	**<0.001**	**0.970 (0.959, 0.981)**	**<0.001**
Intercept	1.349		1.479		1.153		1.252	
AIC	1548.504		1550.674		1521.316		1519.183	

NOTES: N = 1203. Reference categories are

[a]Not at all/A little.

[b]Non-Hispanic white.

[c]Not insured.

[d]Not married.

[e]No regular provider.

[f]Not employed.

[g]High school or less.

[h]$0–$34,999.

[i]Age 9–27 not in home The coefficients are odds ratios.

Table 4

Binomial Logistic Regression Models Predicting Having Heard of the HPV Vaccination.

	Model 1		Model 2 (race/ethnicty included)		Model 3 (trust variable included)		Model 4 (full model)	
	OR (95% CI)	**p-value**	**OR (95% CI)**	**p-value**	**OR (95% CI)**	**p-value**	**OR (95% CI)**	**p-value**
Study variables								
Trust information from doctor[a]								
Some					1.159 (0.678, 1.981)	0.589	1.126 (0.656, 1.935)	0.666
A lot					1.319 (0.808, 2.151)	0.268	1.280 (0.779, 2.102)	0.330
Race/ethnicity[b]								
Black			**0.652 (0.443, 0.959)**	**0.030**			**0.645 (0.438, 0.950)**	**0.026**
Hispanic			**0.564 (0.388, 0.819)**	**0.003**			**0.572 (0.393, 0.832)**	**0.004**
Control variables								
Insured[c]	**1.812 (1.116, 2.942)**	**0.016**	**1.769 (1.085, 2.884)**	**0.022**	**1.789 (1.100, 2.911)**	**0.019**	**1.751 (1.073, 2.859)**	**0.025**
Married[d]	0.911 (0.687, 1.207)	0.515	0.918 (0.690, 1.221)	0.556	0.912 (0.688, 1.209)	0.521	0.918 (0.690, 1.220)	0.555
Regular provider[e]	**1.732 (1.278, 2.346)**	**<0.001**	**1.687 (1.243, 2.290)**	**0.001**	**1.684 (1.239, 2.289)**	**0.001**	**1.643 (1.207, 2.238)**	**0.002**
Employed[f]	**1.779 (1.194, 2.651)**	**0.005**	**1.756 (1.174, 2.625)**	**0.006**	**1.768 (1.186, 2.635)**	**0.005**	**1.743 (1.165, 2.607)**	**0.007**
Retired[f]	**2.113 (1.336, 3.343)**	**0.001**	**2.004 (1.261, 3.183)**	**0.003**	**2.087 (1.318, 3.306)**	**0.002**	**1.975 (1.242, 3.142)**	**0.004**
Education								
Some college/post high school training[g]	**1.696 (1.201, 2.396)**	**0.003**	**1.667 (1.178, 2.358)**	**0.004**	**1.681 (1.189, 2.376)**	**0.003**	**1.654 (1.168, 2.343)**	**0.005**
College/post graduate[g]	**1.936 (1.372, 2.733)**	**<0.001**	**1.845 (1.302, 2.614)**	**0.001**	**1.913 (1.355, 2.703)**	**<0.001**	**1.827 (1.289, 2.590)**	**0.001**
Income								
$35,000–$74,999	**1.612 (1.148, 2.263)**	**0.006**	**1.545 (1.097, 2.175)**	**0.013**	**1.579 (1.123, 2.220)**	**0.009**	**1.518 (1.077, 2.141)**	**0.017**
$75,000-$99,999[h]	**2.010 (1.291, 3.127)**	**0.002**	**1.848 (1.181, 2.891)**	**0.007**	**1.983 (1.273, 3.088)**	**0.002**	**1.829 (1.168, 2.863)**	**0.008**
$100,000 or more[h]	**2.862 (1.894, 4.325)**	**<0.001**	**2.532 (1.663, 3.855)**	**<0.001**	**2.835 (1.874, 4.288)**	**<0.001**	**2.517 (1.652, 3.835)**	**<0.001**
Age 9–27 in home[i]	1.174 (0.886, 1.556)	0.264	1.259 (0.945, 1.678)	0.116	1.172 (0.884, 1.553)	0.270	1.256 (0.952, 1.675)	0.119
Age	**0.964 (0.953, 0.976)**	**<0.001**	**.963 (0.952, 0.974)**	**<0.001**	**.965 (0.954, 0.976)**	**<0.001**	**0.963 (0.952, 0.975)**	**<0.001**
Intercept	0.562	0.158	0.796	0.590	0.468	0.091	0.674	0.398
AIC	1458.236		1452.096		1460.629		1424.735	

NOTES: N = 1203. Reference categories are.

[a] Not at all/A little.

[b] Non-Hispanic white.

[c] Not insured.

[d] Not married.

[e] No regular provider.

[f] Not employed.

[g] High school or less.

[h] $0–$34,999.

[i] Age 9–27 not in home The coefficients are odds ratios.