Published in final edited form as:

J Health Commun. 2009 June ; 14(4): 331–345. doi:10.1080/10810730902873067.

Knowledge of Human Papillomavirus:

Differences by Self-reported Treatment for Genital Warts and Sociodemographic

Characteristics

Jill Koshiol^a, Lila Finney-Rutten^b, Richard P. Moser^c, and Nicola Hesse^d

^aCancer Prevention Fellowship Program, Office of Preventive Oncology and Genetic Epidemiology Branch, National Cancer Institute, National Institutes of Health, Bethesda, Maryland ^bHealth Communication and Informatics Research Branch, Behavioral Research Program, Division of Cancer Control and Population Science, National Cancer Institute, Bethesda, Maryland ^cBehavioral Research Program, Division of Cancer Control and Population Science, National Cancer Institute, Bethesda, Maryland ^dFranklin Square Hospital Center, Baltimore, Maryland

Abstract

The aim of this study was to evaluate knowledge about human papillomavirus (HPV) in individuals with genital warts compared to women from the general population without genital warts. HPV knowledge among women reporting treatment for genital warts was compared to HPV knowledge in women reporting no treatment was assessed using data from the population-based 2005 Health Information National Trends Survey. Three percent (N=97) of women answered “yes” and 97% (N=3450) “no” to “Have you ever been treated for venereal warts or condyloma?” Women who reported treatment for genital warts were more likely to have heard of HPV (Odds ratio (OR): 2.4, 95% confidence interval (CI): 1.4-4.2 vs. no or don’t know), to have been told they had HPV (OR: 24.5, 95% CI: 11.4-52.8), and to have accurate information about HPV, such as HPV causes cancer (OR: 2.7, 95% CI: 1.8-4.3). However, a large proportion (41%) of women who reported treatment for genital warts had not heard of HPV. These women tended to be older, poorer, less educated, non-Hispanic black, less likely to have had a recent Pap test, and divorced, widowed, or separated. Women with genital warts are learning about HPV, but socioeconomically disadvantaged groups may need to be targeted.

Keywords

Human papillomavirus; knowledge; genital warts

Introduction

Human papillomavirus (HPV) is becoming more predominate in the public eye due to media reporting on HPV vaccines and DNA testing and due to direct-to-consumer marketing campaigns, such as the “Tell Someone” campaign sponsored by Merck & Co., Inc. (Whitehouse Station, NJ). In this environment, the general public’s knowledge about HPV is constantly changing. To determine whether changes in knowledge about HPV are associated with changes in screening or other behaviors, it is essential to assess the general population’s baseline understanding of HPV, prior to the main influx of media attention and information

campaigns. Clearly establishing the baseline level of knowledge will set the stage for future studies of the impact of changing HPV knowledge.

Individuals diagnosed with genital warts have a “teachable moment” with regard to HPV. Genital warts patients are infected by noncarcinogenic types of HPV, especially types 6 and 11, and may also be infected with carcinogenic HPV types (Lacey, Lowndes, & Shah, 2006). The infectious nature of HPV is a key piece of information for these patients, given estimates that genital warts develop in approximately two-thirds of those who have sexual contact with individuals having genital warts (Oriel, 1971; 2006). Although the prevalence of genital warts in U.S. adults is commonly estimated at 1% (Koutsky, 1997), population- and claims-based data suggest that the prevalence and incidence of genital warts are increasing (Chuang, Perry, Kurland, & Ilstrup, 1984; Insinga, Dasbach, & Myers, 2003; Koshiol, St. Laurent, & Pimenta, 2004). Thus, individuals with genital warts comprise a growing population that may serve as a model for the teachable moment among HPV-infected individuals. Comparing baseline knowledge about HPV in genital warts patients to HPV knowledge in the general population could reveal useful information about the transmission of knowledge and existing gaps.

Although previous studies have evaluated psychosocial issues in patients with genital warts (Ward, Lowry, Houston, & Maw, 1994; Chandler, 1996), few have asked specifically about HPV. One study of women attending a well woman clinic in London found that subjects with a history of genital warts were more likely to have heard about HPV, but this study did not report on other HPV knowledge questions for this subgroup (Waller, McCaffery, Forrest, Szarewski, Cadman, & Wardle, 2003). A study of men and women attending a university health service or family practice clinics found that subjects with a previous diagnosis of HPV or genital warts had higher HPV knowledge than subjects without such a diagnosis, but the study did not report on subjects with genital warts alone, which is important since a key piece of information for genital warts patients is that they have been infected with HPV (Holcomb, Bailey, Crawford, & Ruffin, 2004). Another study of gay/bisexual men found that most men with genital warts did not know that they also had HPV infection (Tider, Parsons, & Bimbi, 2005) and a survey of women in a German city found that only two 22 women reporting genital warts knew they had been tested for HPV, and only one knew she was HPV positive (Klug, Hukelmann, & Blettner, 2007). Thus, genital warts patients seem to have large gaps in knowledge about HPV. While these studies provide a glimpse of the level of knowledge in genital warts patients, none of them provide detailed information for this teachable moment group, and generalizability is limited.

The 2005 Health Information National Trends Survey (HINTS 2005) provides an excellent opportunity to evaluate genital warts and baseline HPV knowledge in a national sample. Data on HPV knowledge were collected from women in the general U.S. population. Although Digene was marketing its HPV test when HINTS 2005 was conducted, HINTS 2005 was completed prior to the initiation of the Merck “Make the Connection” and “Tell Someone” HPV informational campaigns in the fall of 2005 and spring of 2006, respectively (CBS News, 2006; The Henry J. Kaiser Family Foundation, 2006). Thus, HINTS 2005 describes the level of HPV knowledge in the general population prior to the largest influx of media attention. Approximately 40% of women in HINTS 2005 had heard of HPV (Tiro, Meissner, Kobrin, & Chollette, 2007), which is somewhat higher than, though similar to, the 15-31% found in a recent review of earlier studies of women of all ages (Klug et al., 2007). However, HINTS 2005 also asked about treatment for genital warts, allowing evaluation of HPV knowledge in women with a teachable moment due to genital warts by comparing HPV knowledge in women reporting treatment for HPV to women in the general population reporting no treatment and assessing factors associated with lack of knowledge about HPV among women reporting treatment for genital warts.

Method

HINTS is a biennial national survey conducted to assess how Americans find and use health information. Data collection for HINTS 2005 was initiated in February 2005 and continued through August 2005. The sample design was a random digit dial of all telephone exchanges in the United States, which were acquired through a purchased list. The survey was administered by trained interviewers to a representative sample of U.S. households and is available online at <http://hints.cancer.gov/instrument.jsp>. Within each household, one adult aged 18 or older was selected during a household screener for the extended interview. Complete interviews were conducted with 5491 adults. The final response rate for the household screener was 34.01% and the final response rate for the extended interview was 61.25%. More specific details about the sample and sampling design are reported elsewhere (<http://hints.cancer.gov/instrument.jsp> - see HINTS 2005 Final Report). HINTS 2005 was exempt from Internal Review Board review because the information collected is not sensitive and the risk to respondents from disclosure is minimal.

HPV knowledge items were included in the cervical cancer screening section of the survey. Thus, men were not asked about HPV in HINTS 2005. Of the 3,657 women included in HINTS 2005, 76 reported having cervical cancer and were excluded from the cervical screening section, and 34 additional women did not have yes/no data on genital warts (two refused, 16 don't know, and 16 non-responders). The final study population included 3,547 women.

Participants were asked a series of questions including "Have you ever been treated for venereal warts or condyloma?" For women patients reporting treatment for genital warts, knowing that they have HPV is a critical part of their knowledge about HPV. Thus, "Have you ever been told by a health care provider that you had HPV" was considered as an HPV knowledge question for this analysis. Additional questions about HPV knowledge included "Have you ever heard of HPV? HPV stands for Human Papillomavirus," and "Do you think that HPV..." "...causes cervical cancer," "...is a sexually transmitted disease," "...infection is rare," "...Will often go away on its own without treatment," "...can cause abnormal Pap smears," and "...can affect a woman's ability to get pregnant?"

HPV knowledge was categorized as accurate versus inaccurate. "Yes" was considered accurate and "No" or "Don't know" inaccurate for every question except "Do you think that HPV infection is rare?" and "Do you think that HPV can affect a woman's ability to get pregnant?." For these two questions, "No" was classified as accurate and "Yes" or "Don't know" as inaccurate, and thus were rephrased to "HPV is common" and "HPV does not affect ability to get pregnant" for the tables. Women who answered "No" (n=2,194) or "Don't know" (n=22) to "Have you ever heard of HPV?" were not asked additional HPV questions. Since these women had not heard of HPV or were unsure if they had heard of HPV, they were included in the inaccurate response category for the other HPV knowledge variables to maximize sample size. Excluding women who answered "No" or "Don't know" to having heard of HPV from analyses with the other HPV knowledge variables produced similar results.

The association between self-reported treatment for genital warts and each of the HPV knowledge variables was evaluated using SUDAAN (Research Triangle Institute, 2005) for weighted logistic regression to account for survey sampling design (see HINTS 2005 Final Report). Age, recent Pap test, education, race/ethnicity, income, marital Status, health insurance, and being born in the United States were evaluated as potential confounders. Confounding was considered important if removing a covariate changed the odds ratio (OR) for ever hearing of HPV by at least 10 percent compared with the full model. Only education met this criterion and was thus included in all models assessing genital warts and HPV knowledge. The precision of the ORs was evaluated by calculating confidence limit ratios

(CLR), the upper 95% confidence limit divided by the lower 95% confidence limit, where lower ratios indicate greater precision and thus less likelihood of being influenced by random error (Poole, 2001).

To assess factors associated with HPV knowledge in women with probable diagnosed HPV infection, ORs for sociodemographic characteristics and ever hearing of HPV were calculated in women reporting treatment for genital warts. Given the sparsity of the data, univariable logistic regression was used to avoid over-fitting the models. The results must be interpreted with caution since statistical power is limited in these analyses. For comparison, we also evaluated HPV knowledge in women reporting no treatment for genital warts.

Results

The median age in this study population was 53 (range: 18-96). Weighted to the U.S. population, 38% (95% CI: 37%-40%) of all women in the study population had heard of HPV. Nearly 3% (95% CI: 2%-3%, N=97) reported treatment for genital warts. Women who reported treatment for genital warts tended to be younger than women who did not but were similar by other demographic and socioeconomic characteristics (Table 1). Fifty-eight percent (95% CI: 46%-69%) of women reporting treatment for genital warts and 38% (95% CI: 36%-40%) of women reporting no treatment for genital warts had heard of HPV. Of the women reporting treatment for genital warts, 41% (95% CI: 31%-51%) (unweighted due to limited numbers) had never heard of or were unsure if they had heard of HPV (Table 2). Less than half of the women reporting genital warts treatment who had heard of HPV also reported being told that they had HPV (unweighted: 44%, 95% CI: 31%-57%). Similarly, less than half of the women reporting genital warts treatment knew that HPV causes cancer, is sexually transmitted, is common, and often goes away on its own without treatment. Of those women asked about HPV and pregnancy, the most common response was that HPV did affect their ability to get pregnant, regardless of genital warts status [unweighted: 68% (95% CI: 56%-81%) among women reporting treatment for genital warts, 58% (95% CI: 55%-60%) in all others].

Table 3 presents the ORs for accurate versus inaccurate knowledge of HPV in women reporting treatment for genital warts compared to women reporting no treatment for genital warts. All of the ORs are greater than 1.0, suggesting that women reporting treatment for genital warts know more about HPV than the women in the general population who report no treatment. Several ORs were quite unstable, as indicated by their large CLRs, but the estimates for knowing that HPV causes cancer (OR: 2.7, 95% CI: 1.8-4.3, CLR: 2.5) and that HPV is common (OR: 2.8, 95% CI: 1.7-4.7, CLR: 2.8) were fairly precise.

Table 4 summarizes univariate models for having heard of HPV among women reporting treatment for genital warts and among women no reporting treatment for genital warts. While these analyses are underpowered due to the small number of women who reported treatment for warts, the trends in Table 4 offer clues as to the factors that may be associated with knowledge or lack of knowledge about HPV in women reporting treatment for genital warts. For example, women with greater income seemed to be more likely to have heard of HPV (OR: 1.3, 95% CI: 0.27-6.1 and 4.0, 95% CI: 1.2-13.0 for \$25,000 - <\$50,000 and $\geq$ \$50,000 versus <\$25,000 per year, respectively). The trends were generally similar for women who did not report treatment for genital warts. Dissimilarities (e.g., among women born in the US) may reflect imprecision due to sparse data among women reporting treatment for genital warts.

Discussion

This study is one of the first to evaluate HPV knowledge in a group of women from the general population with self-reported genital warts. The findings suggest that even prior to the main

increase in media attention to HPV, women who had a “teachable moment” due to genital warts had greater HPV knowledge compared to women from the general population who did not have genital warts. However, notable gaps in knowledge exist, even among women with genital warts. These data establish the groundwork and baseline estimates for comparison in future studies of HPV knowledge. Future work may build on this foundation to assess changes in HPV knowledge with increased media attention. Future research may also examine the impact of knowledge on health behavior and cancer outcomes.

The response rates for HINTS 2005, while relatively low, are similar to other national telephone surveys (Nelson, Powell-Griner, Town, & Kovar, 2003). Estimates from HINTS 2005 are somewhat lower than those of other recent national surveys of HPV knowledge. For example, thirty-eight percent of women in HINTS 2005 (weighted to the U.S. population) reported ever hearing of HPV, compared to 49% in a national random sample telephone survey of 1,000 women in 2005 (ARHP, 2005) and 58% in an online survey of 2,604 men and women in 2006 (Cummings, 2006). The increase from 2005 to 2006 likely reflects increasing media exposure. Women reporting treatment for genital warts in HINTS 2005 were more likely to have heard of HPV than women in the general population who reported no treatment for genital warts (OR: 2.4, 95% CI: 1.4-4.2), similar to the association with genital warts in a population of well women clinic attendees (OR: 2.4, 95% CI: 3.6) (Waller et al., 2003). Women in HINTS 2005 who reported treatment for genital warts were also much more likely to know that they had had an HPV infection than women in the general population without genital warts. These results are consistent with a recent survey of U.S. health care providers, which found that clinicians were more likely to talk to patients about HPV if they were diagnosed with HPV through a positive HPV test result (Irwin et al., 2006).

Despite this higher reported knowledge in women reporting treatment for genital warts, many were not well informed about HPV. More than half of the women reporting treatment for genital warts did not know that they had had HPV infection, and few knew that HPV often goes away on its own. Many women also thought that HPV could affect their ability to get pregnant. This response may be understandable since women frequently ask whether HPV can be transmitted to a baby during pregnancy or delivery (Gilbert, Alexander, Grosshans, & Jolley, 2003; Anhang, Wright, Smock, & Goldie, 2004). Such concern is reasonable since vertical HPV transmission can lead to the development of recurrent respiratory papillomatosis (RRP), a benign but potentially fatal disease that may involve malignant transformation and requires many treatments to remove warty lesions from the upper airway (Stamataki, Nikolopoulos, Korres, Felekis, Tzangaroulakis, & Ferekidis, 2007). Maternal history of genital warts is associated with a 200-fold increased risk of RRP (Silverberg, Thorsen, Lindeberg, Grant, & Shah, 2003).

Gaps in knowledge about HPV were evident by sociodemographically-defined subgroups. Although data were sparse, women reporting treatment for genital warts who had not heard of HPV tended to be older, poorer, less educated, non-Hispanic black, less likely to have had a recent Pap test, and divorced, widowed, or separated. Women who did not report treatment for genital warts showed similar patterns. Some characteristics, such as old age, ethnic minority status, less education, and low income are associated with low health literacy (Akers, Newmann, & Smith, 2007), or a decreased ability to “obtain, process, and understand basic health information and services needed to make appropriate health decisions” (Selden, Zorn, Ratzan, & Parker, 2000). Patients with low health literacy may have a decreased ability to comprehend new information at the time of an HPV diagnosis. These patients are also less likely to have access to the internet or other mediums where they may increase their own knowledge. On the other hand, providers may be less likely to discuss complicated topics, such as HPV, with patients who they perceive as having a limited ability to understand. These disparity patterns are similar to those seen for barriers to Pap testing (Finney Rutten, Nelson,

& Meissner, 2004) and cervical cancer mortality (Akers et al., 2007) and may be used to guide efforts to raise public awareness if the findings are replicated in future studies.

It is possible that gaps in patient knowledge about HPV may reflect limited knowledge in health care providers themselves. Two recent surveys of U.S. clinicians found that only 33-40% overall knew that HPV could clear without medical intervention (Irwin et al., 2006; Jain et al., 2006), although obstetrician-gynecologists were much more likely to know that HPV clears spontaneously than physicians in family or internal medicine (67% versus 35% and 29%, respectively) (Irwin et al., 2006). While these studies found that nearly all physicians knew that persistent HPV infection increases the risk of cervical dysplasia and cancer (Irwin et al., 2006; Jain et al., 2006), a survey of 2,748 members of the American Academy of Family Physicians found that only 20% listed HPV as a risk factor for cervical cancer (Ruffin, 2003). Further, many clinicians are unaware that the HPV types that cause genital warts differ from those that cause cervical cancer (Henderson et al., 2007).

Thus, both patient and practitioner education may be warranted. Health education programs may need to target the needs of patients with low health literacy specifically. As determined by a Centers for Disease Control and Prevention (CDC) sponsored expert panel, effective media and outreach campaigns to disadvantaged and minority women may require cognitive testing, one-on-one interviews, or possibly in-home copy tests to establish cultural and language appropriateness (2005). Clinic-based interventions may be the most cost-effective way to target specific sub-populations, although general public education is also needed and may be better served by media campaigns, which typically have modest effects but could affect a large absolute number of individuals on a population level (Snyder, Hamilton, Mitchell, Kiwanuka-Tondo, Fleming-Milici, & Proctor, 2004). Provider education should focus not only on the key aspects of HPV infection (e.g., not all HPV types cause cancer, most infections clear spontaneously), but also on the most effective ways to communicate this information to patients. Because diagnosis with HPV often causes shock and distress, the physician must first address the patient's emotional state (Linnehan & Groce, 2000). After establishing an interpersonal relationship, the physician should employ active listening to determine what information should be given at that time and then communicate that information with minimal use of medical jargon (Finney Rutten et al., 2004). Immediately after providing the information, the physician should assess the patient's comprehension (Finney Rutten et al., 2004), as well as scheduling a follow-up visit at two weeks to address the patient's emotional and informational needs (Linnehan & Groce, 2000). The HINTS 2005 data suggest that providers may need to take particular care to apply these strategies to socioeconomically disadvantaged patients. The CDC has produced several materials and collected additional resources that may help educate both patients and providers (<http://www.cdc.gov/std/HPV/default.htm>).

This study was limited by the relatively small number of women reporting treatment for genital warts in HINTS 2005. This number may be an underestimate since it is based on self-reported treatment for warts, and some individuals with warts go undiagnosed (Koutsky & Kiviat, 1999). Even those who are diagnosed may not undergo treatment. For example, 10% of patients in a prior study of condyloma acuminatum declined treatment (Chuang et al., 1984). Women who chose to receive treatment for genital warts may have had more or less information than those who chose not to undergo treatment, which could have biased findings. There also may be confusion over the terms "venereal warts" and "condyloma" leading to either under-reporting if patients did not understand that these terms refer to genital warts, or over-reporting if participants confused other genital conditions, such as genital herpes (Mays, Zimet, Winston, Kee, Dickes, & Su, 2000), with genital warts. Further, HINTS 2005 did not ask whether a woman had ever had an abnormal Pap test or whether her last Pap result was abnormal. Thus, some of the women who did not report treatment for genital warts may have been diagnosed with HPV due to an abnormal Pap test, which could lead to attenuation of the results. Finally,

the association between genital warts and accurate reporting that HPV causes cervical cancer must be interpreted with caution since some women may believe that the HPV types that cause genital warts also cause cervical cancer (Baer, Allen, & Braun, 2000; Waller, McCaffery, Forrest, & Wardle, 2004). Even so, given that 24% of women attending a well woman clinic agreed with the statement that genital warts cause cervical cancer (Waller et al., 2003), this misperception appears to be common and is therefore probably not limited to women with genital warts.

Despite these limitations, HINTS 2005 provides some of the first national U.S. data on HPV knowledge prior to the wide-spread implementation of at least two informational HPV knowledge campaigns. Previous studies have largely included more restricted study populations, while the few population-based studies have focused on European or Mexican populations (Klug et al., 2007). Thus, the HINTS 2005 data provides a starting point for the evaluation of how HPV knowledge affects health behavior and outcomes in the U.S. For example, this study supports evidence that the message that HPV causes cancer is not always balanced by the message that HPV infection often resolves on its own (Anhang, Stryker, Wright, & Goldie, 2004), which is particularly important in women with genital warts, which are caused by noncarcinogenic HPV types. This imbalance could potentially disrupt appropriate health-seeking behavior. For instance, a recent study of genital warts patients found that depression was correlated with treatment delay (Ireland, Reid, Powell, & Petrie, 2005), and there is concern that emotional distress due to the status of HPV as a sexually transmitted infection could negatively impact cervical cancer screening and follow-up behavior (Waller et al., 2004). Resolution of questions about HPV appears to alleviate worry over positive HPV results, however, and may therefore also influence health behavior in women with genital warts (Waller, McCaffery, Kitchener, Nazroo, & Wardle, 2007). By providing baseline data, HINTS 2005 establishes the foundation for assessing the association between changing HPV knowledge and health outcomes. The next iteration of the survey (HINTS 2007) will allow the evaluation of trends in U.S. women's knowledge of HPV and screening behavior over time and will also assess HPV knowledge in men.

In conclusion, while women with genital warts reported higher HPV knowledge than women without genital warts, notable gaps in knowledge remained. HINTS 2007 may help establish whether these gaps are narrowing as the general population's knowledge of HPV continues to increase or whether certain sub-populations need to be targeted to increase HPV knowledge. These data underscore the urgent need for physician, patient, and public education, as well as further research to assess change in HPV knowledge and its association with health behaviors and cancer outcomes.

Acknowledgments

This study was supported by the National Cancer Institute.

References

- Guidance for evaluating mass communication health initiatives: summary of an expert panel discussion. 2005. Retrieved 25 April 2008, 2008, from [http://www.hsh.harvard.edu/viswanathlab/pdf/Evaluating_Mass_Comm\[1\].pdf](http://www.hsh.harvard.edu/viswanathlab/pdf/Evaluating_Mass_Comm[1].pdf)
- Human papillomavirus and genital warts. Aug 14. 2006 Retrieved September 25, 2006, from <http://www.niaid.nih.gov/factsheets/stdhpv.htm>
- Akers AY, Newmann SJ, Smith JS. Factors underlying disparities in cervical cancer incidence, screening, and treatment in the United States. *Curr Probl Cancer* 2007;31(3):157–81. [PubMed: 17543946]
- Anhang R, Stryker JE, Wright TC Jr. Goldie SJ. News media coverage of human papillomavirus. *Cancer* 2004;100(2):308–314. [PubMed: 14716765]

- Anhang R, Wright TC Jr, Smock L, Goldie SJ. Women's desired information about human papillomavirus. *Cancer* 2004;100(2):315–20. [PubMed: 14716766]
- ARHP. Association of Reproductive Health Professionals national cervical cancer prevention survey. 2005. Retrieved November 15, 2007, from <http://www.arhp.org/files/HPVsurveyExecutiveSummary.pdf>
- Baer H, Allen S, Braun L. Knowledge of human papillomavirus infection among young adult men and women: implications for health education and research. *J Community Health* 2000;25(1):67–78. [PubMed: 10706210]
- CBS News. Merck Awaits FDA Approval for Gardasil. 2006. Retrieved September 22, 2006, from <http://www.cbsnews.com/stories/2006/05/16/ap/health/mainD8HL3D681.shtml>
- Chandler MG. Genital warts: a study of patient anxiety and information needs. *British Journal of Nursing* 1996;5(3):174–9. [PubMed: 8696129]
- Chuang TY, Perry HO, Kurland LT, Ilstrup DM. Condyloma acuminatum in Rochester, Minn., 1950-1978. I. Epidemiology and clinical features. *Arch Dermatol* 1984;120(4):469–475. [PubMed: 6546656]
- Cummings, J. Seventy Percent of U.S. Adults Support Use of the Human Papillomavirus (HPV) Vaccine. *The Wall Street Journal Online*. 2006. Retrieved 15 November 2007, 2007, from http://www.harrisinteractive.com/news/newsletters/wshealthnews/WSJOnline_HI_Health-CarePoll2006vol5_iss13.pdf
- Finney Rutten LJ, Nelson DE, Meissner HI. Examination of population-wide trends in barriers to cancer screening from a diffusion of innovation perspective (1987-2000). *Prev Med* 2004;38(3):258–268. [PubMed: 14766107]
- Gilbert LK, Alexander L, Grosshans JF, Jolley L. Answering frequently asked questions about HPV. *Sex Transm Dis* 2003;30(3):193–4. [PubMed: 12616133]
- Henderson Z, Irwin KL, Montano DE, et al. Anogenital warts knowledge and counseling practices of US clinicians: results from a national survey. *Sex Transm Dis* 2007;34(9):644–52. [PubMed: 17413682]
- Holcomb B, Bailey JM, Crawford K, Ruffin M. T. t. Adults' knowledge and behaviors related to human papillomavirus infection. *J Am Board Fam Pract* 2004;17(1):26–31. [PubMed: 15014049]
- Insinga RP, Dasbach EJ, Myers ER. The health and economic burden of genital warts in a set of private health plans in the United States. *Clin Infect Dis* 2003;36:1397–1403. [PubMed: 12766834]
- Ireland JA, Reid M, Powell R, Petrie KJ. The role of illness perceptions: psychological distress and treatment-seeking delay in patients with genital warts. *Int J STD AIDS* 2005;16(10):667–70. [PubMed: 16212712]
- Irwin K, Montano D, Kasprzyk D, et al. Cervical cancer screening, abnormal cytology management, and counseling practices in the United States. *Obstet Gynecol* 2006;108(2):397–409. [PubMed: 16880312]
- Jain N, Irwin KL, Montano D, et al. Family Physicians' Knowledge of Genital Human Papillomavirus (HPV) Infection and HPV-related Conditions, United States, 2004. *Fam Med* 2006;38(7):483–489. [PubMed: 16823673]
- Klug SJ, Hukelmann M, Blettner M. Knowledge about infection with human papillomavirus: A systematic review. *Prev Med*. 2007
- Koshiol J, St. Laurent S, Pimenta J. Rate and predictors of new genital warts claims and genital warts-related healthcare utilization among privately insured patients in the United States. *Sex Transm Dis* 2004;31(12):748–752. [PubMed: 15608590]
- Koutsky L. Epidemiology of genital human papillomavirus infection. *Am J Med* 1997;102(5A):3–8. [PubMed: 9217656]
- Koutsky, L.; Kiviat, NB.; Holmes, K.; Mardh, P.; Sparling, P. Sexually Transmitted Diseases. McGraw-Hill; New York: 1999. Genital human papillomaviruses; p. 347-360.a. I. et.
- Lacey CJN, Lowndes CM, Shah KV. Chapter 4: Burden and management of non-cancerous HPV-related conditions: HPV-6/11 disease. *Vaccine* 2006;24(S3):S3/35–S3/41. [PubMed: 16950016]
- Linnehan MJ, Groce NE. Counseling and educational interventions for women with genital human papillomavirus infection. *AIDS Patient Care STDS* 2000;14(8):439–45. [PubMed: 10977973]

- Mays RM, Zimet GD, Winston Y, Kee R, Dickes J, Su L. Human papillomavirus, genital warts, Pap smears, and cervical cancer: knowledge and beliefs of adolescent and adult women. *Health Care Women Int* 2000;21(5):361–374. [PubMed: 11261107]
- Nelson DE, Powell-Griner E, Town M, Kovar MG. A comparison of national estimates from the National Health Interview Survey and the Behavioral Risk Factor Surveillance System. *Am J Public Health* 2003;93:1335–1341. [PubMed: 12893624]
- Oriel J. Natural history of genital warts. *Br J Vener Dis* 1971;47:1–13. [PubMed: 5550858]
- Poole C. Low P-values or narrow confidence intervals: which are more durable? *Epidemiology* 2001;12(3):291–294. [PubMed: 11337599]
- Ruffin, M. T. t. Family physicians' knowledge of risk factors for cervical cancer. *J Womens Health* 2003;12(6):561–567.
- Selden, CR.; Zorn, M.; Ratzan, SC.; Parker, RM. Health Literacy. National Library of Medicine; Bethesda: 2000.
- Silverberg MJ, Thorsen P, Lindeberg H, Grant LA, Shah KV. Condyloma in pregnancy is strongly predictive of juvenile-onset recurrent respiratory papillomatosis. *Obstet Gynecol* 2003;101(4):645–52. [PubMed: 12681865]
- Snyder LB, Hamilton MA, Mitchell EW, Kiwanuka-Tondo J, Fleming-Milici F, Proctor D. A meta-analysis of the effect of mediated health communication campaigns on behavior change in the United States. *J Health Commun* 2004;9(Suppl 1):71–96. [PubMed: 14960405]
- Stamatakis S, Nikolopoulos TP, Korres S, Felekis D, Tzangaroulakis A, Ferekidis E. Juvenile recurrent respiratory papillomatosis: still a mystery disease with difficult management. *Head Neck* 2007;29(2):155–62. [PubMed: 17022088]
- The Henry J. Kaiser Family Foundation. National Politics & Policy | FDA Announces Approval of HPV Vaccine Gardasil. *Kaisernetwork.org: Daily Women's Health Policy*. 2006. Retrieved September 22, 2006, from http://www.kaisernetwork.org/Daily_reports/rep_index.cfm?DR_ID=37807
- Tider DS, Parsons JT, Bimbi DS. Knowledge of human papillomavirus and effects on sexual behaviour of gay/bisexual men: a brief report. *Int J STD AIDS* 2005;16(10):707–708. [PubMed: 16212721]
- 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* 2007;16(2):288–294. [PubMed: 17267388]
- Waller J, McCaffery K, Forrest S, Szarewski A, Cadman L, Wardle J. Awareness of human papillomavirus among women attending a well woman clinic. *Sexually Transmitted Infections* 2003;79(4):320–2. [PubMed: 12902585]
- Waller J, McCaffery K, Kitchener H, Nazroo J, Wardle J. Women's experiences of repeated HPV testing in the context of cervical cancer screening: a qualitative study. *Psychooncology* 2007;16(3):196–204. [PubMed: 16858719]
- Waller J, McCaffery KJ, Forrest S, Wardle J. Human papillomavirus and cervical cancer: issues for biobehavioral and psychosocial research. *Ann Behav Med* 2004;27(1):68–79. [PubMed: 14979865]
- Ward KA, Lowry BE, Houston JR, Maw RD. Cervical epithelial abnormalities in females with and without genital warts. *Int J STD AIDS* 1994;5(5):380–1. [PubMed: 7819367]

Table 1

Descriptive statistics for women either reporting or not reporting treatment for genital warts in the 2005 Health Information National Trends Survey

Variable	Genital Warts (N = 97) N (%)	No Genital Warts (N = 3450) N of 3450 (%)
Age		
<40 years	39 (40.2)	888 (27.5)
40-50 years	28 (28.9)	673 (19.5)
>50 years	30 (30.9)	1839 (54.8)
Income		
<\$25,000	21 (24.4)	869 (30.9)
\$25,000 to <\$50,000	27 (31.4)	757 (26.9)
>\$50,000	38 (44.2)	1190 (42.3)
Education		
<High school	36 (37.9)	1354 (40.4)
>High school	59 (61.1)	1997 (59.6)
Race/ethnicity		
Non-Hispanic white	72 (75.8)	2583 (77.6)
Non-Hispanic black	9 (9.5)	293 (8.8)
Other	14 (14.7)	452 (13.6)
Time since last Pap		
≤3 yr	83 (87.4)	2731 (82.9)
>3 yr	12 (12.6)	563 (17.1)
Marital status		
Married/partner	48 (50.5)	1842 (55.0)
Divorced/widowed/separated	37 (39.0)	1108 (33.1)
Never married	10 (10.5)	399 (11.9)
Born in the United States		
No	87 (91.6)	3027 (90.1)
Yes	8 (8.4)	334 (9.9)
Health insurance		
No	14 (14.7)	359 (10.7)
Yes	81 (85.3)	2999 (89.3)

Table 2

Unweighted distribution of human papillomavirus (HPV) knowledge [N (%)] by self-reported genital warts treatment in the 2005 Health Information National Trends Survey

HPV Knowledge Question	Self-Reported Treatment for Genital Warts			
	Yes (N = 97)		No (N = 3450)	
	Accurate N (%)	Inaccurate N (%)	Accurate N (%)	Inaccurate N (%)
Ever heard of HPV	57 (58.8)	40 (41.2)	1274 (36.9)	2176 (63.1)
Ever had HPV	25 (25.8)	72 (74.2)	50 (1.5) ^a	3397 (98.5) ^a
HPV causes cancer	35 (36.1)	62 (63.9)	587 (17.0)	2857 (83.0)
HPV is sexually transmitted	46 (47.4)	51 (52.6)	807 (23.4)	2638 (76.6)
HPV infection is common ^b	45 (46.4)	52 (53.6)	869 (25.2)	2577 (74.8)
HPV often goes away on its own	7 (7.2)	90 (92.8)	37 (1.1)	3410 (98.9)
HPV causes abnormal pap	49 (50.5)	48 (49.5)	955 (27.7)	2492 (72.3)
HPV does not affect ability to get pregnant [†]	8 (8.3)	89 (91.8)	128 (3.7)	3318 (96.3)

^a Accurate or inaccurate not applicable because these women did not report treatment for genital warts. Thus, it is not possible to determine if they should have reported having HPV.

^b These questions reverse the wording used in the survey in order to be consistent with the rest of the analysis.

Table 3

Associations between reporting treatment versus no treatment for genital warts and human papillomavirus (HPV) knowledge outcomes in the 2005 Health Information National Trends Survey HINTS 2005

HPV Knowledge Question	Genital Warts (N = 97)	No Genital Warts (N = 3450)	OR (95% CI) ^a	CLR ^b
Ever heard of HPV				
No/Don't know	40	2176	1.0	
Yes	57	1274	2.4 (1.4-4.2)	3.1
Ever had HPV ^c				
No/Don't know	72	3397	1.0	
Yes	25	50	24.5 (11.4-52.8)	4.6
HPV causes cancer ^c				
No/Don't know	62	2857	1.0	
Yes	35	587	2.7 (1.8-4.3)	2.5
HPV is sexually transmitted ^c				
No/Don't know	51	2638	1.0	
Yes	46	807	2.5 (1.3-4.8)	3.6
HPV is common ^{c, d}				
No/Don't know	52	2577	1.0	
Yes	45	869	2.8 (1.7-4.7)	2.8
HPV often goes away on its own ^c				
No/Don't know	90	3410	1.0	
Yes	7	37	8.0 (2.3-28.3)	12.4
HPV causes abnormal pap ^c				
No/Don't know	48	2492	1.0	
Yes	49	955	2.7 (1.5-4.8)	3.2
HPV does not affect ability to get pregnant ^{c, d}				
No/Don't know	89	3318	1.0	
Yes	8	128	2.4 (0.88-6.7)	7.6

^a OR = odds ratio (95% confidence interval). Weighted for sampling and adjusted for education.

^b CLR = confidence limit ratio, a measure of the precision of the odds ratio (upper confidence limit divided by lower confidence limit).

^c ORs excluding women who answered "No" or "Don't know" to having heard of HPV: 21.5 (95% CI: 9.1-50.9) for ever had HPV, 1.9 (95% CI: 0.9-4.0) for HPV causes cancer, 1.8 (95% CI: 0.7-4.4) for HPV is sexually transmitted, 2.1 (95% CI: 0.9-5.2) for HPV infection is common, 5.4 (95% CI: 1.4-20.3) for HPV often goes away on its own, 2.0 (95% CI: 0.6-6.2) for HPV causes abnormal pap, and 1.6 (95% CI: 0.5-4.7) for HPV does not affect ability to get pregnant.

^d These questions reverse the wording used in the survey in order to be consistent with the rest of the analysis.

Table 4

Univariable models for having heard of human papillomavirus (HPV) vs. no/don't know among 97 women reporting treatment for genital warts in the 2005 Health Information National Trends Survey

Variable	Treatment for HPV (N = 97)			No Treatment for HPV (N = 3450)		
	Yes N (%)	No/Don't Know N (%)	OR (95% CI) ^a	Yes N (%)	No/Don't Know N (%)	OR (95% CI) ^a
Age model						
<40 years	27 (47.4)	12 (30.0)	1.0	421 (33.0)	467 (21.5)	1.0
40-50 years	18 (31.6)	10 (25.0)	0.70 (0.19-2.6)	305 (23.9)	368 (16.9)	1.1 (0.91-1.37)
>50 years	12 (21.1)	18 (45.0)	0.41 (0.11-1.5)	548 (23.0)	1341 (61.6)	0.52 (0.43-0.63)
Income model						
<\$25,000	8 (15.4)	13 (38.2)	1.0	219 (20.5)	650 (37.2)	1.0
\$25,000 to <\$50,000	16 (30.8)	11 (32.4)	1.3 (0.27-6.1)	267 (25.0)	490 (28.0)	1.7 (1.3-2.3)
>\$50,000	28 (53.9)	10 (29.4)	4.0 (1.2-13.0)	581 (54.5)	609 (34.8)	2.9 (2.3-3.6)
Education model						
<High school	15 (26.8)	21 (53.9)	1.0	281 (22.5)	1073 (51.0)	1.0
>High school	41 (73.2)	18 (46.2)	3.8 (1.0-14.4)	967 (77.5)	1030 (49.0)	3.6 (2.9-4.5)
Race/ethnicity model						
Non-Hispanic white	44 (78.6)	28 (71.8)	1.0	1016 (81.7)	1567 (75.2)	1.0
Non-Hispanic black	3 (5.4)	6 (15.4)	0.11 (0.01-1.0)	87 (7.0)	206 (9.9)	0.70 (0.51-0.97)
Other	9 (16.1)	5 (12.8)	1.7 (0.30-9.5)	141 (11.3)	311 (14.9)	0.58 (0.45-0.73)
Time since last Pap model						
≤3 yr	51 (92.7)	32 (80.0)	1.0	1121 (89.9)	1610 (78.7)	1.0
>3 yr	4 (7.3)	8 (20.0)	0.58 (0.13-2.6)	126 (10.1)	437 (21.4)	0.42 (0.34-0.53)
Marital status model						
Married/partner	30 (53.6)	18 (46.2)	1.0	751 (60.3)	1091 (51.9)	1.0
Divorced/widowed/separated	19 (33.9)	18 (46.2)	0.36 (0.10-1.3)	305 (24.5)	803 (38.2)	0.53 (0.42-0.66)
Never married	7 (12.5)	3 (7.7)	1.6 (0.09-27.3)	189 (15.2)	210 (10.0)	1.2 (0.86-1.6)
Born in the United States model						
No	5 (8.9)	3 (7.7)	1.0	106 (8.5)	228 (10.8)	1.0
Yes	51 (91.1)	36 (92.3)	1.6 (0.18-14.5)	1146 (91.5)	1881 (89.2)	0.57 (0.41-0.79)
Health insurance model						
No	5 (8.9)	9 (23.1)	1.0	126 (10.7)	233 (11.1)	1.0
Yes	51 (90.1)	30 (76.9)	1.7 (0.29-9.8)	1125 (89.3)	1874 (88.9)	1.1 (0.73-1.6)

^aOR = odds ratio (95% confidence interval), univariable but weighted for sampling. No/don't know is referent.