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Men's beliefs about HPV-related disease

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Abstract

While human papillomavirus (HPV) infection is associated with genital warts, anal cancer, and oral cancer, limited research has examined what men think causes these diseases. We sought to examine knowledge and beliefs about HPV-related disease among gay and bisexual men, who are at high risk for HPV infection and HPV-related cancers, and compare them to heterosexual men. We conducted an online survey in January 2009 with a national sample of men aged 18–59 who self-identified as either gay or bisexual ($n = 312$) or heterosexual ($n = 296$). The response rate was 70%. Fewer than half of men knew that HPV can cause genital warts (41%), anal cancer (24%), and oral cancers (23%). However, gay and bisexual men typically knew more than heterosexual men about these topics. Overall, most men believed that sexual behavior causes genital warts (70%) and anal cancer (54%), and tobacco use causes oral cancer (89%). Perceived causal factors differed substantially among the three diseases, while differences by sexual orientation were fewer and smaller in magnitude. Many men were unaware that HPV infection can cause genital warts, oral cancer, and anal cancer.

Keywords

HPV; Anal cancer; Oral cancer; Homosexual men

Introduction

New prevention opportunities, including human papillomavirus (HPV) vaccine and anal cancer screening, make it increasingly important to understand men's beliefs about what causes HPV-related disease (Gerend and Barley 2009; O'Connor and O'Connor 2009; Reed et al., 2010). HPV infection is the central cause of genital warts and anal cancer in men (Daling et al. 2004; Gillison et al. 2008; Greer et al. 1995). Nearly 4% of sexually active men report a history of genital warts (Dinh et al. 2008), but the true prevalence may be much higher. Risk factors for genital warts include sexual debut at a young age, having many sexual partners, and having unprotected sex. An estimated 2,100 men will get anal cancer in 2009 (American Cancer Society 2009a). Anal cancer risk factors include smoking, sexual activity (including receptive anal intercourse), human immunodeficiency virus (HIV) infection, and other conditions that lower immunity (American Cancer Society 2009b; Palefsky and Rubin 2009; Ryan et al. 2000). Persistent HPV infection is also a probable cause of many oropharyngeal cancers, which affected an estimated 25,240 new men in 2009 (American Cancer Society 2009a; Gillison et al. 2008). The main risk factors for oral cavity and oropharyngeal cancers include tobacco use (in both smoked and smokeless forms), alcohol use, poor nutrition, and immune system suppression (American Cancer Society 2009a, c; Parkin and Bray 2006).

Gay and bisexual men have higher levels of both HPV infection and HPV-related disease than heterosexual men. Studies that include primarily heterosexual men have typically found that 50% or less are infected with HPV (Dunne et al. 2006). In contrast, an estimated 61% of HIV-negative and 93% of HIV-positive gay and bisexual men have anal HPV infections (Palefsky et al. 1998). Men who have sex with men are also at increased risk for anal cancer compared to the general population (Daling et al. 1987, 2004; Holly et al. 1989; Palefsky and Rubin 2009).

While men's understanding of HPV-related disease is likely to be important for planning prevention initiatives, few studies have examined these beliefs (Cuschieri et al. 2006). Few men know that HPV causes genital warts, and little to no research has examined their understanding of HPV's causal role in anal cancer and possibly oral cancer (Cuschieri et al. 2006). Furthermore, studies have yet to comprehensively address the perceived role of sexual behaviors, health behaviors, and other risk factors in causing these HPV-related diseases. In our study, we assessed men's understanding of factors that increase their chances of getting genital warts, oral cancer, and anal cancer. We also examined whether these beliefs were different among heterosexual men than among gay and bisexual men.

Methods

Participants and procedures

The University of North Carolina Men's Health Study examined men's beliefs about HPV vaccine and HPV-related cancers. Participants were men aged 18–59 years who were members of an ongoing population-based panel of US households maintained by Knowledge Networks (Menlo Park, CA). After identifying panel members using list-assisted random-digit dialing, Knowledge Networks provided them with free internet and a small payment in exchange for completing multiple internet-based surveys each month. Our study used a stratified sampling approach to obtain roughly equal numbers of men from the panel who identified as heterosexual and men who identified as either gay or bisexual. The Institutional Review Board at the University of North Carolina approved the study.

Of 874 men we invited to participate in January 2009, 609 (70%) completed our Internet-based survey (Reiter et al., 2010a, b). Compared to non-respondents, respondents were more likely to be older, non-Hispanic white, have college degrees, and have household incomes of at least \$60,000 (all $P < .05$), but they were equally likely to have a spouse or be living with a partner ($P = .18$). We did not analyze data for one man who had already received HPV vaccine. Most men were non-Hispanic white (79%; Table 1), had less than a college degree (55%), reported an annual household income of at least \$60,000 (55%), and lived in an urban area (88% lived in a metropolitan statistical area) (Office of Management and Budget 2000). About half of men reported being gay or bisexual (51%) and most reported five or more lifetime sexual partners (74%). The mean age was 44 years (standard deviation [SD] = 10). Compared to heterosexual men, gay and bisexual men were more likely to be older, have a college degree, report a higher household income, live in an urban area, and report five or more lifetime sexual partners (all $P < .05$), but they did not differ on other demographic characteristics.

Measures

We developed survey items based on our previous HPV vaccine studies of females, parents, and healthcare providers (Fazekas et al. 2008; Hughes et al. 2009; Keating et al. 2008; Ziarnowski et al. 2009). We tested the instrument with 28 men to assess whether survey instructions and items were clear, to confirm that participants interpreted survey items as we intended, and to assess men's familiarity with HPV and HPV vaccine. After refining items, we further tested the survey using in-depth interviews with 8 more gay and heterosexual men. The final survey is available online at <http://www.unc.edu/~ntbrewer/hpv.htm>, including text that describe the specific diseases.

Awareness and knowledge—The survey assessed awareness of HPV with a single item that read, “Have you heard of HPV or human papillomavirus before today?” For men who had heard of HPV, three separate items assessed whether men knew that HPV infection can cause genital warts, oral cancer, and anal cancer. For all participants, three separate questions assessed whether men thought HIV/acquired immune deficiency syndrome (AIDS) affects the chances of getting genital warts, oral cancer, and anal cancer. We dichotomized responses into “increases chances” (the correct answer, coded as 1) and “no

effect/decreases chances" (=0). We calculated a knowledge score by summing up the number of correct answers to the knowledge questions and dividing by 6 (possible range 0 to 100%).

The survey assessed how much men thought they knew about genital warts, oral cancer, and anal cancer (i.e., perceived knowledge). The three items had 4-point response scales. We dichotomized responses into "a moderate amount/a lot" (coded as 1) compared to "nothing at all/a little" (=0). We calculated a perceived knowledge score by summing up the scores on the dichotomized perceived knowledge items.

Beliefs about HPV-related disease—The survey assessed men's beliefs about causes of HPV-related disease (genital warts, oral cancer, and anal cancer). Participants identified factors they thought might increase the chances of getting each of the diseases. Response options included environmental and biological exposures, stress, sexual behaviors, smoking, and other health behaviors that we identified in a pilot study. Survey software allowed participants to endorse multiple responses, allowed "I don't know" responses only for men who indicated no potential risk factors, and rotated presentation order of response options across participants (but the order was the same for each participant across the three diseases).

Data analysis

We used McNemar's test to look for differences in participants' knowledge and beliefs about the three diseases (genital warts, oral cancer, and anal cancer). These within-subjects analyses examined whether pairs of beliefs had different frequencies. We used multivariate logistic regressions to examine whether sexual orientation predicted knowledge and beliefs. To examine the association of knowledge with perceived knowledge, we used bivariate correlations for the individual items and then multivariate linear regression for the composite scores. As the multivariate regression analyses were between-subjects analyses subject to confounding, we controlled for age, education, urbanicity, and reported number of lifetime sexual partners. Logistic regressions controlled for education but not income, because the two variables were highly correlated, and education is presumably more proximally related to the knowledge variables we examined. We analyzed data with SPSS version 16.0 (SPSS, Inc, Chicago, IL). Tests of significance were two-tailed with a critical alpha of .05. For within-subjects McNemar tests that compared beliefs about all three diseases, we recommend that readers interpret associations with *p* values between .05 and .001 as being tentative findings, because of possible small inflation of family-wise error.

Results

Knowledge and perceived knowledge

Most men reported having heard of HPV prior to the survey. More gay and bisexual men had heard of the virus than heterosexual men (79 vs. 62%, $P < .05$) (Table 2). Knowledge was low overall, but more gay and bisexual than heterosexual men gave correct answers to the knowledge questions (mean percent correct: 49 vs. 33%, $P < .001$). Overall, more men knew that HPV can cause genital warts (41%) than knew that it can cause oral cancer (23%,

$P < .001$) or anal cancer (25%, $P < .001$). When asked whether having HIV/AIDS affected the chances of getting HPV-related disease, roughly half knew it increased the risk of these diseases, but more gay and bisexual men knew this than heterosexual men.

Men expressed relatively low levels of perceived knowledge about HPV-related disease. Many men said they knew “little” or “nothing at all” about genital warts (80%), oral cancer (90%), or anal cancer (94%). Gay and bisexual men reported higher perceived knowledge about genital warts and anal cancer than did heterosexual men. Individual perceived knowledge items showed small associations with the individual knowledge items (bivariate r s ranged from .12 to .30, all $P < .05$). The composite knowledge and perceived knowledge scores showed a moderate association that remained even after controlling for demographics (standardized beta = .34, $P < .001$).

Causal beliefs

Genital warts—Men commonly believed that sexual behaviors increase the chances of getting genital warts (Table 3). Having a high number of sexual partners, not using a condom during sex, and having sex were the causal factors that men most commonly cited. Over half of men said that an infection with a virus could lead to genital warts. Seven percent of men said they did not know what causes genital warts.

Oral cancer—Men most frequently said tobacco-related behaviors, including smoking and chewing tobacco, increase the chances of getting oral cancer. About half of participants cited genetics and unsafe chemicals in food or water. Many men (43%) also identified infection with a virus as a potential cause of oral cancer.

Anal cancer—Men commonly said sexual behaviors increase the chances of getting anal cancer. About half of men believed that having sex, tearing or bleeding during anal sex, and having a high number of sexual partners increase the chances of getting anal cancer. Men also frequently cited infection with a virus and not using condoms when having sex. A relatively large number of men (18%) reported that they did not know what causes anal cancer.

Differences by disease—Factors that men believed increase the chances of getting genital warts, oral cancer, and anal cancer differed between the diseases for 36 of 37 comparisons (Table 3). The average absolute difference in endorsing potential causes for one disease compared to another was 26% (range 1–85%). Among the largest differences was that almost all men believed tobacco use increases the chances of getting oral cancers, but few believed it causes anal cancer or genital warts. Most men believed sexual behaviors increase risk of genital warts, and about a half believed they increase risk of anal cancer, but few believed sexual behaviors increase risk of oral cancer. Men commonly cited bad family genetics as causing oral and anal cancer but rarely genital warts. Men commonly associated unsafe chemical exposure with oral cancer, less often with anal cancer, and very rarely with genital warts.

Beliefs about stress, poor personal hygiene, and viral infection showed the least variability across the diseases. Belief that infection with a virus caused the diseases ranged from 43 to

58%, but was least common for oral cancer. Belief that poor personal hygiene caused the diseases ranged from 26 to 40%, but was least common for anal cancer. Belief that stress caused the diseases ranged from 17 to 28%, but was least common for genital warts.

Differences by sexual orientation—Gay and bisexual men differed from heterosexual men in some of the factors they identified as increasing the chances of getting HPV-related disease (Table 4), but these differences were relatively small as compared to differences across diseases reported in the previous paragraph. The average absolute difference in heterosexual compared to gay or bisexual men endorsing potential causes for diseases was 6% (range 0 to 19%). The only difference that was larger than 10% was for stress, which gay men were more likely to endorse as a cause for all three diseases than heterosexual men.

Discussion

HPV-infected men experience substantial burden of HPV-related disease, including genital warts, anal cancer, and oral cancer (O'Connor and O'Connor 2009). However, we know remarkably little about what men believe causes these health problems. We found that while most men in a national sample had heard of HPV, their knowledge of HPV-related disease was low. Differences in beliefs about risk factors for three HPV-related diseases differed markedly, but we saw fewer and generally smaller differences by sexual orientation. Because the vast majority of men believed they knew little about HPV-related disease, it may be useful to view the perceived risk factors as ones that men found plausible but were uncertain about.

The most commonly endorsed risk factor across all three HPV-related diseases (genital warts, oral cancer, and anal cancer) was infection with a virus, but only about half of men held this belief, perhaps because the media have only recently begun covering research on the viral origins of these diseases. Only a quarter of men knew that HPV infection can cause anal cancer and oral cancer. Men endorsed stress or poor hygiene as risk factors somewhat less commonly, but with similar frequency across the three diseases. It was more common for men to associate risk factors with only one, rather than all three, of the diseases.

An overwhelming majority of men attributed oral cancer to smoking and smokeless tobacco use, much more so than to viral infection or sexual activity. As most Americans believe smoking causes lung cancer (Finney Rutten et al. 2008), it seems logical for men to extend this idea to smoking causing oral cancer, given that inhaled smoke passes through the mouth into the lungs. Also, recent mass media campaigns have emphasized smokeless tobacco's harms to oral health. Few men associated using tobacco products with anal cancer or genital warts, perhaps because the genital area may be perceived as more distally, if at all, exposed to tobacco products. Women are similarly skeptical or unaware that smoking is associated with increased risk for cervical cancer (Hall et al. 2003; Lee et al. 2007). However, tobacco use is a well-established risk factor for many cancers, including anal, cervical, penile, and oropharyngeal cancers (Daling et al. 2004, 2005; Dillner et al. 2000; US Department of Health and Human Services 2004).

Men largely attributed genital warts and anal cancer, but not oral cancer, to sexual behavior. The low attribution of sexual activity to oral cancer may be due, in part, to sex risk-reduction efforts that portray oral sex as a less risky sexual activity than vaginal or anal sex in the context of HIV transmission and other sexually transmitted infections (STIs) (Halpern-Felsher et al. 2005). This may increase skepticism of the link between sexual behavior and risk of developing oral cancer. Other patterns were attributing cancer, but rarely genital warts, to genetic influences or unsafe chemicals in food or water.

Knowledge about HPV-related disease was quite low. Few men knew HPV infection can cause genital warts, oral cancer, and anal cancer. Somewhat more gay men knew that HIV infection increases the risk for these diseases, but even among this group knowledge was low. Perhaps a positive sign is that many men acknowledged that they knew little about these diseases. In combination, these findings suggest that men need health education efforts around HPV-related disease and that many of them are aware of this need and thus may be receptive to educational efforts.

Gay and bisexual men had higher knowledge of HPV-related disease than heterosexual men. The differences were somewhat more pronounced for perceived knowledge of and willingness to speculate on the causes of genital warts and anal cancer. While one explanation is that more gay and bisexual men had a college education than heterosexual men, analyses comparing sexual orientation groups controlled for education. Another explanation is that sexual health advocacy and education to combat HIV/AIDS may have sensitized gay and bisexual men to these concerns. Whatever the reason, gay and bisexual men's low knowledge of these topics is especially concerning, because they have higher levels of HPV infection and HPV-related disease than heterosexual men (Daling et al. 1987, 2004; Dunne et al. 2006; Holly et al. 1989; Palefsky et al. 1998).

Study strengths include a large national sample of heterosexual, gay and bisexual men and a high participation rate. While the online survey panel maintained by Knowledge Networks closely matches the US population on many demographic characteristics (Baker et al. 2003; Dennis 2009), most men in our study were non-Hispanic white, of high socioeconomic status, and living in urban areas. An additional limitation is having few younger participants, who may be more aware of HPV and HPV-related disease. Although the number of statistical tests we conducted suggests that several of the associations we report are likely to be due to Type I error, we believe that the broad pattern of our findings is convincing and informative. Differences by sexual orientation may be due to confounding factors not controlled for in statistical analyses, though we controlled for key variables that differed by sexual orientation. However, the large differences observed between HPV-related diseases are not subject to concerns of confounding, because differences were assessed within-subjects.

Men's understanding of HPV is increasingly important now that the Food and Drug Administration (FDA) has approved HPV vaccine for men (Food and Drug Administration 2009). One challenge is that men's knowledge of HPV-related disease is low. An important cause of these diseases is persistent HPV infection, yet only about half of men found viral infection to be a plausible risk factor for any of the three diseases, and fewer still knew HPV

causes them. A positive finding was that many men were aware that they have low knowledge of HPV-related disease, potentially making them more receptive to educational efforts. Current HPV vaccine campaigns target women, raising the possibility that discussions of persistent HPV infection, its causes and possible complications may be outside the experiences of most men (Gerend and Barley 2009). HPV-related disease prevention efforts will benefit from improved understanding of beliefs and knowledge in high-risk populations, such as gay and bisexual men, as well as the larger population of heterosexual men who experience the most disease in absolute terms.

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Table 1Participant characteristics (*n*, %)

	Gay/bisexual men (<i>n</i> = 312)	Heterosexual men (<i>n</i> = 296)
Age (years)		
19–39	60 (19)	109 (37)**
40–49	127 (41)	90 (30)
50–59	125 (40)	97 (33)
Race/ethnicity		
Non-Hispanic white	253 (81)	230 (78)
Other	59 (19)	66 (22)
Education		
No college degree	138 (44)	197 (67)**
College degree	174 (56)	99 (33)
Annual household income		
<\$60,000	126 (40)	147 (50)*
>\$60,000	186 (60)	149 (50)
Urbanicity		
Urban	292 (94)	242 (82)**
Rural	20 (6)	54 (18)
Number of lifetime sexual partners		
<5	38 (12)	123 (42)**
5	274 (88)	173 (58)

* $P < .05$;** $P < .001$

Table 2HPV awareness and knowledge (*n*, %)

	Gay/bisexual men (<i>n</i> = 312)	Heterosexual men (<i>n</i> = 296)
Heard of HPV prior to survey	247/312 (79)	182/296 (62)*
Knew HPV infection can cause... ^a		
Genital warts	114/247 (46)	62/182 (34)*
Oral cancer	62/247 (25)	38/182 (21)
Anal cancer	79/247 (32)	26/182 (15)**
Knew HIV/AIDS increases chances of getting...		
Genital warts	180/312 (58)	111/296 (38)**
Oral cancer	181/312 (58)	112/296 (38)**
Anal cancer	186/312 (60)	130/296 (44)*
Said they knew a "moderate amount" or "a lot" about...		
Genital warts	90/312 (29)	30/296 (10)**
Oral cancer	43/312 (14)	21/296 (7)
Anal cancer	30/312 (10)	5/296 (2)**

Analyses controlled for age, education, urbanicity, and reported number of lifetime sexual partners

HPV human papillomavirus, HIV human immunodeficiency virus, AIDS acquired immune deficiency syndrome

* $P < .05$;** $P < .001$ ^a Only participants who had previously heard of HPV received these questions

Table 3

Perceived risk factors for HPV-related disease

	Genital warts (%)	Oral cancer (%)	Anal cancer (%)	Differences across diseases		
				GW vs. OC	GW vs. AC	OC vs. AC
General health behaviors						
Smoking tobacco	4	<u>89</u>	16	**	**	**
Using "smokeless" chewing tobacco	—	<u>86</u>	—			
Drinking alcohol	6	27	8	**	*	**
Poor personal hygiene	34	40	26	*	**	**
Not cleaning well enough after having a bowel movement	—	—	22			
Eating a bad diet	—	25	24	**		
Not regularly brushing teeth and flossing	—	38	—			
Sexual behaviors						
Having sex ^a	<u>70</u>	23	<u>54</u>	**	**	**
High number of sexual partners ^b	<u>80</u>	26	<u>47</u>	**	**	**
Not using condoms when having sex ^b	<u>79</u>	21	45	**	**	**
Having sex at a young age ^b	33	10	23	**	**	**
Tearing or bleeding from having anal sex	—	—	<u>53</u>			
Other causes						
Infection with a virus	58	43	46	**	**	ns
Stress	17	28	20	**	*	**
Bad family genetics	15	<u>55</u>	42	**	**	**
Unsafe chemicals in food or water	6	49	21	**	**	**
I don't know	7	3	18	**	**	**

The 3 most frequently identified causes for each disease are underlined. Survey software allowed "I don't know" responses only for men who indicated no potential risk factors

HPV human papillomavirus, GW genital warts, OC oral cancer, AC anal cancer, — not assessed, $n = 608$

^aThe questionnaire defined "having sex" differently for genital warts ("includes oral, vaginal, and anal sex"), oral cancer (included only oral sex), and anal cancer (included only anal sex)

^bThe questionnaire defined "having sex" as including oral, vaginal, and anal sex

* $P < .05$;

ns not statistically significant

$P < .001$;

**

Table 4

Sexual orientation differences in perceived risk factors for HPV-related disease

	Genital warts		Oral cancer		Anal cancer	
	Gay/bisexual (%)	Heterosexual (%)	Gay/bisexual (%)	Heterosexual (%)	Gay/bisexual (%)	Heterosexual (%)
General health behaviors						
Smoking tobacco	5	3	91	88	20	11*
Using "smokeless" chewing tobacco	–	–	86	85	–	–
Drinking alcohol	8	3*	29	24	11	5
Poor personal hygiene	31	36	42	39	25	27
Not cleaning well enough after having a bowel movement	–	–			21	24
Eating a bad diet	–	–	28	21	28	20
Not regularly brushing teeth and flossing	–	–	39	37	–	–
Sexual behaviors						
Having sex ^a	75	65	25	22	54	53
High number of sexual partners ^b	82	77	28	23*	51	43*
Not using condoms when having sex ^b	85	73**	24	19	49	41*
Having sex at a young age ^b	34	33	9	12	21	25
Tearing or bleeding from having anal sex	–	–	–	–	55	50
Other causes						
Infection with a virus	62	54	47	40*	52	40*
Stress	22	12*	37	18**	28	12**
Bad family genetics	15	14	57	52	47	37
Unsafe chemicals in food or water	6	6	51	46	24	18
I don't know	2	12**	3	3	11	25**

Analyses controlled for age, education, urbanicity, and reported number of lifetime sexual partners. Survey software allowed "I don't know" responses only for men who did not indicate any potential risk factors

HPV human papillomavirus, – not assessed. Gay and bisexual men, $n = 312$; and heterosexual men, $n = 296$

^aThe questionnaire defined "having sex" differently for genital warts ("includes oral, vaginal, and anal sex"), oral cancer (included only oral sex), and anal cancer (included only anal sex)

^bThe questionnaire defined "having sex" as including oral, vaginal, and anal sex

* $P < .05$;

** $P < .001$