

# Human papillomavirus awareness, knowledge, and vaccination status in a diverse population of male postsecondary students in Greater Vancouver

A study suggests education campaigns are needed to ensure young men know that the HPV vaccine is available to men as well as women, and that the vaccine can protect against non-cervical cancers and genital warts.

## ABSTRACT

**Background:** In addition to causing cervical cancers in women, human papillomavirus (HPV) infections can cause anogenital warts in men and women, and lead to cancers of the oral cavity, pharynx, anus, and genitalia in both sexes. Although vaccination to protect against this most common of sexually transmitted infections is available to men as well as women, few studies have focused on vaccine-eligible men.

**Methods:** A survey was designed to collect demographic information and assess awareness and knowledge of HPV and vaccination status of males age 19 to 26 of varying backgrounds. Questionnaires were made available in student health clinics at two large urban universities and two large urban colleges in Greater Vancouver between December 2012 and May

2013. The data collected were analyzed to identify trends rather than to quantify the degree of differences between demographic groups.

**Results:** Of 176 respondents, 141 (80.1%) reported that they had heard of HPV, with 11 (6.3%) indicating positive vaccination status. Awareness and knowledge of HPV varied widely among demographic groups. Overall, knowledge regarding non-cervical morbidities and vaccine availability to males was poor, with respondents who were homosexual and those already vaccinated demonstrating superior knowledge of HPV.

**Conclusions:** This study highlights the need for education about non-cervical morbidities related to human papillomavirus infections and the availability of HPV vaccine for males.

## Background

Human papillomavirus (HPV) infections are the most common sexually transmitted infections worldwide.<sup>1</sup> There are over 150 types of HPV, with over 40 being able to infect the anogenital region of both sexes. The prevalence rate of HPV in British Columbian women is between 12.2% and 16.8%.<sup>2,3</sup> In British Columbian men, the rate is likely comparable.<sup>4</sup> Estimates suggest that over 50% of the sexually active population will be infected with the virus at some point in life.<sup>5</sup> Although virtually all cervical cancers are due to HPV infections,<sup>6</sup> with HPV-16 and HPV-18 accounting for around 70% of cancers,<sup>7</sup> the

---

Mr Little is a year 4 medical student at the University of British Columbia. Dr Ogilvie is medical director of Clinical Prevention Services at the BC Centre for Disease Control and an associate professor in the Family Practice Department, the Obstetrics and Gynaecology Department, and the School of Population and Public Health at UBC. Dr Mirwaldt is director of the UBC Student Health Service.

---

*This article has been peer reviewed.*

morbidity and mortality associated with HPV are not restricted to cervical cancer or confined to women. HPV is responsible for anogenital warts in both sexes, a condition with an overall incidence rate of 120 per 100 000 women and 154 per 100 000 men in Canada.<sup>8</sup> In the province of BC alone, direct treatment for genital warts costs an estimated \$1 million annually.<sup>9</sup> In addition to cervical cancer, HPV is believed to be the causative agent in a number of other cancers. It is estimated that 5.2% of all cancers worldwide are associated with HPV infections.<sup>10</sup> HPV is believed to account for 90% of anal cancers, 35% of oropharyngeal cancers, 40% to 50% of penile cancers, and 25% of oral cavity cancers.<sup>10-13</sup> Like cervical cancer, the majority of these cancers are attributable to HPV-16 and HPV-18.<sup>10</sup>

Two HPV vaccines are available in Canada. These include a quadrivalent vaccine and a bivalent vaccine that both protect against the two most common cancer-causing HPV types. In addition, the quadrivalent vaccine confers immunity to HPV-6 and HPV-11, the virus types most responsible for anogenital warts.

Many jurisdictions, including all Canadian provinces and territories, have included the HPV vaccine in the routine immunization program for school-age girls. Despite this, a large percentage of parents do not provide consent, and the vaccination rate in a BC school-based program is under 70%.<sup>14</sup> In keeping with this finding, a systemic review from 2007 rated vaccine acceptability among parents at between 54.9% and 81%.<sup>15</sup>

Because males are linked to the transmission of HPV and are vulnerable to infection-related complications themselves, the Canadian National Advisory Committee on Immunization recommends the quadrivalent

HPV vaccine for all males age 9 to 26.<sup>16</sup> For the most part, these vaccinations must be paid for privately at significant cost. It is only very recently that some health jurisdictions around the world have included males in public HPV vaccination programs. These include Australia (2013) and the Canadian province of PEI (2013). In September 2014, Alberta began offering the vaccine to male students.

of birth, and number of years residing in Canada. Respondents were asked whether they had heard about HPV infection before. Those who indicated no were asked to submit their questionnaires immediately. Those who indicated yes were asked to respond to a further 16 statements about HPV and the HPV vaccine by circling “True,” “False,” or “Don’t Know.” The majority of these statements

### **In our study population of vaccine-eligible males, the vaccination rate was 6.3%.**

Historically, the focus of research has been on HPV knowledge and vaccination rates in women. Fewer studies have investigated HPV awareness specifically among vaccine-eligible men, and many of these studies have focused on men who have sex with men because of the role of the virus in anal cancers. To address this gap, we undertook a study to assess the HPV knowledge and vaccination status of vaccine-eligible males at various postsecondary institutions in Greater Vancouver.

### **Methods**

A questionnaire was developed to assess the HPV knowledge and vaccination status of males age 19 to 26. Using a literature review of previous studies that assessed HPV knowledge and vaccine acceptability, we determined the demographic data to collect and areas of knowledge to assess. The questionnaire asked for respondent age, sexual identity, ethnicity, country

were adapted from various published studies,<sup>17-20</sup> but were not pilot tested before use in our study. The final two questions asked respondents to indicate whether they had been vaccinated and to provide the reason(s) if they had not been vaccinated. The survey was reviewed and approved by the UBC Behavioural Research Ethics Board. As required, this survey was also reviewed and approved by the independent research ethics boards of other postsecondary institutions involved in the study.

The questionnaires were made available at four institutions in Greater Vancouver. Between December 2012 and May 2013 questionnaires were available in the waiting areas of student health clinics at two large urban universities and one large urban college. Questionnaires were also made available in the student health clinic of another large urban college between February and May 2013. Stacks of questionnaires were placed next to a

drop box with a sign asking male students between 19 and 26 to complete a survey regarding HPV knowledge. A bowl of granola bars was also placed next to the drop box. Questionnaires from respondents who were not in this age range or who did not identify as male were excluded from the analysis.

The completed questionnaires were reviewed and statistical methods (including the Fisher exact test, Spearman coefficient, and Mann-Whitney test) were employed to identify trends rather than quantify the degree of differences between demographic groups in the study population.

**Results**

Of 178 questionnaires collected at the end of the survey period, 176 were eligible for analysis. The majority of respondents (141) had heard of HPV. One of these participants filled out demographic information but did not assess knowledge-based statements or indicate his vaccination status. Assuming a negative vaccination status for males who had never heard of HPV or who did not respond to the question regarding their vaccination status, the overall vaccination rate in our study population was 6.3%.

Among respondents who had

heard of the virus, the vaccination rate was drastically higher in those who had been in Canada for fewer years: 7 of 34 (20.6%) in the 0 to 10 years group had been vaccinated compared with only 3 of 92 (3.3%) in the over 10 years group (Table 1).

**Reason for not being vaccinated**

Respondents who had not been vaccinated were directed to a follow-up question that sought to determine the reasons for their negative vaccination status (Table 2). Five options were offered:

1. Unaware that HPV could affect men
2. Unaware that vaccinations were available to men
3. Cost of vaccine
4. Don't like getting vaccines
5. Other

Respondents who chose option 5 were given the opportunity to write about their reason.

Of the 120 respondents who answered this question, the largest proportion (45.8%) indicated they were unaware that vaccinations for HPV were available to men, while 10.0% indicated the cost of the vaccine was

**Table 1. Vaccination status of survey respondents by demographic category.**

	Vaccinated (n = 11)	Not vaccinated or don't know status (n = 129)	Never heard of HPV (n = 35)
<b>Age</b>			
19–22	7	54	19
23–26	4	73	15
<b>Sexual identity</b>			
Heterosexual	7	110	33
Homosexual	2	10	0
Bisexual	1	7	1
Other	1	2	0
<b>Postsecondary institution</b>			
University	9	117	23
College	2	12	12
<b>Ethnicity</b>			
Caucasian	7	81	12
Asian/South Asian	4	31	15
African/Arab	0	1	5
Hispanic	0	4	0
Other	0	12	3
<b>Region of birth</b>			
North America	7	93	12
Asia	3	21	13
Europe	1	11	5
Middle East	0	4	5
<b>Years in Canada</b>			
0–10	7	27	18
Over 10	3	89	13

Note: One participant who had heard of HPV but did not disclose his vaccination status was not included in this table. Further, demographic data not disclosed by some respondents were not included in this table.

**Table 2. Reasons for not being vaccinated given by 120 respondents who had heard of HPV.**

Reason	Number of respondents
1. Unaware that HPV could affect men	9
2. Unaware that vaccinations were available to men	55
3. Cost of vaccine	12
4. Don't like getting vaccines	4
5. Other	27
Multiple responses (e.g., 1 + 2, 2 + 3)	13

the most significant barrier, 7.5% indicated they were unaware that HPV could affect men, and 3.3% indicated they did not like getting vaccines. Thirteen respondents (10.8%) chose multiple reasons, with option 1 (unaware that HPV could affect men) plus option 2 (unaware that vaccinations were available) being the most common.

**Knowledge of HPV**

The characteristics of the 141 respondents who had heard of HPV (80.1%) were examined to determine whether

there were significantly different levels of awareness according to demographic categories. Greater awareness of HPV correlated with being a university rather than a college student, being Caucasian, being born in North America, and living in Canada for over 10 years (Table 3).

Of the 141 males who had heard of HPV, 140 answered all 16 knowledge-based true-false questions regarding HPV and HPV vaccine. Respondents who had been vaccinated were able to correctly identify more statements than unvaccinated respondents. Com-

pared with heterosexual respondents, homosexual respondents were able to correctly identify more statements. There were no significant differences among other demographic groups, although Asian respondents correctly identified more statements than Caucasian respondents.

An analysis of correct responses to the survey questions was also performed to determine topic-specific knowledge of HPV (Table 4). Of the respondents who had previously heard of HPV, the vast majority were aware that it is a sexually transmit-

**Table 3. Characteristics of 141 respondents who had heard of HPV and 35 respondents who had not heard of HPV.**

	Had heard of HPV	Had not heard of HPV
<b>Sexual identity</b>		
Heterosexual	118	33
Homosexual	12	0
Bisexual	8	1
Other	3	0
<b>Postsecondary institution</b>		
University	126	23
College	15	12
<b>Ethnicity</b>		
Caucasian	89	12
Asian/South Asian	35	15
African/Arab	1	5
Hispanic	4	0
Other	12	3
<b>Region of birth</b>		
North America	101	12
Asia	23	13
Europe	12	5
Middle East	4	5
<b>Years in Canada</b>		
0-10	34	18
Over 10	92	13

Note: Demographic data not disclosed by some respondents were not included in this table.

**Table 4. Analysis of survey responses indicating topic-specific knowledge of HPV.**

Survey question	Answer	Correct responses	Incorrect responses*	Proportion of correct responses (%)
HPV can infect women	True	137	4	97.2
HPV infections can cause cervical cancer	True	125	15	89.3
HPV is a sexually transmitted infection	True	125	16	88.7
A vaccine for HPV is available to women	True	121	19	86.4
HPV infections are usually obvious	False	102	39	72.3
HPV cannot infect men	False	95	46	67.4
HPV vaccine exists that protects against cervical cancer	True	83	57	59.3
HPV infections can cause genital warts	True	79	59	57.2
A vaccine for HPV is not available to men	False	47	93	33.6
HPV infections can cause oral cancers	True	46	94	32.9
HPV infections cannot cause genital cancers in males	False	44	96	31.4
HPV infections cannot cause anal cancers	False	41	99	29.3
An HPV vaccine exists that can protect against genital warts	True	40	100	28.6
HPV infections can cause pharyngeal (throat) cancers	True	34	106	24.2
There are no HPV vaccines available that protect against other (non-cervical) cancers	False	22	118	15.7
Most HPV infections will not resolve on their own	False	21	117	15.2

\* Incorrect responses include those where the participants indicated that they did not know the answer.

ted infection (88.7%) that can infect women (97.2%) and cause cervical cancer (89.3%). Most were also aware that an HPV vaccine is available for women (86.4%), but significantly fewer knew this vaccine protects against cervical cancer (59.3%).

Interestingly, while a large proportion of respondents were aware that HPV infects men (67.4%), few knew that an HPV vaccine is available for men (33.6%). Of respondents who had previously heard of HPV, 57.2% knew that HPV could cause genital warts. Fewer knew that HPV is a causative agent in oral cancers (32.9%), genital cancers (31.4%), anal cancers (29.3%), and pharyngeal cancers (24.2%). Moreover, few respondents were aware that a vaccine could protect against genital warts (28.6%) and non-cervical cancers (15.7%). The smallest proportion of respondents (15.2%) knew that most HPV infections resolve on their own.

Further analysis was conducted to compare topic-specific knowledge of various demographic groups. More homosexual than heterosexual respondents knew that HPV can cause anal cancers (66.7% versus 25.6%). Homosexual respondents were also more aware than heterosexual respondents that an HPV vaccine exists that can protect against genital warts (58.3% versus 26.5%). Respondents who had been in Canada longer than 10 years were more aware than respondents who had been in Canada fewer years that HPV infections can cause cervical cancer (95.7% versus 76.5%). Men who were born in Asia (86.4%) or were of Asian/South Asian descent (72.7%) had greater awareness that HPV infections can cause genital warts than men who were born in North America (53%) or were of Caucasian descent (51.1%).

### Conclusions

Although HPV infection is of greatest concern in the context of cervical cancer in women, the virus can cause significant morbidity and mortality in other contexts and in both sexes. As a result, vaccination is currently recommended for all males age 9 through 26 by the Canadian National Advisory Committee on Immunization.

### Vaccination rates

In our study population of vaccine-eligible males, the vaccination rate was 6.3%. Although our study population was likely enriched for those who had been vaccinated, the literature suggests that vaccination rates may be highly variable depending on demographics and location.<sup>21,22</sup>

We found the vaccinated group of respondents to be diverse, other than being all of Caucasian or Asian/South Asian descent. Vaccinated respondents attended colleges and universities, were born in various countries, and reported various sexual orientations. Study respondents who had been in Canada fewer than 10 years had a significantly higher vaccination rate than those who had been in Canada longer than 10 years. In a seemingly contradictory finding, however, there was a positive correlation between the more years in Canada and having heard of HPV. It thus appears that the group of respondents who had lived in Canada fewer than 10 years was enriched for both individuals who had been vaccinated and individuals who had never heard of HPV.

We were unable to establish why respondents who had been vaccinated were disproportionately newer to Canada. One possible reason is that they represent an international socioeconomic group better able to access costly vaccination. Another possible reason is that health care providers

have been more inclined to discuss HPV vaccination with newcomers to Canada than with long-time residents. It is noteworthy that one of the few characteristics shared by members of the vaccinated population is superior knowledge of HPV, a finding that suggests better HPV knowledge promotes vaccination.

### Need for education

A sizable proportion of respondents had not heard of HPV (19.9%). Respondents surveyed at college health clinics were also less likely to have heard of HPV than those surveyed at university clinics. The reasons for this remain unclear. A significant proportion of individuals who had lived in Canada fewer than 10 years had never heard of HPV. The reasons for this are likely complex and could arise from a lack of awareness of HPV internationally, a lack of HPV-specific education in Canada, and cultural factors.

Among survey respondents who had heard of HPV (80.1%), there was a good understanding of HPV as a sexually transmitted infection that can cause cervical cancer. Knowledge surrounding HPV infections at other body sites and the availability of vaccination for males was poor. In this study, both HPV knowledge and vaccination rates were higher among homosexual respondents when compared with heterosexual respondents. This may be the result of recent campaigns to improve awareness of HPV among men who have sex with men, prompted by an increase in the prevalence of HPV-related anal cancers in this population.

When survey respondents gave reasons for their negative vaccination status, the largest proportion (45.8%) indicated they were unaware that vaccinations were available to men. This highlights the important role that education can play in increasing

awareness of HPV. Education regarding HPV-related morbidities and the many benefits conferred by vaccination could improve vaccination rates.

The groups identified by our study as likely to benefit from HPV education include college students and newcomers to Canada. HPV education might also challenge the belief in older populations of both sexes that most HPV infections are chronic and of lesser concern, and thus increase vaccine uptake, even though this belief was not found to be a major reason for lack of vaccination in our study.

### Study limitations

A major limitation of this study is the population surveyed. Because we used student health clinics to contact participants, the findings may not apply to all men, particularly those not attending postsecondary education institutions. As well, compared with other medical clinics, student health clinics are more likely to provide HPV vaccine information, thus increasing awareness in their visitors. Further, the voluntary nature of this survey may mean we obtained responses from men more engaged in their wellness, more knowledgeable about HPV than most clinic visitors or men in general, or both.

Despite these limitations, our results still indicate there is value in designing education campaigns to increase HPV awareness and knowledge, which in turn could improve vaccination rates for males.

### Competing interests

None declared.

### References

- Forman D, de Martel C, Lacey CJ, et al. Global burden of human papillomavirus and related diseases. *Vaccine* 2012; 30(suppl 5):F12-23.
- Moore RA, Ogilvie G, Fornika D, et al. Prevalence and type distribution of human papillomavirus in 5,000 British Columbia women—implications for vaccination. *Cancer Causes Control* 2009;20:1387-1396.
- Ogilvie GS, Cook DA, Taylor DL, et al. Population-based evaluation of type-specific HPV prevalence among women in British Columbia, Canada. *Vaccine* 2013;31: 1129-1133.
- Dunne EF, Nielson CM, Stone KM, et al. Prevalence of HPV infection among men: A systematic review of the literature. *J Infect Dis* 2006;194:1044-1057.
- Myers ER, McCrory DC, Nanda K, et al. Mathematical model for the natural history of human papillomavirus infection and cervical carcinogenesis. *Am J Epidemiol* 2000;151:1158-1171.
- Walboomers JM, Jacobs MV, Manos MM, et al. Human papillomavirus is a necessary cause of invasive cervical cancer worldwide. *J Pathol* 1999;189:12-19.
- Munoz N, Bosch FX, Castellsague X, et al. Against which human papillomavirus types shall we vaccinate and screen? The international perspective. *Int J Cancer* 2004;111:278-285.
- Kliwier EV, Demers AA, Elliott L, et al. Twenty-year trends in the incidence and prevalence of diagnosed anogenital warts in Canada. *Sex Transm Dis* 2009;36: 380-386.
- Marra F, Ogilvie G, Colley L, et al. Epidemiology and costs associated with genital warts in Canada. *Sex Transm Infect* 2009;85:111-115.
- Parkin DM, Bray F. Chapter 2: The burden of HPV-related cancers. *Vaccine* 2006; 24(suppl 3):S3/11-25.
- Watson M, Saraiya M, Ahmed F, et al. Using population-based cancer registry data to assess the burden of human papillomavirus-associated cancers in the United States: Overview of methods. *Cancer* 2008;113(10 suppl):2841-2854.
- Kreimer AR, Clifford GM, Boyle P, et al. Human papillomavirus types in head and neck squamous cell carcinomas worldwide: A systematic review. *Cancer Epidemiol Biomarkers Prev* 2005;14:467-475.
- Miralles-Guri C, Bruni L, Cubilla AL, et al. Human papillomavirus prevalence and type distribution in penile carcinoma. *J Clin Pathol* 2009;62:870-878.
- Ogilvie G, Anderson M, Marra F, et al. A population-based evaluation of a publicly funded, school-based HPV vaccine program in British Columbia, Canada: Parental factors associated with HPV vaccine receipt. *PLoS Med* 2010;7:e1000270.
- Tricco AC, Anonychuk AM, Ng C, et al. International acceptability of human papillomavirus vaccine: A systematic review. Presented at the 24th International Papillomavirus Conference and Clinical Workshop, Beijing, China, 3-9 November 2007.
- National Advisory Committee on Immunization. Update on human papillomavirus (HPV) vaccines. *Can Commun Dis Rep* 2012;38(ACS-1):62.
- Dahlstrom LA, Sundstrom K, Young C, et al. Awareness and knowledge of human papillomavirus in the Swedish adult population. *J Adolesc Health* 2012;50:204-206.
- Gerend MA, Magloire ZF. Awareness, knowledge, and beliefs about human papillomavirus in a racially diverse sample of young adults. *J Adolesc Health* 2008; 42:237-242.
- Blodt S, Holmberg C, Muller-Nordhorn J, et al. Human Papillomavirus awareness, knowledge and vaccine acceptance: A survey among 18-25 year old male and female vocational school students in Berlin, Germany. *Eur J Public Health* 2012; 22:808-813.
- Gilbert P, Brewer NT, Reiter PL, et al. HPV vaccine acceptability in heterosexual, gay, and bisexual men. *Am J Mens Health* 2011;5:297-305.
- Reiter PL, McRee AL, Kadis JA, et al. HPV vaccine and adolescent males. *Vaccine* 2011;29:5595-5602.
- Fontenot HB, Fantasia HC, Charyk A, et al. Human papillomavirus (HPV) risk factors, vaccination patterns, and vaccine perceptions among a sample of male college students. *J Am Coll Health* 2014;62:186-192. **BCMJ**