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# A National Survey of Canadian Adults on HPV: Knowledge, Attitudes, and Barriers to the HPV Vaccine



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## Abstract

**Objective:** Identifying human papillomavirus (HPV) vaccination motivators and barriers among adults could lead to new approaches to improve HPV vaccination rates in non-pediatric populations. This Canadian survey aimed to assess current knowledge of, attitudes towards, and barriers to the HPV vaccine among the general public.

**Methods:** An online panel was used to survey HPV unvaccinated women (n = 802) and vaccinated women (n = 250) 18 to 45 years old, as well as 18- to 26-year-old men (n = 200), in May and June 2016. A 16-item questionnaire collected data on sociodemographic factors, health-seeking behaviours, knowledge of HPV infection and its consequences, and the HPV vaccine. Data were stratified by sex and by vaccination status among women.

**Results:** The majority of individuals somewhat or strongly agreed that vaccination is an important aspect of disease prevention (vaccinated women, 93%; unvaccinated women, 85%; and men, 59%). However, a high proportion of patients were concerned about vaccine safety (vaccinated women, 26%; unvaccinated women, 40%; and men, 36%). Moreover, 58% to 61% of participants were generally cautious about taking any vaccine. The number one reported barrier to vaccination was not having a recommendation from a doctor (38%). Cost was seen as a barrier by only 18% to 20% of participants.

**Conclusion:** Canadian participants show a broad diversity in HPV knowledge and regarding barriers to vaccination. The youngest populations (vaccinated women and men) showed higher levels of knowledge regarding HPV.

**Key Words:** Human papillomavirus, HPV vaccination, HPV knowledge, national survey, Canadian adults

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## Résumé

**Objectif :** En cernant les facteurs de motivation et les obstacles touchant la vaccination contre le virus du papillome humain (VPH) chez les adultes, on pourrait trouver de nouvelles stratégies pour augmenter le taux de vaccination dans les populations non pédiatriques. Ce sondage canadien visait à évaluer les connaissances actuelles sur le vaccin anti-VPH, les attitudes à son égard et les obstacles à la vaccination dans la population générale.

**Méthodologie :** Nous avons utilisé une plateforme en ligne pour sonder des femmes non vaccinées contre le VPH (FNV; n = 802) et des femmes vaccinées (FV; n = 250) âgées de 18 à 45 ans, ainsi que des hommes de 18 à 26 ans (n = 200), en mai et juin 2016. Au moyen d'un questionnaire de 16 questions, nous avons recueilli des données sur les facteurs sociodémographiques, les comportements favorisant la santé, et les connaissances sur le VPH, ses conséquences et le vaccin. Les données ont été stratifiées par sexe, et par statut d'immunisation chez les femmes.

**Résultats :** La majorité des répondants étaient partiellement ou entièrement d'accord que la vaccination est un aspect important de la prévention des maladies (FV : 93 %; FNV : 85 %; hommes : 59 %). Cependant, une grande proportion des patients avaient des réserves quant à l'innocuité du vaccin (FV : 26 %; FNV : 40 %; hommes : 36 %). De plus, de 58 % à 61 % des participants étaient généralement prudents lorsqu'il était question de se faire vacciner. Le principal obstacle à la vaccination rapporté était l'absence de recommandation par un médecin (38 %). Le coût n'était vu comme un obstacle que par 18 % à 20 % des participants.

**Conclusions :** Les Canadiens ont un degré de connaissance du VPH et des obstacles à la vaccination très variables. Les populations plus jeunes (femmes vaccinées et hommes) présentaient des degrés de connaissance supérieurs.

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### National Advisory Committee on Immunization guidelines – July 2016

- 2vHPV, 4vHPV, or 9vHPV vaccine recommended for females aged 9 to 26 and may be used in females *over age 26* (no upper age limit) who have not been vaccinated previously or who have not completed the series
- *Is* recommended for those with current or past history of Pap abnormalities, cervical cancer, and anogenital warts
- 4vHPV or 9vHPV vaccine recommended for males aged 9 to 26 and may be used in males *over age 26* (no upper age limit) who have not been vaccinated previously or who have not completed the series

HPV: human papillomavirus; 2v, 2v, 9v: 2-valent, 4-valent, 9-valent, respectively.

From National Advisory Committee on Immunization. Updated recommendations on human papillomavirus (HPV) vaccines: 9-valent HPV vaccine and clarification of minimum intervals between doses in the HPV immunization schedule. Ottawa: Public Health Agency of Canada; 2017.

## INTRODUCTION

Human papillomavirus (HPV) is a sexually transmitted infection that can lead to cervical, anal, vaginal, vulvar, penile, and oropharynx cancers.<sup>1</sup> There are several types of HPV: high-risk types that have cancer-causing potential and low-risk types causing anogenital warts.<sup>2</sup>

Since 2006, Canada has authorized vaccines to help prevent most of the common high-risk and low-risk HPV types. A large body of evidence has documented high efficacy and excellent safety profiles of the vaccine.<sup>3,4</sup> HPV vaccination programs within Canada have focused largely on reaching adolescent girls through school-based vaccination programs, which were implemented across all provinces and territories between 2007 and 2010.<sup>5</sup> Between 2013 and 2016, six provinces extended school-based program coverage to include male students.<sup>6</sup> Currently, all Canadian provinces and territories fund HPV vaccination for boys.<sup>7</sup> In 2016, the National Advisory Committee on Immunization released updated guidelines recommending that the HPV vaccine be used for female and male patients aged 9 to 26 and that it may be used for women and men over age 26 (Box).<sup>3</sup>

Because the HPV vaccination has been targeted to, and funded for, adolescent populations, the majority of adults who could benefit from vaccination have not yet been reached. The best available estimates for HPV vaccination uptake in Canada come from a systematic review and meta-analysis of 12 observational studies and show that, among adolescents aged 18 and under, uptake is approximately 66.95% (95% confidence interval [CI] 55.00%–77.89%), as compared with only 13.58% (95% CI 10.93%–16.46%) among individuals aged 18 to 26.<sup>8</sup> Adults must access HPV vaccination opportunistically through their primary health care providers. To develop strategies to increase vaccination rates among adults, it is important to understand current barriers to HPV vaccination in the general population. This study aimed to explore the level of awareness of HPV among adult women aged 18 to 45 and young men aged 18 to 26. To our knowledge, this is the first survey to report

data on rates of HPV knowledge and attitudes among adults across Canada.

## METHODS

### Survey Administration

A cross-sectional online survey of Canadian adults was conducted from May to June 2016 by using LegerWeb, an online platform. The LegerWeb platform, which includes over 400 000 Canadians, was built using recruitment methods to maximize census representation. For this study, the sampling frame consisted of adult women (aged 18 to 45) and men (aged 18 to 26) throughout Canada. Random sampling with quotas was performed, and a sampling error estimate was calculated using probabilistic modelling. The goal was to survey a total of 1250 women and men from across Canada, including 250 women aged 18 to 26, 800 women aged 27 to 45, and 200 men aged 18 to 26. A probability sample of the same size would yield a margin of error of  $\pm 2.7\%$ , 19 times out of 20. The sampling list was accessed through LegerPoll; participants were offered \$2 to complete the survey. All participating individuals consented to the use of their data for research purposes.

### Research Tool

A novel questionnaire consisting of 16 items was developed to collect data on participant demographics, vaccination history, knowledge of HPV prevention, risks associated with HPV, the HPV vaccine, benefits or harms associated with the HPV vaccine, and attitudes towards care providers and sources of health information. A copy of the questionnaire is provided in online [Appendix 1](#). The questionnaire was pre-tested by key experts and adapted according to recommendations. Question format included multiple choice (seven questions), Likert scale (three questions), true or false (one question), and open-ended (two questions).

## Statistical Analysis

The results of the survey were summarized using frequencies and proportions for categorical variables and means and SD for continuous variables. Differences in responses among groups were measured using *t* tests for continuous variables and  $\chi^2$  tests for categorical variables (tested at  $\alpha = 0.05$  and  $\alpha = 0.01$ ). Results were stratified by respondent groups (unvaccinated women, vaccinated women, and men). Analyses were performed using SPSS software (IBM Corp., Armonk, NY) and WinCross software (The Analytical Group, Scottsdale, AZ).

## RESULTS

In total, 250 vaccinated women, 802 unvaccinated women, and 200 men responded to the survey. The response rate to the survey was 6%. The respondents' demographic profile is described in [Table 1](#). Respondents resided across 10 provinces, with the majority from Ontario (34%), Québec (30%), and British Columbia (12%). On average, unvaccinated women were older than vaccinated women (mean age 33 vs. 27 years). The mean age among male respondents was 22 years; 8% of male respondents had received the HPV vaccine. Unvaccinated women reported higher annual incomes, and they were more frequently married or living with their partners, likely attributable to the older age distribution in this group. Levels of educational attainment were similar across groups; 34% of participants held college diplomas, and 41% held university degrees. A greater proportion of unvaccinated women were Roman Catholic (30%) as compared with vaccinated women or men (22% and 18%, respectively). Sets of age-stratified tables by group are provided in online [Tables 1 to 3](#).

Health-seeking behaviours with respect to vaccination and cervical cancer screening frequency are presented in [Table 2](#). Women who had received the HPV vaccine were more likely to have received other vaccines as well when compared with unvaccinated women and men. This phenomenon was observed across the board for hepatitis B, hepatitis A, Td/Tdap (tetanus, diphtheria, pertussis), MMR (measles, mumps, rubella), chickenpox, meningococcal disease, rabies, pneumococcal, and yellow fever vaccines. Furthermore, the higher rates of vaccine receipt were not solely the result of the younger age distribution of vaccinated as compared with unvaccinated women because the male respondent group (composed entirely of 18- to 26-year-olds) also had lower vaccination rates. Among men and HPV-unvaccinated women, 15% and 18% reported receiving no vaccines at all within the past 10 years, respectively. The majority of women reported Pap screening every 1–3 years whether vaccinated or not;

however, 20% of vaccinated women, as compared with only 13% of unvaccinated women, reported never having had a Pap test. The higher rates of never having Pap screening among vaccinated women was likely a reflection of their younger age because Pap screening in most provinces does not begin until age 21.

## Knowledge Among Participants

Respondents demonstrated a wide range of knowledge regarding HPV infection and vaccination prevention. When asked the open-ended question “To the best of your knowledge, what is HPV?” approximately 40% of all respondents answered that HPV is a sexually transmitted disease, sexually transmitted infection, or venereal disease. As shown in [Table 3](#), vaccinated women were more knowledgeable about HPV overall and were more likely to recognize the benefits of HPV vaccination than unvaccinated women and men. With respect to knowledge of HPV infection, 89% of respondents accurately believed that “You are still at risk for HPV if you have only had one sexual partner,” and 63% of respondents accurately believed that three-quarters of Canadians will be infected by HPV at least once in their lifetime. Compared with unvaccinated women, vaccinated women were significantly more likely to consider that the likelihood of being infected with HPV is high. Knowledge gaps in terms of HPV prevention were identified; for example, 73% of respondents falsely believed that HPV can be prevented by safe sex practices, such as condom use. Unvaccinated women and men were less aware than vaccinated women that HPV infection may lead to cervical and vaginal cancers and genital warts. Less than one-third of all participants were aware of the association between HPV and vulvar cancer, anal cancer, and cervical dysplasia.

Overall, 86% of respondents somewhat or strongly agreed that vaccination is an important element of disease prevention, with the agreement rate being highest among vaccinated women (93%), followed by unvaccinated women (85%), and men (81%). However, awareness of the existence of a vaccine to prevent HPV infection and the diseases associated with the virus was low among men (33%) and unvaccinated women (64%). Additionally, a substantial proportion of respondents were unaware of the benefits of HPV vaccination in adults. A total of 32% of respondents falsely believed that if you have been exposed to HPV, it is too late to be vaccinated, and 20% falsely believed that women above age 18 can no longer be vaccinated.

## Motivators for HPV Vaccination

Overall results revealed several motivators for being vaccinated. Among vaccinated women ( $n = 250$ ) and vaccinated

**Table 1. Demographic traits among HPV vaccinated and unvaccinated women and men participating in a Canadian survey on HPV (2016)<sup>a</sup>**

Demographic traits	Unvaccinated women, n (%)	Vaccinated women, n (%)	Men, n (%)	Total, N (%)
<b>Age</b>				
18–26	142 (17.7)	122 (48.8) <sup>b</sup>	200 (100)	464 (37.1)
27–45	660 (82.3)	128 (51.2) <sup>b</sup>	—	788 (62.9)
Age (mean)	33.1	27.2 <sup>b</sup>	22.4 <sup>b</sup>	30.2
<b>Education</b>				
Elementary	2 (0.2)	1 (0.4)	4 (2.0)	7 (0.6)
High school	165 (20.6)	63 (25.2)	64 (32.0)	292 (23.3)
College	277 (34.5)	84 (33.6)	62 (31.0)	423 (33.8)
University	351 (43.8)	100 (40.0)	66 (33.0)	517 (41.3)
<b>Annual household income before taxes</b>				
< \$20 000	57 (7.1)	43 (17.2) <sup>b</sup>	39 (19.5)	139 (11.1)
\$20 000–39 999	131 (16.3)	33 (13.2)	42 (21.0)	206 (16.5)
\$40 000–59 999	122 (15.2)	38 (15.2)	27 (13.5)	187 (14.9)
\$60 000–79 999	128 (16.0)	45 (18.0)	17 (8.5)	190 (15.2)
\$80 000–99 999	97 (12.1)	28 (11.2)	18 (9.0)	143 (11.4)
≥\$100 000	156 (19.5)	32 (12.8) <sup>b</sup>	33 (16.5)	221 (17.7)
<b>Marital status</b>				
Single	253 (31.5)	133 (53.2) <sup>b</sup>	163 (81.5) <sup>b</sup>	549 (43.8)
Married or living together	509 (63.5)	106 (42.4) <sup>b</sup>	28 (14.0)	643 (51.4)
Widowed	4 (0.5)	1 (0.4)	1 (0.5)	6 (0.5)
Separated	13 (1.6)	—	—	13 (1.0)
Divorced	12 (1.5)	5 (2.0)	1 (0.5)	18 (1.4)
Prefer not to answer	11 (1.4)	5 (2.0)	7 (3.5)	23 (1.8)
<b>Religious affiliation</b>				
Roman Catholic	240 (29.9)	56 (22.4) <sup>c</sup>	36 (18.0)	332 (26.5)
Atheist	123 (15.3)	51 (20.4)	39 (19.5)	213 (17.0)
Agnostic	92 (11.5)	36 (14.4)	28 (14.0)	154 (12.3)
Spiritual, but not affiliated with a religion	90 (11.2)	36 (14.4)	18 (9.0)	146 (11.7)
Protestant	56 (7.0)	19 (7.6)	5 (2.5)	80 (6.4)
Orthodox Christian	14 (1.7)	5 (2.0)	7 (3.5)	26 (2.1)
Other Christian	64 (8.0)	11 (4.4) <sup>c</sup>	10 (5.0)	85 (6.8)
Muslim	12 (1.5)	3 (1.2)	9 (4.5)	24 (1.9)
Buddhist	15 (1.9)	1 (0.4) <sup>c</sup>	4 (2.0)	20 (1.6)
Hindu	8 (1.0)	5 (2.0)	6 (3.0)	19 (1.5)
Jewish	8 (1.0)	5 (2.0)	4 (2.0)	12 (1.0)
Sikh	5 (0.6)	1 (0.4)	2 (4.0)	10 (0.8)
<b>Location of residence</b>				
British Columbia	115 (14.3)	16 (6.4) <sup>b</sup>	19 (9.5)	150 (12.0)
Alberta	89 (11.1)	14 (5.6) <sup>b</sup>	10 (5.0) <sup>b</sup>	113 (9.0)
Saskatchewan	39 (4.9)	7 (2.8)	1 (0.5) <sup>b</sup>	46 (3.7)
Manitoba	24 (3.0)	6 (2.4)	6 (3.0)	36 (2.9)
Ontario	224 (27.9)	116 (46.4) <sup>b</sup>	89 (44.5) <sup>b</sup>	429 (34.3)
Quebec	231 (28.8)	79 (31.6)	65 (32.5)	375 (30.0)

(continued)

**Table 1. (Continued)**

Demographic traits	Unvaccinated women, n (%)	Vaccinated women, n (%)	Men, n (%)	Total, N (%)
New Brunswick	24 (3.0)	2 (0.8) <sup>b</sup>	2 (1.0)	28 (2.2)
Nova Scotia	39 (4.9)	7 (2.8%)	6 (3.0)	52 (4.2)
Prince Edward Island	8 (1.0)	1 (0.4)	2 (1.0)	11 (0.9)
Newfoundland and Labrador	10 (1.2)	2 (0.8)	0 (0)	12 (0.9)
Total	802	250	200	1252

<sup>a</sup> Comparison groups: unvaccinated women versus vaccinated women; men versus all women (vaccinated and unvaccinated).

<sup>b</sup> Indicates significance at the 99% level.

<sup>c</sup> Indicates significance at the 95% level.

HPV: human papillomavirus.

men (n = 16), the most common motivators for vaccination were protecting their health (75%), preventing the spread of HPV (44%), having a recommendation from their doctor (34%), and the fact that their vaccine was paid

for or covered by their private insurance (34%). When unvaccinated women and men were asked what would motivate them to be vaccinated, the majority of respondents said a recommendation from or discussion with their

**Table 2. Health-seeking behaviours among participant groups<sup>a</sup>**

Behaviours	Unvaccinated women, n (%)	Vaccinated women, n (%)	Men, n (%)	Total, N (%)
<b>Vaccinations within the last 10 years</b>				
Flu	442 (55.1)	145 (58.0)	97 (48.5)	684 (54.6)
Hepatitis B	247 (30.8)	175 (70.0) <sup>b</sup>	70 (35.0)	492 (39.3)
Td/Tdap	266 (33.2)	117(46.8) <sup>b</sup>	53 (26.5) <sup>b</sup>	436 (34.8)
Hepatitis A	203 (25.3)	146 (58.4) <sup>b</sup>	73 (36.5)	422 (33.7)
MMR	164 (20.4)	96 (38.4) <sup>b</sup>	33 (16.5) <sup>b</sup>	293 (23.4)
Chickenpox/varicella	49 (6.1)	59 (23.6) <sup>b</sup>	33 (16.5) <sup>c</sup>	141 (11.3)
Meningococcal disease	45 (5.6)	47 (18.8) <sup>b</sup>	20 (10.0)	112 (8.9)
Rabies	38 (4.7)	41 (16.4) <sup>b</sup>	18 (9.0)	97 (7.7)
Pneumococcal	34 (4.2)	34 (13.6) <sup>b</sup>	11 (5.5)	79 (6.3)
Yellow fever	30 (3.7)	30 (12.0) <sup>b</sup>	15 (7.5)	75 (6.0)
Typhoid	4 (0.5)	3 (1.2)	4 (2.0)	11 (0.9)
No vaccines within past 10 years	141 (17.6)	—	20 (15.0)	171 (13.7)
HPV	-	250 (100)	16 (8.0)	266 (21.2)
<b>How often do you receive Pap tests?</b>				
Every year	242 (30.2)	81 (32.4)	—	323/1052 (30.7)
Every 2 years	25 (3.1)	1 (0.4)	—	26/1052 (2.5)
Once every 3 years	269 (33.5)	79 (31.6)	—	348/1052 (33.1)
I have had a Pap test previously but do not go regularly	135 (16.8)	32 (12.8)	—	167/1052 (15.9)
I have never had a Pap test	105 (13.1)	51 (20.4) <sup>b</sup>	—	156/1052 (14.8)
Other	2 (0.8)	9 (0.9)	—	9/1052 (0.9)
I don't know/prefer not to answer	19 (2.4)	4 (1.6)	—	23/1052 (2.2)
Total	802	250	200	1252

<sup>a</sup> Comparison groups: unvaccinated women versus vaccinated women; men versus all women (vaccinated and unvaccinated).

<sup>b</sup> Indicates significance at the 99% level.

<sup>c</sup> Indicates significance at the 95% level.

HPV: human papillomavirus; MMR: measles, mumps, rubella; Td/Tdap: tetanus, diphtheria, pertussis.

**Table 3. HPV knowledge and attitudes among participant groups<sup>a</sup>**

Knowledge and attitudes	Unvaccinated women, n (%)	Vaccinated women, n (%)	Men, n (%)	Total, N (%)
<b>Awareness of HPV consequences</b>				
Cervical cancer	599 (74.7)	215 (86.0) <sup>b</sup>	113 (56.5)	927 (74.0)
Genital warts	367 (45.8)	150 (60.0) <sup>b</sup>	90 (45.0)	607 (48.5)
Vaginal cancers	294 (36.7)	122 (48.8) <sup>b</sup>	69 (34.5)	485 (38.7)
Vulvar cancers	193 (24.1)	78 (31.2) <sup>c</sup>	44 (22.0)	315 (25.2)
Anal cancer	132 (16.5)	59 (23.6) <sup>c</sup>	45 (22.5)	236 (18.8)
Cervical dysplasia	120 (15.0)	53 (21.2)	30 (15.0)	203 (16.2)
<b>Beliefs regarding HPV vaccine benefits</b>				
Prevention of cervical cancer	575 (71.7)	217 (86.8) <sup>b</sup>	116 (58) <sup>b</sup>	908 (72.5)
Prevention of vulvar and vaginal cancers	372 (46.4)	150 (60.0) <sup>b</sup>	88 (44.0)	610 (48.7)
Prevention of anal cancers	234 (29.2)	93 (37.2) <sup>c</sup>	72 (36.0)	399 (31.9)
Prevention of genital warts	361 (45.0)	142 (56.8) <sup>b</sup>	101 (50.5)	604 (48.2)
Less likely to develop precancerous lesions	401 (50.0)	162 (64.8) <sup>b</sup>	84 (42.0)	647 (51.7)
Prevents HPV transmission to partners	464 (57.9)	187 (74.8) <sup>b</sup>	128 (64.0)	779 (62.2)
<b>Reasons for not being vaccinated</b>				
My doctor has never discussed it with me	316 (39.4)	—	55 (29.9) <sup>c</sup>	371/986 (37.6)
I've never really thought of it	264 (32.9)	—	80 (43.5) <sup>b</sup>	344/986 (34.9)
I don't know enough about it	242 (30.2)	—	56 (30.4)	298/986 (30.2)
I am married/in a stable relationship	209 (26.1)	—	15 (8.2) <sup>b</sup>	224/986 (22.7)
I'm too old for the HPV vaccine	192 (23.9)	—	7 (3.8) <sup>b</sup>	199/986 (20.2)
Cost/no private insurance	158 (19.7)	—	33 (17.9)	191/986 (19.4)
I'm not sure it's safe	145 (18.5)	—	26 (14.1)	171/986 (17.3)
Potential health risks	107 (13.3)	—	23 (12.5)	130/986 (13.2)
Potential side effects	107 (13.3)	—	20 (10.9)	127/986 (12.9)
Product(s) haven't been around long enough	98 (12.2)	—	14 (7.6) <sup>c</sup>	112/986 (11.4)
I am still undecided	48 (6.0)	—	11 (6.0)	59/986 (6.0)
I don't like needles	43 (5.4)	—	9 (4.9)	52/986 (5.3)
I don't agree with vaccination	36 (4.5)	—	6 (3.3)	42/986 (4.3)
Not aligned with my religious/cultural beliefs	17 (2.1)	—	9 (4.9)	26/986 (2.6)
The HPV vaccine doesn't work	13 (1.6)	—	4 (2.2)	17/986 (1.7)
I'm a male/do not feel the need/less risks	1 (0.1)	—	14 (7.6) <sup>b</sup>	15/986 (1.5)
Not sexually active	11 (1.4)	—	2 (1.1)	13/986 (1.3)
Already have HPV/already sexually active/already at risk	10 (1.2)	—	—	10/986 (1.0)
I don't know	55 (6.9)	—	24 (13.0) <sup>b</sup>	79/986 (8.0)
<b>Total</b>	<b>802</b>	<b>250</b>	<b>200</b>	<b>1252</b>

<sup>a</sup> Comparison groups: unvaccinated women versus vaccinated women; men versus all women (vaccinated and unvaccinated).

<sup>b</sup> Indicates significance at the 99% level.

<sup>c</sup> Indicates significance at the 95% level.

HPV: human papillomavirus.

doctor (55%) or whether the vaccine was paid for or covered by private insurance (31%). Unvaccinated men were more likely than unvaccinated women to report that knowing someone who has HPV would motivate them to be vaccinated.

Knowledge was identified as a motivator for HPV vaccination; 28% of vaccinated individuals cited knowledge of the risks associated with HPV as a motivator for being vaccinated. Unvaccinated individuals reported they would be motivated if they had more information on the

efficacy of the vaccine (31%), the safety of the vaccine (25%), and the risks of contracting HPV (18%). The most commonly accessed sources of health information reported by participants were doctors (85%), websites (68%), pharmacists (42%), Health Canada (39%), and nurses (33%). In terms of the reliability of information, respondents perceived doctors to be the most trustworthy source of information (95%), followed by nurses (91%), Health Canada (90%), pharmacists (88%), and Public Health (85%).

### Barriers to HPV Vaccination

Reasons for not being vaccinated are shown in Table 3. The top three reported reasons for not being vaccinated against HPV were not having discussed HPV vaccination with a doctor (38%), not having considered HPV vaccination (35%), and not knowing enough about HPV vaccination (30%). Lack of awareness was also demonstrated by the fact that only 64% of unvaccinated women and 33% of men were aware of the existence of the HPV vaccine. Women were more likely to report not seeking vaccination because they were too old (24%) or were in a married or stable relationship (26%). Only 1.5% of unvaccinated participants cited religious beliefs as a top reason for not being vaccinated.

Concerns regarding the safety of HPV vaccination and vaccines in general were common. Approximately 60% of participants expressed caution about receiving any vaccine. Despite having received the vaccine, 25% of vaccinated women were unsure of the safety of the vaccine. This concern was higher among unvaccinated women (40%) and men (36%). Cost or lack of private insurance was reported as a reason for not being vaccinated by 19% of unvaccinated women and men. Furthermore, nearly 50% of respondents somewhat or strongly agreed with the statement that if the HPV vaccine was necessary, then the government would pay for it. Additionally, individuals may not feel motivated to receive the vaccine if they do not perceive themselves to be at risk. In this sample, 28% of respondents agreed with the statement “HPV is not something that affects someone like me,” and 19% of female respondents agreed that “You don’t need the HPV vaccine if you get a regular Pap test from your doctor.”

## DISCUSSION

This study of Canadian adults uncovered several knowledge gaps with respect to HPV infection and the benefits of HPV vaccination for adult populations. The majority of unvaccinated individuals reported that they would be vaccinated if the vaccine were recommended by their doctors, and cost was identified as a barrier by only 20% of

respondents; however, participants may have been unaware of the price of the HPV vaccine (approximately \$450 for three doses) and may not have voiced concern for this reason. Limited awareness of the HPV vaccine continues to be a barrier to access: the most commonly cited reasons for not being vaccinated against HPV were related to lack of knowledge.

The survey found that vaccinated women were more knowledgeable about HPV when compared with unvaccinated women and men. Vaccinated women also had higher rates of vaccination against other viruses, a finding that perhaps reflects a more positive view of vaccine safety and efficacy in general among this group or a more complete approach towards vaccination taken by their primary health care provider. Male respondents demonstrated on average lower levels of knowledge of HPV when compared with women. The 8% of men who reported receiving the vaccine in the study likely did so opportunistically and not from the in-school vaccine program; the earliest school-based programs including boys were initiated in 2013–2015 in three Canadian provinces (Prince Edward Island, Nova Scotia, and Alberta),<sup>9</sup> at which point the male respondents included in our study would have been too old to participate in school-based vaccination.

With respect to screening, 13% of unvaccinated women reported never having had a Pap test. These results are likely explained by the inclusion of female participants aged 18 to 21, for whom Pap screening is not recommended. Continued efforts should be made to conduct cervical cancer screening among women, particularly those who have not received the HPV vaccine and may be at higher risk for cervical cancer. Among unvaccinated women, a common reason for not seeking the vaccine is older age. Further efforts should be made to educate individuals and health care providers on the benefits of HPV vaccinations because even if an individual is already infected with one HPV type, the vaccine can provide benefit by protecting against other types.<sup>3</sup>

### Framing Our Results Within Other Studies

Most studies on knowledge of HPV and attitudes towards vaccination in Canada have focused on adolescents or their parents’ sentiments about vaccination of their children<sup>10–13</sup> or college-aged women<sup>14,15</sup> and men.<sup>16–18</sup> However, none of these studies surveyed individuals above age 26 regarding their perception of HPV risk and motivators or barriers with respect to their own vaccination. In our study, 82% of unvaccinated women and 51% of vaccinated women were over age 26; therefore, the responses of our survey provide novel information representing adult women.

In terms of motivators for vaccination, we found that the majority of the unvaccinated individuals surveyed would accept the vaccine provided it was recommended by a physician, they had greater knowledge about the vaccine, or cost barriers were removed. The majority of documented studies of methods that increase HPV vaccine uptake have occurred among adolescents and young adults up to age 26.<sup>19</sup> One such study found that physicians' recommendations for vaccines were significantly associated with vaccine uptake among women aged 19 to 26.<sup>20</sup> It has also been demonstrated in a Canadian context that HPV vaccine uptake rates are higher among publicly funded programs (67%) versus programs where participants must pay out of pocket (14%).<sup>8</sup> Further research regarding interventions to increase uptake in adults is needed.

### Limitations of the Study

Given the sampling methodology, these results are largely generalizable to populations across Canada. The observed response rate was low but standard for surveys administered from the LegerWeb platform because of the sampling methodology used. To ensure that the quota sample size was met for each group, a mass invitation was sent to a random sample representative of the Canadian population, and data were collected only until each group had been filled, thus contributing to what appears to be a low response rate. Nonetheless, with any survey study design there is a strong potential for an impact of selection bias. In our study, it is possible that individuals with a greater interest in HPV may have been more likely to respond to this survey. Unfortunately, no measures to collect data on non-response bias were available for our analysis. The unvaccinated women surveyed were on average older than the vaccinated women, so differences in responses may reflect age cohort trends and differential targeting of health information among groups. We engaged in best efforts to mitigate confounding related to age by providing age-stratified tables (online [Tables 1–3](#)). Additionally, the comparison group of male respondents was relatively small because analyzing male-female differences was not the principal aim of this study.

### CONCLUSION

Evidence has shown that HPV vaccine acceptability is highest when individuals believe that HPV infection is likely and that the vaccine is effective and when a strong recommendation for vaccination comes from a health care provider.<sup>21</sup> Many unvaccinated individuals would be open to receiving the vaccine and would also benefit from it. To increase HPV vaccine uptake among adults, it is essential for doctors to identify unvaccinated patients, counsel them on the

benefits of vaccination, and prescribe the vaccine whenever possible. Public health messages regarding HPV vaccination must be inclusive of adult women and men and should convey information regarding the significant and continuing benefits of HPV vaccination beyond adolescence.

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### SUPPLEMENTARY DATA

Supplementary data related to this article can be found at <https://doi.org/10.1016/j.jogc.2019.05.005>.

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## Appendix 1. HPV Adult Survey

**Table legend:** The survey consists of multiple choice (Q1, Q4, Q5, Q8, Q9, Q10, Q11); Likert-scale questions (Q2, Q7, Q12); true or false (Q6), open-ended questions (Q3, Q5, Q5b)

**Screening question 1 – In what part of Canada do you live?**

**Screening question 2 - Please specify your gender**

**Screening question 3 – How old are you?**

**Screening question 4 – Have you received any of the following vaccines/been vaccinated to prevent any of the following diseases in the last 10 years?**

- Flu
- Hep B
- Td/Tdap (Tetanus, diphtheria, pertussis)
- Hep A
- MMR (measles, mumps, rubella)
- HPV
- Chickenpox/varicella
- Meningococcal disease
- Rabies
- Pneumococcal
- Yellow fever
- Typhoid
- Other
- None
- I don't know/prefer not to answer

**Q. 1 – How often do you go to a doctor for routine Pap tests? (Women only)**

- Every year
- Every 2 years
- Once every 3 years
- I have had a Pap test previously but do not go regularly
- I have never had a Pap test
- Other – specify
- I don't know/prefer not to answer

**Q. 2 - Please indicate to what extent you agree/disagree with each of the following statements?**

*(Strongly agree, somewhat agree, somewhat disagree, strongly disagree)*

- Having Pap screening every 3 years is sufficient
- Pap tests are an effective way of screening for cervical cancer

- Pap tests are an effective way of preventing cervical cancer
- Vaccination is an important aspect of disease prevention
- I am generally cautious about taking any vaccine

**Q. 3 – To the best of your knowledge what is HPV (human papillomavirus)?**

**Q. 4 – As far as you are aware, which of the following are possible consequences of becoming infected with HPV?**

- Cervical cancer
- Genital warts
- Cervical dysplasia
- Vulvar cancers
- Vaginal cancers
- Anal cancer
- Throat cancer
- Mouth/oral cancer
- Other
- I don't know
- I prefer not to answer

**Q. 5 – Before today, had you hear of any vaccine to prevent HPV and diseases associated with the virus?**

- Yes
- No
- I don't know/prefer not to answer

**Q. 5 (cont) – If yes, please specify name**

- Gardasil
- The HPV vaccine (unspecified)
- Other
- Don't know/no answer

**Q. 5b - If yes, what do you know about the vaccine to prevent HPV? (*open-ended*)**

**Q. 6 – To the best of your knowledge which of the following statements are true or false:**

- HPV affects both men and women
- Cervical cancer is the only risk associated with HPV
- If you don't have genital warts then you don't have HPV
- Only teen girls need/can be vaccinated for HPV
- Even if you have been exposed to HPV you can be vaccinated
- Older women (18 years and older) can't be vaccinated against HPV

- HPV can be prevented by using safe sex practices (i.e. condom use)
- You are still at risk for HPV if you have only had one sexual partner
- About 75% of Canadians will be infected by HPV at least once in their lifetime

**Q. 7 – Please indicate the extent you agree/disagree with each of the following statements**

*(Strongly agree, somewhat agree, somewhat disagree, strongly disagree)*

- HPV is a serious health risk
- HPV affects both men and women
- The likelihood of becoming infected by HPV is high
- It only takes one sexual partner to become infected by HPV
- HPV is not something that affects someone like me
- You don't need the HPV vaccine if you get a regular Pap test from your doctor
- If the HPV vaccine was necessary then the government would pay for it
- The HPV vaccine doesn't work
- I am not sure about the safety of the HPV vaccine
- I would get vaccinated against HPV if it was recommended by my doctor
- I know others who have received the HPV vaccine

**Q. 8 – Which of the following do you consider to be potential benefits of the HPV vaccine:**

- Prevention of cervical cancer
- Prevent the spread of HPV to sexual partners
- Less likely to develop precancerous lesions
- Prevention of vulvar and other vaginal cancers
- Prevention of genital warts
- Prevention of anal cancers
- I don't see any benefit to the vaccine
- I don't know

**Q. 9 – Which of the following, if any, are reasons you have not been vaccinated against HPV?**

- My doctor has never discussed it with me
- I've never really thought about it
- I don't know enough about it
- I am married/in a stable relationship
- I'm too old for the HPV vaccine
- Cost/no private insurance
- I'm not sure it's safe
- Potential health risks
- Potential side effects
- Product(s) haven't been around long enough

- I am still undecided
- I don't like needles
- I don't agree with vaccination
- Not aligned with my religious/cultural beliefs
- The HPV vaccine doesn't work
- I'm a male/do not feel the need/less risks
- Not sexually active
- Already have HPV/already sexually active/already at risk
- Already vaccinated
- Other
- I don't know

**Q. 10a – Among the reasons identified above, what are the top three reasons you have not been vaccinated against HPV? (*unvaccinated individuals only*)**

**Q. 10b - what motivated you/what would motivate you to get vaccinated against HPV?**

- Protecting my health
- Preventing the spread of HPV
- A recommendation from my doctor
- Vaccine was paid/covered by private insurance coverage
- Discussions with my doctor
- Information on the risks associated with contracting HPV
- Information on the efficacy of the vaccine
- Discussions with my parents or relatives
- Information on the safety of the vaccine
- One of my friends got vaccinated
- I know someone who has HPV
- I know someone who has had cervical cancer
- Offered at school
- Mandatory at school
- Other
- Don't know/prefer not to answer

**Q. 11 - Which, if any, following resources do you use to access information about your health?**

- Doctor
- Websites
- Pharmacist
- Health Canada
- Nurse
- Friends/family
- Public health
- Print articles
- News program
- Posters/materials in doctor's office or pharmacy
- TV advertising
- Chiropractor
- Naturopath

- Materials from pharmaceutical companies
- Homeopath
- Spiritual leader
- Other health care providers
- Midwife
- Public health/sexual health clinic
- I don't know/I prefer not to answer

**Q. 12 - In your opinion, how trustworthy are each of the following as sources for information about HPV and the HPV vaccine?**

*(Very trustworthy, somewhat trustworthy, not very trustworthy, not at all trustworthy, I don't know, I prefer not to answer)*

- Websites
- Doctor

- Nurse
- Print articles
- News program
- Pharmacist
- Naturopath
- Chiropractor
- Spiritual leader
- Homeopath
- Materials from pharmaceutical companies
- Health Canada
- Public health
- TV advertising
- Friends/family
- Posters/materials in doctor's office or pharmacy
- Other healthcare providers
- Midwife

**Supplemental Table 1. Age-stratified Demographic traits among HPV vaccinated and unvaccinated women and men participating in a Canadian survey on HPV (2016)**

Age group	Unvaccinated women		Vaccinated women		Men	Total
	18-26	27-45	18-26	27-45	18-26	18-45
<b>Education</b>						
Elementary	0.7%	0.2%		0.8%	2.0%	0.6%
High school	32.4%	18.0%	39.3%	11.7%	32.0%	23.3%
College	28.2%	35.9%	32.0%	35.2%	31.0%	33.8%
University	38.0%	45.0%	28.7%	50.8%	33.0%	41.3%
<b>Annual Household Income before taxes</b>						
< \$20 000	15.5%	5.3%	27.9%	7.0%	19.5%	11.1%
\$20 000 – 39 999	21.8%	15.2%	14.8%	11.7%	21.0%	16.5%
\$40 000 – 59 999	15.5%	15.2%	12.3%	18.0%	13.5%	14.9%
\$60 000 – 79 999	14.1%	16.4%	9.8%	25.8%	8.5%	15.2%
\$80 000 – 99 999	7.0%	13.2%	9.0%	13.3%	9.0%	11.4%
≥ \$100 000	6.3%	22.3%	8.2%	17.2%	16.5%	17.7%
<b>Marital status</b>						
Single	62.0%	25.0%	72.1%	35.2%	81.5%	43.8%
Married or living together	34.5%	69.7%	24.6%	59.4%	14.0%	51.4%
Widowed		0.6%		0.8%	0.5%	0.5%
Separated	0.7%	1.8%				1.0%
Divorced	0.7%	1.7%		3.9%	0.5%	1.4%
Prefer not to answer	2.1%	1.2%	3.3%	0.8%	3.5%	1.8%
<b>Religious affiliation</b>						
Roman catholic	26.1%	30.8%	26.2%	18.8%	18.0%	26.5%
Atheist	13.4%	15.8%	25.4%	15.6%	19.5%	17.0%

*(continued)*

**Supplemental Table 1. (Continued)**

	Unvaccinated women		Vaccinated women		Men	Total
Agnostic	13.4%	10.8%	16.4%	12.5%	14.0%	12.3%
Spiritual, but not affiliated with a religion	13.4%	11.1%	11.5%	17.2%	9.0%	11.7%
Protestant	5.6%	8.5%	4.1%	4.7%	5.0%	6.8%
Orthodox Christian	2.1%	8.0%	4.1%	10.9%	2.5%	6.4%
Other Christian	1.4%	1.8%	1.6%	2.3%	3.5%	2.1%
Muslim	2.1%	1.4%	0.8%	1.6%	4.5%	1.9%
Buddhist	4.9%	1.2%	0.8%		2.0%	1.6%
Hindu	2.1%	0.8%	2.5%	1.6%	3.0%	1.5%
Jewish	1.4%	0.2%	0.8%	3.1%	2.0%	1.0%
Sikh	2.1%	0.3%		0.8%	2.0%	0.8%
<b>Location of residence</b>						
British Columbia	9.9%	15.3%	4.1%	8.6%	9.5%	12.0%
Alberta	13.4%	10.6%	8.2%	3.1%	5.0%	9.0%
Saskatchewan	5.6%	4.5%	3.3%	2.3%	0.5%	3.7%
Manitoba	3.5%	2.9%	3.3%	1.6%	3.0%	2.9%
Ontario	5.0%	9.0%	13.4%	10.6%	8.2%	3.1%
Quebec	23.2%	30.0%	50.8%	13.3%	32.5%	30.0%
New Brunswick	3.5%	2.9%	3.3%	1.6%	3.0%	2.2%
Nova Scotia	9.9%	3.8%	2.5%	3.1%	3.0%	4.2%
Prince Edward Island	2.1%	0.8%	0.8%		1.0%	0.9%
Newfoundland	0.7%	1.4%	0.8%	0.8%		1.0%
<b>TOTAL</b>	<b>142</b>	<b>660</b>	<b>122</b>	<b>128</b>	<b>200</b>	<b>1252</b>

**Supplemental Table 2. Health-seeking behaviours among participant groups stratified by age**

Age group	Unvaccinated women		Vaccinated women		Men	Total
	18-26	27-45	18-26	27-45		
<b>Vaccinations within the last 10 years</b>						
Flu	50.0%	56.2%	50.8%	64.8%	48.5%	54.6%
Hepatitis B	39.4%	28.9%	71.3%	68.8%	35.0%	39.3%
Td/Tdap	34.5%	32.9%	46.7%	46.9%	26.5%	34.8%
Hepatitis A	31.7%	23.9%	59.0%	57.8%	36.5%	33.7%
MMR	27.5%	18.9%	34.4%	42.2%	16.5%	23.4%
Chickenpox/varicella	11.3%	5.0%	20.5%	26.6%	16.5%	11.3%
Meningococcal disease	10.6%	4.5%	14.8%	22.7%	10.0%	8.9%
Rabies	9.2%	3.8%	9.8%	22.7%	9.0%	7.7%
Pneumococcal	3.5%	4.4%	4.9%	21.9%	5.5%	6.3%
Yellow fever	3.5%	3.8%	6.6%	17.2%	7.5%	6.0%
Typhoid	0.7%	0.5%		2.3%	2.0%	0.9%
No vaccines within past 10 years	14.8%	18.2%			15.0%	13.7%
HPV			100.0%	100.0%	8.0%	21.2%
<b>How often do you receive Pap tests</b>						
Every year	23.2%	31.7%	29.5%	35.2%		30.7%

(continued)

**Supplemental Table 2. (Continued)**

	Unvaccinated women		Vaccinated women		Men	Total
Every 2 years	2.8%	3.2%		0.8%		2.5%
Once every three years	16.2%	37.3%	15.6%	46.9%		33.1%
I have had a Pap test previously but do not go regularly	18.3%	16.5%	15.6%	10.2%		15.9%
I have never had a Pap Test	36.6%	8.0%	36.9%	4.7%		14.8%
Other	0.7%	0.9%		1.6%		0.9%
I don't know/prefer not to answer	2.1%	2.4%	2.5%	0.8%		2.2%
<b>TOTAL</b>	<b>142</b>	<b>660</b>	<b>122</b>	<b>128</b>	<b>200</b>	<b>1252</b>

Abbreviations: Td/Tdap = tetanus, diphtheria, pertussis; MMR = measles, mumps, rubella

**Supplemental Table 3. HPV knowledge and attitudes among participant groups stratified by age**

	Unvaccinated women		Vaccinated women		Men	Total
<b>Age group</b>	18-26	27-45	18-26	27-45	18-26	18-45
<b>Awareness of HPV consequences</b>						
Cervical cancer	68.3%	76.1%	82.0%	89.8%	56.5%	74.0%
Genital warts	48.6%	45.2%	53.3%	66.4%	45.0%	48.5%
Vaginal cancers	35.2%	37.0%	43.4%	53.9%	34.5%	38.7%
Vulvar cancers	26.8%	23.5%	27.9%	34.4%	22.0%	25.2%
Anal cancer	18.3%	16.1%	17.2%	29.7%	22.5%	18.8%
Cervical dysplasia	13.4%	15.3%	11.5%	30.5%	15.0%	16.2%
<b>Beliefs regarding HPV vaccine benefits</b>						
Prevention of cervical cancer	66.2%	72.9%	86.9%	86.7%	58.0%	72.5%
Prevention of vulvar and vaginal cancers	45.8%	46.5%	62.3%	57.8%	44.0%	48.7%
Prevention of anal cancers	32.4%	28.5%	37.7%	36.7%	36.0%	31.9%
Prevention of genital warts	52.8%	43.3%	54.9%	58.6%	50.5%	48.2%
Less likely to develop precancerous lesions	49.3%	50.2%	65.6%	64.1%	42.0%	51.7%
Prevents HPV transmission to partners	61.3%	57.1%	76.2%	73.4%	64.0%	62.2%
<b>Reasons for not being vaccinated</b>						
My doctor has never discussed it with me	33.8%	40.6%			29.9%	37.6%
I've never really thought of it	35.9%	32.3%			43.5%	34.9%
I don't know enough about it	35.9%	28.9%			30.4%	30.2%
I am married/in a stable relationship	15.5%	28.3%			8.2%	22.7%
I'm too old for the HPV vaccine	7.0%	27.6%			3.8%	20.2%
Cost/no private insurance	23.2%	18.9%			17.9%	19.4%
I'm not sure it's safe	16.9%	18.3%			14.1%	17.3%
Potential health risks	12.7%	13.5%			12.5%	13.2%
Potential side effects	12.7%	13.5%			10.9%	12.9%
Product(s) haven't been around long enough	9.2%	12.9%			7.6%	11.4%
I am still undecided	9.9%	5.2%			6.0%	6.0%
I don't like needles	14.8%	3.3%			4.9%	5.3%
I don't agree with vaccination	7.0%	3.9%			3.3%	4.3%

(continued)

**Supplemental Table 3.** (Continued)

	Unvaccinated women		Vaccinated women		Men	Total
Not aligned with my religious/cultural beliefs	4.9%	1.5%			4.9%	2.6%
The HPV vaccine doesn't work	0.7%	1.8%			2.2%	1.7%
I'm a male/do not feel the need/less risks	0.7%				7.6%	1.5%
Not sexually active	1.4%	1.4%			1.1%	1.3%
Already have HPV/already sexually active/already at risk	1.4%	1.2%				1.0%
I don't know	9.2%	6.4%			13.0%	8.0%
<b>TOTAL</b>	<b>142</b>	<b>660</b>	<b>122</b>	<b>128</b>	<b>200</b>	<b>1252</b>