Highlights

- Preventing HPV-associated cancers through publicly funded vaccine programs is a priority
- Canadian provinces and territories design and implement vaccination programs
- It is difficult to gather current and reliable data on HPV vaccination in Canada
- This paper describes each jurisdiction’s current HPV vaccine program and coverage rates
- Considerations for policy development are discussed
Abstract

Background: The National Advisory Committee on Immunization in Canada recommends human papillomavirus (HPV) vaccination for females and males (ages 9-26). In Canada, the HPV vaccine is predominantly administered through publicly funded school-based programs in provinces and territories. This research provides an overview of Canadian provincial and territorial school-based HPV vaccination program administration and vaccination rates, and identifies foreseeable policy considerations. Methods: We searched the academic and grey literature and contacted administrators of provincial and territorial vaccination programs to compile information regarding HPV vaccine program administration and vaccination rates in Canada’s 13 provincial and territorial jurisdictions. Results: As of October 2016, All 13 Canadian jurisdictions vaccinate girls, and six jurisdictions include boys in school-based publicly funded HPV vaccination programs. Eleven jurisdictions administer the HPV vaccine in a two-dose schedule. The quadrivalent vaccine (HPV4) has been the vaccine predominantly used in Canada; however, the majority of provinces will likely adopt the nonavalent vaccine in the future. According to available data, vaccination uptake among females ranged between 47%-93.9%, while vaccination uptake among males (in programs with available data to date) ranged between 77.9%-87.4%. Conclusions: Future research and innovation will beneficially inform Canadian jurisdictions when considering whether to administer the nonavalent vaccine, whether to implement a two or one-dose vaccination schedule, and how to improve uptake and rates of completion. The usefulness of standardizing methodologies for collecting and reporting HPV vaccination coverage and implementing a national registry were identified as important priorities.
Canadian school-based HPV vaccine programs and policy considerations

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Keywords

Canada; cancer prevention; human papillomavirus; immunization policy; school-based vaccination programs; vaccination coverage.
1. Introduction

Infection by the human papillomavirus (HPV) can result in morbidity and mortality because HPV is associated with multiple cancers and other health problems [1]. In Canada, the most common HPV-associated cancers are cervical, oropharyngeal, and anal cancers [2]. Over the past ten years, the safety and efficacy of the HPV vaccine has been established; the oncogenic protection offered by the HPV vaccine will ameliorate the health burden that HPV causes [1, 3-5]. Consequently, many countries have implemented HPV vaccine programs [1]. In Canada, the National Advisory Committee on Immunization (NACI) has recommended HPV vaccination for females (since 2007) and males (since 2012) [6]. The Public Health Agency of Canada advises that the HPV vaccine should be administered to school-aged children in order to provide the highest level of immunogenicity and to protect individuals before they become sexually active [7].

Three vaccines, the bivalent (HPV 2; protecting against two strains; Cervarix®), GlaxoSmithKline), quadrivalent (HPV 4; protecting against four strains; Gardasil®, Merck), and nonavalent (HPV 9; protecting against nine strains; Gardasil®9, Merck) have been developed to protect against HPV infections and are approved for use [1, 6, 8-10]. In Canada, the quadrivalent and nonavalent vaccines have been licensed for females and males (aged 9-26), while the bivalent vaccine is licensed only for females (aged 9-45) [11]. The Canadian Immunization Committee originally set HPV vaccine coverage targets at 80% and 90% to vaccinate school-aged girls within two and five years of program introduction respectively [12]. The exact coverage necessary to achieve herd protection for HPV is not known, but a recent systematic review and meta-analysis of high-income countries suggested that female HPV vaccination
coverage of 50% would contribute to the presence of some herd effects [13]. However, for an individual to be protected, his or her partner must be among those vaccinated within the herd, which excludes certain groups (e.g. men who have sex with men in female-only vaccination programs) [14].

Canadian provinces and territories are responsible for providing health care to their people within their jurisdiction (with the exception of indigenous people living on reserves, whose vaccine programs are offered by the Federal Government) [15, 16]. The HPV vaccine is therefore administered predominantly through publicly funded school-based programs at the provincial or territorial level. There is substantial variation in the delivery and administration of HPV vaccine programs among the provinces and territories, including whether boys are offered the HPV vaccine. Moreover, the HPV vaccine programs have been evolving in these jurisdictions, presenting a complicated picture. To understand the Canadian context better and to assist international comparison, it is important to describe the complexities of the thirteen school-based programs accurately. To date, such descriptions in the academic literature have been out-dated or incomplete because of the lack of reliable and current reports of Canadian HPV vaccination programs [2, 18-20]. Moreover, Canada’s programs have been inaccurately portrayed (e.g. by the World Health Organization, in a recent academic international overview of HPV vaccination programs, in a report by the Institut Català d'Oncologia (ICO) Information Centre on HPV and Cancer, and in a report by the Canadian Cancer Society) [1, 2, 21-23].

Because Canada does not have a national vaccination surveillance program, it is difficult to

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1 Canada consists of thirteen jurisdictions known either as “provinces” or “territories”. Provinces are relatively populous and have elected provincial governments that exercise constitutional power in their own right [15]. Territories are situated primarily north of 60° latitude, have approximately only 3% of the Canadian population, and exercise power delegated to them by the Federal Government [17].
compare jurisdictions’ vaccine rates as there is dissimilarity in data collection procedures, vaccination target age, years reported, and linking registries across the different provinces remains a challenge [24, 25]. Indeed, a recent report by the Canadian Partnership Against Cancer writes, “it is currently challenging to gather consistent, standardized data on HPV vaccination across Canada because provinces and territories collect and report data on uptake differently” (p.21) [20]. Accurate portrayal of uptake and completion of HPV vaccination in Canadian jurisdictions would enable program changes to be monitored, advance sound policymaking, and assist national and international comparison. Therefore, this research aimed to provide a current and comprehensive portrayal of school-based HPV vaccine programs in Canada, to compile recent vaccination rates (i.e. first dose ‘uptake’ and last dose ‘completion’), and to identify foreseeable policy issues for Canadian HPV vaccine programs.

2. Methods

Between July and October, 2016, we sought to identify the most current details of school-based HPV vaccination programs (such as the eligible population, the type of vaccine, and the number of doses administered) and HPV vaccination rates in each Canadian jurisdiction (such as “uptake” or first dose and “completion” or final dose). First, we conducted a search of the academic and grey literature to obtain descriptions of HPV programs and vaccination rates in Canada, and to provide a historical context to current programs. We searched Pubmed and Google Scholar using “human papillomavirus AND vaccine AND Canada” as well as “human papillomavirus AND vaccine AND [for each jurisdiction; e.g. Ontario]”. In total, 600 articles were detected in Pubmed, 259 of which were identified as duplicates, resulting in a total of 341
academic articles that were captured and their title and/or abstracts examined. In Google Scholar, the first and second page (up to 20 articles) were examined for reliable information about the HPV vaccine programs and their success. Second, we reviewed the references of the literature identified by the search. Additional articles were captured by reviewing relevant papers’ references.

Third, we continually examined Canadian publications including the Canadian Immunization Guide (last updated for HPV September 2016) [26], and the most recent information provided by the provincial and territorial health ministries. Finally, we sent email messages to all jurisdictions’ ministries and/or vaccination program coordinators to confirm that published program information was accurate, and to seek more recent coverage rates; we sent reminders two and four weeks after first contact. We asked informants about the details of their jurisdiction’s programs (e.g. gender targeted, grade, dose schedule, catch up program…etc.), as well as the most recent uptake (first dose) and completion (two or three doses) rates for the HPV vaccine school-based program. We also asked them whether there are any publicly available reports on the jurisdictions’ program and coverage rates. Informants in ten jurisdictions responded with information, while informants in three jurisdictions did not.

3. Results

We provide an overview of the administration of Canadian school-based HPV vaccination programs (2016-2017) in Table 1. We have clarified the population vaccinated, grade, and vaccine dose schedule for each jurisdiction. Between 2007 -2010, all Canadian jurisdictions initiated a school-based HPV vaccine program for females within their publicly funded
vaccination programs. From 2013-2016, six Canadian provinces expanded their programs to include boys, thus achieving a gender-neutral HPV vaccination program [27]. For all jurisdictions in 2016-2017, school-based programs were offered in grades four to seven, and administered generally in a two-dose schedule. In 2016-2017, catch-up programs were directed to males in grades 8 and 9 in three provinces (i.e., Alberta, Manitoba, and Prince Edward Island (P.E.I.)) for varying lengths of time (Table 1). For both sexes, HPV vaccination programs in Canada are primarily school-based; the target age group in 2016-2017 ranges from grades four to seven (approximately ages nine to 13 years). This year, Ontario changed the target age of its vaccination program from grade eight to seven in recognition of evidence that the vaccine is more effective at a younger age [28].

We present the most recent reported vaccination rates, where possible, in Table 2 and Figure 1. “Uptake” refers to the administration of the first dose whereas “completion” refers to administration of the final dose (we specify the dose, 2 or 3 depending upon the jurisdiction’s requirements). Available data for female HPV vaccination uptake (i.e., first dose) ranged between 46.7% in the Northwest Territories (2013/2014) and 93.9% in Newfoundland and Labrador (2014/2015). Available data for female completion rates (i.e., two or three doses depending on jurisdiction) ranged between 39.3% in the Northwest Territories (2013/2014; three doses) and 89.2% in Newfoundland and Labrador (2014/2015; three doses). Vaccination uptake among males (in programs with available data to date) ranged between 75.0% in Alberta to 87.4% in P.E.I, while vaccination completion ranged from 66.0% in Alberta to 81.4% in P.E.I. Data for males are available from only Alberta and P.E.I because the remaining four gender-neutral provincial programs were initiated in 2015 or 2016. Available data suggest that vaccination rates in some provinces are rising [29], while other jurisdictions’ vaccination rates
appear to be falling slightly (Table 2). Overall, these rates indicate that the HPV vaccine program remains under-used in Canada.

4. Discussion

4.1. HPV vaccination programs

Given that healthcare in Canada is the jurisdiction of the provinces and territories, there is substantial variation in the delivery and administration of the HPV vaccine across the 13 different programs. This study has tracked the substantial evolution of the programs (e.g. regarding type of vaccine, dose, and population vaccination), providing a comprehensive portrayal of school-based HPV vaccine programs in Canada. The details and overview offered here may lead to clarity in international comparison and present varying policy options for other countries to pursue.

In 2016-2017, both HPV 4 and HPV 9 were used in different programs throughout Canada. A number of Canadian programs do not clearly specify which vaccine is offered to children. Nevertheless, given the efficacy and greater protection of HPV 9 and its cost-effectiveness [11, 30], Canadian jurisdictions are likely to move towards administering HPV 9, phasing out HPV 4.

Canada is a global leader in offering two (rather than three) doses [1, 31]. British Columbia has provided two doses since 2010, and Quebec has offered a two-dose schedule since 2013 [32, 33]. Outside Canada, two-dose vaccination was introduced in Switzerland in 2012 [31]. In 2014, a number of other countries (including the United Kingdom, South Africa, France, Spain, The Netherlands, and Chile) began providing only two doses [31]. This dosing change
coincided with the WHO’s 2014 approval of the use of two-dose schedules in females (who are younger than 15 and immunocompetent). As of April 2017, few countries (e.g. Australia) continue to provide three doses of the HPV vaccine [34]. In a two-dose regime, a minimum spacing of five [35] or six [11] months between doses is necessary.

As of September 2016, 11 (of 13) jurisdictions administered the HPV vaccine in a two-dose schedule (Table 1). Nevertheless, NACI recommended that while HPV2 and HPV4 may be administered in two doses (prior to age 15 or 14, respectively); HPV9 should be administered in three doses (as of July 2016) [11]. In November 2016, Iversen et al. reported evidence that, like HPV4 [35,36], two doses of HPV9 in females and males aged 9-14 was found to be noninferior to three doses of HPV9 [37,38]. As more data about the persistence of antibody responses become available, NACI’s recommendation might change to a two (or even one [36]) dose schedule. In the meantime, however, NACI does not deem two doses of HPV9 sufficient based on the available evidence; a booster shot may be necessary. The duration of immunity for the HPV9 vaccine has not yet been determined, but existing data suggest long-lasting (up to 10 years) protection after HPV4 vaccination [39].

In Canada, the HPV vaccine is predominantly administered through publicly funded school-based programs in provinces and territories (often in conjunction with another vaccine such as Hepatitis B). As Table 1 illustrates, all provinces and territories developed female vaccination programs between 2007 and 2010. From 2013 to 2016, six provinces funded HPV vaccination for boys [27]. In recent announcements, four provinces (i.e. British Columbia, New Brunswick, Newfoundland and Labrador, and Saskatchewan) have stated that they will commence funding HPV vaccination for boys in September 2017 [40-42]. The HPV vaccination programs are voluntary; nurses must receive the consent of parents or guardians before
administering the HPV vaccine to children. In publicly funded programs, public health nurses typically administer the HPV vaccine in schools [28]. If children miss one or more doses of the HPV vaccine at school, then the next time that the nurse is in the school, the nurse typically finds the child for vaccination. Additionally, the child may obtain the missed dose outside of school (from a public health nurse, doctor, pharmacist, or nurse practitioner) [6]. It would be helpful to determine how many Canadian children miss HPV vaccine doses offered in schools and how likely they are to obtain missed doses outside of school; across Canada these data is not systematically collected and reported to the public health nurses [43]. Research has shown that providing opportunities to receive missed doses in schools through catch-up programs is important in optimizing coverage [44, 45].

Even though HPV vaccine programs in Canada are school-based, it is worth noting that certain groups may receive the HPV vaccine outside of school. These include children with significant fear of needles who may be vaccinated apart from their peers in a public health clinic. More notably, since September 2015, British Columbia has funded and made the HPV vaccine available in clinics for a subset of males including males aged 9-26 who have (or plan to have) sex with men, are infected with human immunodeficiency virus (HIV), or are street-involved; males aged 9-18 in the care of the Ministry of Children and Family Development; and males aged 12-17 in youth custody services centres [46]. This approach was directed to males in greatest need of HPV vaccination, but has received criticism for being inequitable and difficult to implement [14]. The number of British Columbia males vaccinated in this way will diminish because all males will be invited to receive the vaccine in Grade 6 beginning in September 2017. Quebec has an enhanced HPV vaccine program; in addition to its school-based program for girls and boys (Table 1), Quebec offers publicly funded school HPV vaccination to females aged 9 to
17, all individuals aged 26 or under who are infected with HIV or who have a weakened immune system, and to males aged 26 or under who have, or plan to have, sex with men (since 2016) [47]. Ontario also offers the HPV vaccine to men who have sex with men, aged 26 or younger (since 2016) [48]. Saskatchewan provides the HPV vaccine to males 9-17 who are HIV infected [49]. For all non-eligible individuals, the HPV vaccine can be purchased privately (approximately $540 CAD for all three doses); some private insurance policies partially cover this cost [50].

4.2. HPV vaccine uptake

A comprehensive and current depiction of HPV vaccine uptake rates across Canada is necessary for comparison of Canada’s HPV vaccine rates compare with that of other countries. This information can be used also to assist in identifying which regions may benefit from a psychosocial or economic intervention and emerging issues for policy makers. Furthermore, standardization in how vaccine uptake is measured across Canadian jurisdictions may assist in improving our understanding of how evolving vaccine policy may affect HPV vaccine rates as well as important areas for further research.

As Table 2 demonstrates, vaccination uptake among females ranged between 46.7%-93.9%, while vaccination uptake among males (in programs with data available to date) ranged between 77.9%-87.4%. Data for males are available from only P.E.I and Alberta because the remaining four gender-neutral provincial programs were initiated in 2015 or 2016, with four more commencing in 2017. Although McClure et al. (2015) found that a significantly greater proportion of girls completed three doses of the HPV vaccine compared to boys (2013/2014) in P.E.I. [51], it appears that more recently there has been little difference in coverage between girls
and boys in P.E.I and Alberta (2014 /2015 , Table 2). Where governments fund in-school HPV vaccine programs, males are more likely to be vaccinated than where the program does not exist. Specifically, in contrast to uptake for males in P.E.I. and Alberta (77.9% and 87.4% respectively in 2014/2015), a national survey conducted before any male vaccination programs (except P.E.I) found that only approximately 1% of parents reported their sons received the HPV vaccine [52].

Interestingly, since males have been included in HPV vaccine programs in Australia (2013), female uptake has also increased [53]. Future research is required to evaluate whether there is a similar rise in female HPV vaccine uptake when males are offered the vaccine in Canada and, if so, then to identify the underlying reasons for this phenomenon [54].

The coverage rates presented in Table 2 obscure the variation within each jurisdiction. As an example of such variation, coverage rates in different British Columbia health service delivery areas ranged from 46.5% to 75.4% [32]. Manitoba also reported “a significantly higher proportion of vaccinated than non-vaccinated females lived in urban areas and in areas of higher income...” [55]. By contrast, an Ontario evaluation found HPV vaccine refusal was highest in regions with both the lowest and highest income levels (2007-2011 data) [56]. Further research is required to identify and to understand the disparities in HPV vaccination coverage within different Canadian jurisdictions (e.g. by gender, household income, ethnicity, and region) because such disparities might foreshadow future inequalities in cancer burden [57].

It is important to assess how coverage rates reported by Canadian jurisdictions (Table 2) compare with self-report data from Canadian parents. A recent Statistics Canada survey of Canadian parents of 12-13 year-old girls (N =5720) found that, overall, an estimated 72.3% reported their daughter had received one dose of the HPV vaccine [58]. Moreover, parents of girls residing in Nunavut, the Northwest Territories, and Yukon reported the lowest uptake while
Newfoundland and Labrador and P.E.I reported the highest [58]. Parental survey data might be inaccurate because parents may not know or remember whether their child received the HPV vaccine and may confuse the HPV vaccine with another vaccine. Encouragingly, these data from a Statistics Canada parent survey are similar to the proportion and distribution of uptake as reported by the programs (Table 2); however, further and continued evaluation is required.

Canadian HPV vaccination uptake rates compare poorly with other developed countries. Although HPV uptake rates in Canadian jurisdictions are perhaps slightly better than the United States (63% in females; 2015 survey data) [59], they are worse than Australia (85.6% in girls and 77% in boys; 2015 vaccination data) [60, 61] and the United Kingdom (89.5% in females; 2015 vaccination data) [62]. Like Canada, both Australia and the United Kingdom offer the HPV vaccine at no cost to parents in school-based vaccination programs. Canada’s comparably lower HPV uptake is similar to its uptake with respect to other childhood vaccinations; in 2013, Canada’s coverage was ranked below most affluent countries (28th of 29 countries, above Austria) according to UNICEF evaluation [63]. To increase vaccine coverage rates in adolescents, the existing research has indicated that important interventions include: making national recommendations, implementing school-based vaccine administration, sending reminders (e.g. for parents to sign consent forms), offering opportunities to receive missed doses (e.g. through schools or by automatically notifying physicians), and creating vaccination information systems (or registries) [44, 45, 64-66]. Other crucial strategies include: educational interventions to increase awareness and knowledge, doctors’ recommendation, and management of concerns and misconceptions of parents and adolescents [27, 44, 67]. Greater high quality research is necessary to evaluate which interventions are most effective in increasing HPV
vaccine coverage [44, 68, 69]. Case studies evaluating the successful programs of New foundland and L abrador or P.E.I. may be particularly fruitful in this regard.

4.3. Strengths and L imitations

This study’s principle strength is compiling specific details of each Canadian jurisdiction’s school-based HPV vaccine program and providing the most recent coverage rates. The principle limitations arise because some jurisdictions did not respond to inquiries, or report information differently or inconsistently. The HPV vaccine coverage rates of the different jurisdictions (reported in Table 2) are difficult to compare because jurisdictions have important differences in data collection procedures, vaccination target age, and years report ed. In particular, we aimed to report which vaccine is administered in each jurisdiction (i.e. HPV 2, 4 or 9), but could not do so because we received conflicting information.

4.4. Future poli cy considerations

Canada’s HPV vaccine programs face key challenges. First, the well-identified need in Canada for implementation of national standards for immunization registries and methods for coverage assessments has not yet been met [43, 70-72]. Consequently, it is difficult to report national data regarding HPV vaccination rates even though there continues to be demand for such data. A recent report by the Canadian Partnership Against Cancer explains that “standardized data collection and reporting on HPV vaccination could result in more comparable uptake rates and the ability to more accurately assess prevention and health promotion efforts and the impact of vaccination on subsequent cancer outcomes” (p.21) [20]. The Canadian Immunization Comm i ttee has also called for harmonization of data in a national registry as an
im port ant element in evaluating H PV vaccination programs and preventing H PV -associated
cancer: “The evaluation of the imm unization program wi ll require specifi c tools. The
avail ab i ty of a registry of H PV im munization coverage and a registry of cervi cal cancer, as well
as a national HPV sentinel surveil lance system, wi ll be important components in this evaluation.
Effective linkage between the latter databases will be needed” (p.33) [73].
All provinces and territories with one exception (Nunavut) have systems to assess vaccine
coverage [70]. Efforts are underw ay to implement a new national comm unicable disease and
surveillance and case management system called “Panorama” that permi ts jurisdicc ions to input
and access imm unization data [70, 74]. If Canada had a national H PV registry as countries such
as A ustrali a do, then cross-jurisdiction and international comparisons could be made accurately.
Such a registry wi ll be helpful as a basis when investigating the determi nants of vaccination
rates, identif ying wh ether dif ferences exist among specifi c groups, monitoring program success,
and facil itating the sharing of strategies that contribute to high vaccine rates.
Second, greater transparency i s needed to inform parents, researchers, and poli cy-makers
nationally and internationally about Canada’s HPV vaccine programs. Tulsieram et al. (2016 )
exami ned the readabil i ty and coherence of HPV information on seven provincial
departments/mi nistries of health w ebsites and found that information i s not comprehensible to a
sizeable group of the population [75]. Organizations and academi cs should be able to report
Canada’s experience accurately and easi ly, yet the conclusions of recent publi cations
demonstrate that such report ing remains a chall enge [1, 2, 20, 21, 76]. This paper found that no
coverage data have ever been reported for HPV vaccination (or any other vaccine) in one
jurisdiction—N unavut, a territor y founded in 1999 —and that the most recent available coverage
data for some jurisdictions were dated (i.e. up to f iv e years old) (Table 2). H ow coverage data
were collected, and who was included and excluded from coverage data reports is information that is essential to monitoring and evaluating HPV vaccination programs. Provinces and territories should annually enter into the database, Panorama, important information about vaccine uptake and completion rates.

A final issue related to both transparency and consistency across Canada is the importance of reporting adverse risks and events. Steenbeek et al. (2012) found major discrepancies and dissimilarities in the list of HPV vaccine-related physical risks that were reported by Canadian jurisdictions, and by organizations such as Merck Frosst Canada, NACI, and the Society of Obstetricians and Gynecologists of Canada [77]. Standardized content and format for consent forms and physical risks reports would increase reporting consistency across Canada. Furthermore, employing Panorama’s system of surveillance for monitoring adverse events would also likely increase confidence in the safety of the HPV vaccine program.

5. Conclusion

The prevention of HPV-associated cancers is an important public health priority. Measuring and reporting on HPV vaccination programs and coverage rates is crucial to informing future cancer prevention activities [20]. Canada has been an international leader in implementing gender neutral vaccination programs for both girls and boys and a two-dose HPV vaccine schedule [1, 31, 78]; however, specific details of Canada’s HPV vaccination programs and coverage rates are often incomplete, not current, or unavailable. This paper offers a current portrait of HPV vaccine programs in Canada and has compiled recent coverage rates for use in
national and international comparison and in policy development. The research has also identified policy issues that Canadian HPV vaccine programs will likely soon face. Indeed, Canadian jurisdictions variously must consider whether to administer the nonavalent vaccine, to offer possible booster shots, to establish a one-dose vaccination schedule, and to begin HPV vaccine programs for boys. The jurisdictions must also consider how to improve uptake and completion rates. To make future evidence-based policy decisions, Canadian HPV vaccination programs should offer transparent data about HPV vaccine coverage, detail the specifics of their HPV vaccine programs clearly, and employ standard methods for collecting HPV vaccination rates. In order to evaluate program success, to make accurate comparisons, and to improve HPV prevention efforts on a national basis, it is critical for jurisdictions to employ the existing national system, Panorama, to monitor HPV vaccination.
Acknowledgements

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**Table 1. Publicly Funded School-Based HPV Vaccination Programs, by Canadian Jurisdiction for 2016-2017**

<table>
<thead>
<tr>
<th>Jurisdiction</th>
<th>Population Vaccinated</th>
<th>Grade Vaccinated</th>
<th>Vaccine Dose Schedule*</th>
<th>Catch-up Program</th>
<th>Sources</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alberta</td>
<td>Females (since 2008); Males (since 2014)</td>
<td>5</td>
<td>3</td>
<td>Male catch-up (3 doses) 2014-2018 in grade 9</td>
<td>[26, 79]</td>
</tr>
<tr>
<td>British Columbia</td>
<td>Females (since 2008)</td>
<td>6</td>
<td>2</td>
<td>°</td>
<td>[26, 46]</td>
</tr>
<tr>
<td>Manitoba</td>
<td>Females (since 2008); Males (since 2016)</td>
<td>6</td>
<td>2</td>
<td>Male catch-up (2 doses) 2016-2019 in grade 8 or 9 (depending on health region)</td>
<td>[26, 80]</td>
</tr>
<tr>
<td>New Brunswick</td>
<td>Females (since 2008)</td>
<td>7</td>
<td>2</td>
<td>°</td>
<td>[26, 81]</td>
</tr>
<tr>
<td>Newfoundland and Labrador</td>
<td>Females (since 2007)</td>
<td>6</td>
<td>2</td>
<td>°</td>
<td>[26, 82]</td>
</tr>
<tr>
<td>Nova Scotia</td>
<td>Females (since 2007); Males (since 2015)</td>
<td>7</td>
<td>2</td>
<td>No male catch-up program</td>
<td>[26, 83]</td>
</tr>
<tr>
<td>Northwest Territories</td>
<td>Females (since 2009)</td>
<td>4-6</td>
<td>2 (9-14 y); 3 (≥15 y)</td>
<td>°</td>
<td>[26, 84]</td>
</tr>
<tr>
<td>Nunavut</td>
<td>Females (since 2010)</td>
<td>6</td>
<td>3</td>
<td>°</td>
<td>[26, 85]</td>
</tr>
<tr>
<td>Ontario</td>
<td>Females (since 2007); Males (since 2016)</td>
<td>7</td>
<td>2</td>
<td>No male catch-up program</td>
<td>[26, 28, 48]</td>
</tr>
<tr>
<td>Prince Edward Island</td>
<td>Females (since 2007); Males (since 2013)</td>
<td>6</td>
<td>2</td>
<td>Male catch-up (2 doses; unless 15 years of age at dose 1 in which case 3 doses) 2015-2016 in grade 9</td>
<td>[26, 86, 87]</td>
</tr>
<tr>
<td>Quebec</td>
<td>Females (since 2008); Males (since 2016)</td>
<td>4</td>
<td>2</td>
<td>No male catch-up program</td>
<td>[26, 47]</td>
</tr>
<tr>
<td>Saskatchewan</td>
<td>Females (since 2008)</td>
<td>6</td>
<td>2</td>
<td>°</td>
<td>[26, 88]</td>
</tr>
<tr>
<td>Yukon</td>
<td>Females (since 2009)</td>
<td>6</td>
<td>2</td>
<td>°</td>
<td>[26, 89, 90]</td>
</tr>
</tbody>
</table>

Note. * Two doses are administered in a 0/6 month schedule while 3 doses are administered in a 0/2/6 month regimen. ° No male HPV vaccine program.
<table>
<thead>
<tr>
<th>Jurisdiction</th>
<th>Female Uptake</th>
<th>Female Completion</th>
<th>Male Uptake</th>
<th>Male Completion</th>
<th>Sources</th>
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<tbody>
<tr>
<td>Alberta</td>
<td>74.2% (2013/2014)</td>
<td>64.9% (3 doses)</td>
<td>75.0% (2014-2015)</td>
<td>66.0% (3 doses)</td>
<td>[91]</td>
</tr>
<tr>
<td></td>
<td>76.1% (2014/2015)</td>
<td>67.6% (3 doses)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>British Columbia</td>
<td>Not Available</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Manitoba</td>
<td>68.8% (2013/2014)</td>
<td>58.2% (3 doses)</td>
<td>---</td>
<td>---</td>
<td>[19, 20]</td>
</tr>
<tr>
<td></td>
<td>70.1% (2014/2015)</td>
<td>58.6% (3 doses)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>New Brunswick</td>
<td>80.1% (2012/2013)</td>
<td>75.1% (3 doses)</td>
<td>---</td>
<td>---</td>
<td>[92]</td>
</tr>
<tr>
<td></td>
<td>80.1% (2013/2014)</td>
<td>73.1% (3 doses)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>78.9% (2014/2015)</td>
<td>73.5% (3 doses)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Newfoundland and Labrador</td>
<td>96.6% (2012/2013)</td>
<td>94.3% (3 doses)</td>
<td>---</td>
<td>---</td>
<td>[93, 94]</td>
</tr>
<tr>
<td></td>
<td>92.8% (2013/2014)</td>
<td>88.7% (3 doses)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>93.9% (2014/2015)</td>
<td>89.2% (3 doses)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nova Scotia</td>
<td>88.8% (2013/2014)</td>
<td>75.0% (3 doses)</td>
<td>Not Available</td>
<td>Not Available</td>
<td>[19]</td>
</tr>
<tr>
<td>Northwest Territories *</td>
<td>46.7% (2013/2014)</td>
<td>39.3% (3 doses)</td>
<td>---</td>
<td>---</td>
<td>[20, 95]</td>
</tr>
<tr>
<td></td>
<td>62% (2014/2015)</td>
<td>48% (2/3 doses)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>66% (2015/2016)</td>
<td>55% (2/3 doses)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nunavut †</td>
<td>87.8% (2013/2014)</td>
<td>61.9% (3 doses)</td>
<td>---</td>
<td>---</td>
<td>[96]</td>
</tr>
<tr>
<td></td>
<td>68.6% (2014/2015)</td>
<td>61.5% (3 doses)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ontario °</td>
<td>Not Available</td>
<td>70.2% (2011/2012; 3 doses)</td>
<td>---</td>
<td>---</td>
<td>[97]</td>
</tr>
<tr>
<td></td>
<td></td>
<td>80.2% (2012/2013; 3 doses)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Prince Edward Island</td>
<td>90.7% (2012/2013)</td>
<td>87.3% (3 doses)</td>
<td>85.4% (2013/2014)</td>
<td>79.0% (3 doses)</td>
<td>[98]</td>
</tr>
<tr>
<td></td>
<td>90.6% (2013/2014)</td>
<td>84.9% (3 doses)</td>
<td>87.4% (2014/2015)</td>
<td>81.4% (3 doses)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>87.9% (2014/2015)</td>
<td>82.7% (3 doses)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Quebec</td>
<td>81% (2013/2014)</td>
<td>77% (2 doses)</td>
<td>---</td>
<td>---</td>
<td>[19, 20]</td>
</tr>
<tr>
<td></td>
<td>78.2% (2014/2015)</td>
<td>74.4% (2 doses)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Saskatchewan</td>
<td>79.5% (2011/2012)</td>
<td>72.7% (3 doses)</td>
<td>---</td>
<td>---</td>
<td>[88]</td>
</tr>
<tr>
<td></td>
<td>80.2% (2012/2013)</td>
<td>73.5% (3 doses)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>79.8% (2013/2014)</td>
<td>72.8% (3 doses)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Note. The year provided for completion rates are the same as for uptake rates. Grade 4 is the target vaccination for Quebec; grade 5 for Alberta; grade 6 for British Columbia, Manitoba, Newfoundland and Labrador, Nunavut, Prince Edward Island, Saskatchewan, and Yukon; grade 7 for New Brunswick, Nova Scotia, and Northwest Territories; and, grade 8 for Ontario. † Nunavut does not have a vaccination registry for any vaccine; data reported here is for the Qikiqtaluk (Baffin) region only. ‡ More recent rates not available. (Ontario plans to release more recent rates in a forthcoming report). ° Although Ontario children were vaccinated in grade 7 in 2016-2017, the most recent coverage rates are provided for the period when the children were vaccinated in grade 8. * Although Northwest Territories vaccinates girls in grades 4 to 6, coverage estimates are conducted in grade 7. □ Rates of grade 9 males in Alberta’s catch-up program.
Figure 1. Available data reporting most recent HPV vaccine coverage rates, by Canadian jurisdiction

Note. Comparisons across jurisdictions should consider variation in data collection procedures, vaccination target age, and most recent year reported. Darker shade represents uptake rates and lighter shade represents completion rates. Nunavut data reported here is for the Qikiqtaluk (Baffin) region only.