Improving Human Papilloma Virus (HPV) Vaccine Uptake

A Rapid Review

Region of Peel – Public Health
Communicable Diseases Division
October 2019
Please use the following citation when referencing this document:

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Key Messages

1. Reminder interventions, vaccine requirements in schools and national permissive recommendations are effective at improving vaccine coverage overall among youth.

2. School-based clinics are effective at improving HPV vaccine uptake among children and youth.

3. Reminder, healthcare provider and social marketing interventions have mixed effects on HPV vaccine uptake among children and youth.

4. Countrywide provision of vaccines is effective at reducing the prevalence of HPV infection and genital warts among youth.
Executive Summary

Question
What interventions can impact HPV vaccine uptake among school-aged children and youth?

Issue and Context
Infection with Human Papilloma Virus (HPV) is an established cause of several cancers. Between 2003-12, 1,857 HPV-related cancers were reported in Peel, with an estimated 919 of these cases attributed to HPV infection. Infections from the most common types of HPV can be prevented with the HPV vaccine.

The Vaccine-Preventable Diseases (VPD) program at the Region of Peel – Public Health (ROP – PH) provides the publicly-funded HPV vaccine to eligible students through school and community-based clinics. Since the 2015/16 school year, HPV vaccine coverage among students in Peel has ranged between 55%-66%. Nationally, the target is 90 per cent coverage of two or more doses of the HPV vaccine by 17 years of age. The VPD program seeks to identify interventions to increase HPV vaccine coverage among children and youth age 12-18 years.

Methods
A search of synthesized published and grey literature returned 1,141 results. After assessing for relevance, quality and overlap, three moderate-quality systematic reviews were included in this review.

Findings
For vaccine coverage overall, reminders, vaccine requirements in schools and national permissive recommendations are effective at improving coverage among youth. Clinic staff training has no effect on vaccine coverage overall among youth.
For HPV vaccine uptake specifically, school-based immunization clinics are effective at improving uptake among children and youth. Reminders, healthcare provider interventions and social marketing campaigns have mixed effects on HPV vaccine uptake among children and youth.

For HPV infection and genital warts, countrywide provision of vaccines is effective at reducing the prevalence of these adverse health outcomes among youth.

**Recommendations**

1. Continue to offer the HPV vaccine to eligible students at ROP – PH school and community-based clinics.
   a. Explore opportunities to optimize student attendance and HPV vaccine uptake at Peel clinics (e.g., more clinic days per school per year, additional clinic opportunities in secondary schools).

2. Continue to provide reminders to students and parents about initiating and completing the HPV vaccine series.
   a. Examine current reminder methods (e.g., paper flyers) and explore alternative strategies to remind students and/or parents to get the HPV vaccine (e.g., preference-based and electronic reminders such as, e-mails or text messages).

3. Consider whether a multi-pronged approach (e.g., a combination of reminder, healthcare provider and social marketing interventions) is appropriate and feasible to improve HPV vaccine uptake in Peel.

4. Investigate opportunities to advocate to the Ministry of Health for province-wide provision of the HPV vaccine for school-aged children and youth.

5. Continue to monitor HPV vaccine uptake (e.g., series initiation and completion) among Peel students from Grade 7 until the end of the eligibility period in Grade 12 and report on trends over time.
1 **Issue**

Infection with Human Papilloma Virus (HPV) is an established cause of several cancers, including cancers of the cervix, anus, vagina, penis, oropharynx, and vulva.\(^1\) Infections from the most common types of HPV can be prevented with the HPV vaccine.\(^1\) HPV vaccine coverage requires a two or three dose series depending on age or certain pre-existing medical conditions. HPV vaccine initiation refers to uptake of the first dose in the series. HPV vaccine completion refers to uptake of all required doses in the series.

The HPV vaccine was first authorized for use in Canada in 2006 and then introduced into Ontario’s school-based immunization program in September 2007.\(^2\) Initially, only Grade 8 girls were eligible for the vaccine through this program. In 2012, the eligibility was expanded to include girls in grades 8-12. In the 2015/16 school year, the HPV vaccine coverage rate among 13-year-old girls in Peel was 65 per cent.\(^6\) In September 2016, the eligibility criteria were revised again to include girls in Grade 7, as well as boys in grades 7-12 born in the year 2004 or later. In the 2016/17 school year, the HPV vaccine coverage rate among 12-year-old students in Peel was 55 per cent; 59 per cent among females and 52 per cent among males.\(^6\) Due to changing eligibility criteria, data on HPV vaccine coverage are not comparable from year to year and trends in HPV vaccine coverage among Peel students cannot be reported.

Since the introduction of the HPV vaccine into the school-based immunization program, HPV vaccine coverage among Peel students has ranged from 55%-66%.\(^6\) Nationally, the target for HPV vaccine coverage set by the Government of Canada is 90 per cent.\(^3\) This target is supported by the Canadian Partnership Against Cancer.\(^4,5\)
The Vaccine-Preventable Diseases (VPD) program at the Region of Peel – Public Health (ROP – PH) has used several approaches to try to improve vaccine uptake among students in Peel. In 2012, the VPD program reviewed the school curriculum and provided activities to raise awareness about immunization. Other tactics were informed by a previous literature review\(^6\) and internal reports on factors influencing the uptake of various vaccines among Peel students.

These tactics included:

- updating vaccine fact sheets;
- providing information to school administrators on the importance of immunization;
- answering parental and client questions at the Communicable Disease Contact Centre;
- notifying parents when students opt out of immunization; and
- evaluating products provided to parents, such as consents for immunization.

Despite these efforts, HPV vaccine coverage among Peel students has not consistently increased towards the national target. The VPD program seeks to identify interventions to increase HPV vaccine coverage among children and youth age 12-18 years.

2 Context

In the 2010 Ontario Burden of Infectious Disease Study, HPV was ranked the third-highest pathogen in terms of disease burden and health care costs.\(^7\) Between 2003-12, 1,857 HPV-related cancers were reported in Peel, with an estimated 919 of these cases attributed to HPV infection.\(^8\) The remaining cancer cases may be attributed to other exposures or risk factors (e.g., tobacco use for oral cancer, age for vulvar cancer). In 2018, Cancer Care Ontario (CCO) reported that over 1,300 cancer cases caused by HPV could be prevented in Ontario annually through vaccination, screening and treatment.\(^8\) HPV vaccination through Ontario’s school-based
immunization program is expected to decrease the number of new HPV infections occurring in the population.  

As per the Immunization of School Pupils Act (ISPA), public health is mandated to enforce immunization requirements for 12 different antigens for children enrolled in schools. The VPD program provides publicly-funded immunization programs to eligible individuals through school and community-based clinics. Grade 7 students are eligible for the meningococcal, hepatitis B and HPV vaccines at school-based clinics. Of these vaccines, only the meningococcal vaccine is mandated under the ISPA. The hepatitis B and HPV vaccines are not required for school attendance under ISPA, but are recommended for Grade 7 students by the Ministry of Health.

The VPD program uses significant resources to deliver school-based immunization clinics to students eligible for the publicly-funded HPV vaccine. Clinics for Grade 7 students are held two or three times a year at each school. Students without consent for the HPV vaccine in Grade 7 receive a paper flyer addressed to their parents reminding them that their child remains eligible for the HPV vaccine. These students are offered the vaccine at school again in Grade 8 or they can receive the vaccine at a ROP-PH community clinic until the end of Grade 12.

In the 2017/18 school year, the VPD program held 704 school and 17 community-based immunization clinics. That year, 18,325 Grade 7 students were eligible for the HPV vaccine; 75 per cent of students initiated the HPV vaccine series and 55 per cent completed the two-dose series. This was similar to the previous school year.

In 2018, the Government of Canada established vaccination coverage goals based on international standards and best practices; the vaccination coverage goal for all adolescent vaccines is 90 per cent. For the HPV vaccine specifically, this means 90 per cent vaccination
coverage of two or more doses of the HPV vaccine by 17 years of age. The VPD program aims to increase HPV vaccine coverage among Peel students towards this target, but has been unable to do so.

3 Literature Review Question

What interventions can impact HPV vaccine uptake among school-aged children and youth?

<table>
<thead>
<tr>
<th>Population</th>
<th>School-aged children and youth (age 9-18 years)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intervention</td>
<td>Any intervention to influence HPV vaccination</td>
</tr>
<tr>
<td>Comparator</td>
<td>Any comparison</td>
</tr>
<tr>
<td>Outcomes</td>
<td>Primary: HPV vaccine uptake or coverage</td>
</tr>
<tr>
<td></td>
<td>Secondary: HPV infection, genital warts and/or adverse outcomes</td>
</tr>
</tbody>
</table>

4 Literature Search

In December 2018, a search of published and grey literature was conducted (Appendix A). The search was limited to synthesized evidence from the past 11 years (since 2007). This limit was applied because the 2007/08 school year was the first year Ontario’s publicly-funded, school-based HPV vaccination program was introduced. Databases searched were: PsycINFO, MEDLINE, MEDLINE In-Process, Cochrane Database of Systematic Reviews, Global Health, Health Star, Academic Search Premier, and Cumulative Index of Nursing and Allied Health Literature (CINAHL). Health Evidence™ was also searched.

Grey literature sources were: Centers for Disease Control (CDC), Ministry of Health and Long-Term Care (MOHLTC), British Columbia Centres for Disease Control (BCCDC), Public Health Agency of Canada (PHAC), Provincial Infectious Diseases Advisory Committee (PIDAC), National Institute for Health and Care Excellence (NICE), World Health Organization (WHO), Public Health
Ontario (PHO), Turning Research Into Practice (TRIP), ECRI Guidelines Trust, Institut national de santé publique du Québec (INSPQ), National Health and Research Council (NHMRC), American Academy of Pediatrics, DuckDuckGo and Google customized search.

5 Relevance Assessment

At least two reviewers independently screened titles and abstracts and conducted a full-text review of articles. Discrepancies were discussed until consensus was reached. Articles were assessed for relevance using the following criteria:

Inclusion criteria: English language; published from 2007 onward; synthesized literature (e.g., review or guideline); population includes children and youth 9-18 years old; intervention(s) to influence the uptake of the HPV vaccine; outcome of HPV vaccine uptake or coverage.

Exclusion criteria: developing countries; outcomes focused only on HPV vaccine effectiveness, efficacy, safety, cost, and/or benefit.

The population includes ages 9-18 years for consistency with the recommendation by the National Advisory Committee on Immunization (NACI) to administer the HPV vaccine from age nine and up. This review focuses on school-aged children and youth, however immunization schedules for school-based HPV vaccine programs vary across Canada.10

6 Results of Search

The searches identified 1,141 articles. After removing 113 duplicates and 990 non-relevant articles, 37 received full-text assessment. Thirty-two non-relevant articles were excluded. After completing the search and relevance assessment, a new and relevant systematic review was
discovered through a monthly update from Health Evidence™. Six systematic reviews were selected for critical appraisal (Appendix B).

7 Critical Appraisal

A minimum of two reviewers independently appraised the quality of the six systematic reviews using the Health Evidence™ Quality Assessment tool.\textsuperscript{11} Disagreement was resolved in consultation with a third reviewer.

Two systematic reviews received weak quality ratings and were excluded. Four received moderate quality ratings (Appendix C).\textsuperscript{12-15} One of these was later excluded due to incomplete and inaccurate reporting of outcome data from the individual studies included in the review.\textsuperscript{15}

8 Description of Included Papers

Three systematic reviews were included. Three studies overlapped between two of the systematic reviews, but this overlap was not considered significant.

Das et al. (2016): Systematic Review and Meta-Analysis of Interventions to Improve Access and Coverage of Adolescent Immunizations.\textsuperscript{12}

The objective of this moderate-quality systematic review was to determine the effectiveness of interventions to improve immunization coverage among adolescents. Evidence was derived from 23 studies: four randomized control trials, three quasi-randomized trials and 16 before-after studies. The authors state included evidence was assessed for quality, however no details were provided. Most studies were conducted in the United States. The population was males and females ranging from 9-24 years old.
The interventions were focused on improving coverage of various vaccines recommended for adolescents and youth. Eleven studies focused on improving coverage of multiple vaccines and 12 studies focused on one specific vaccine type; seven studies focused specifically on the HPV vaccine. The intervention formats included: vaccine requirements in schools, national permissive recommendations, countrywide provision of vaccines, reminders and clinic staff training. The intervention settings included: schools, clinics, communities, a hospital and entire countries. The outcomes of interest were: vaccine coverage, prevalence of HPV infection and genital warts, incidence of measles, mumps and pertussis, rubella susceptibility, and varicella deaths. No information was provided on how these outcomes were measured.

A meta-analysis was conducted for the overall effect of all interventions on vaccine coverage (13 studies). Further sub-group analyses were conducted by intervention type. Meta-analyses were also performed for the prevalence of HPV infection (two studies) and the prevalence of genital warts (three studies). Using Grading of Recommendations Assessment, Development and Evaluation (GRADE), the evidence was rated as moderate quality for vaccine coverage and low for prevalence of HPV infection and genital warts (Appendix D).

Kang et al. (2018): Completeness of Human Papilloma Virus Vaccination: A Systematic Review.\textsuperscript{13}

The objective of this moderate-quality systematic review was to evaluate the impact of interventions implemented after the first dose of HPV vaccination on the rate of HPV vaccine completion in adolescents and young adults. Evidence was derived from five studies: three randomized control trials and two cluster-randomized trials. The authors state included studies were assessed for quality, however no details were provided. All studies were conducted in the
United States. The population was males and females ranging from 9-26 years old who had received their first dose of the HPV vaccine.

The interventions were focused on HPV vaccine completion. The intervention formats included electronic or automated reminders, mailed letters and DVD-based education on HPV. The intervention settings were: pediatric clinics, a community (eight-county catchment area), a reproductive health center and a university student health center. The outcome of interest was HPV vaccine completion rate, which was measured using objective data from electronic medical records or health records.

The evidence was rated as moderate quality using GRADE and was synthesized narratively. Findings were grouped by intervention type and reported at the single-study level (Appendix D).


The objective of this moderate-quality systematic review was to determine the effectiveness of interventions conducted at the practice or community level to increase uptake of the HPV vaccine. Evidence was derived from 14 studies: six randomized control trials, seven quasi-experimental trials and one study that used both designs for different components. Included studies were not assessed for quality. All studies were conducted in the United States. The population was males and females ranging from 9-20 years old, including privately insured, publicly or underinsured populations, and a mix of patient demographics.

The interventions were focused on HPV vaccine uptake. Half of the included studies focused on the HPV vaccine only and the other half focused on multiple vaccines, including the HPV vaccine. The intervention formats included: reminder and recall systems, physician-focused interventions,
school-based programs and social marketing campaigns. The intervention settings included urban, suburban and rural settings. The outcome of interest was HPV vaccine uptake, which was measured as: initiation, completion, being up-to-date, timeliness and/or receiving at least one dose.

The evidence was synthesized narratively. Findings were grouped by intervention type and reported at the single-study level (Appendix D).

9 Synthesis of Findings

For the synthesis, HPV vaccine uptake refers to initiation and/or completion of the series, as well as other indicators of uptake such as, being up-to-date and timeliness of HPV vaccine uptake. Vaccine coverage refers to vaccine series completion for several different vaccines including, but not limited to the HPV vaccine. Similar interventions are grouped together (Table 1).

School interventions include:

- vaccine requirements in schools; and
- school-based immunization clinics.

Reminder interventions include:

- mailed letters;
- telephone calls;
- automated messages;
- electronic messages (e.g., texts, e-mails, private Facebook messages); and
- recall systems (e.g., electronic alerts).
Healthcare provider interventions include:

- clinic staff training; and
- physician-focused interventions.

Nationwide interventions include:

- national permissive recommendations; and
- countrywide provision of vaccines.

Controls include:

- status quo;
- no intervention;
- other geographical regions (e.g., counties, state); or
- historical controls.

Table 1. Effectiveness of interventions on HPV vaccine uptake among children and youth

<table>
<thead>
<tr>
<th>INTERVENTIONS</th>
<th>OUTCOMES</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Vaccine coverage 1 SR (13 studies)</td>
</tr>
<tr>
<td></td>
<td>HPV vaccine uptake 2 SRs (23 studies)</td>
</tr>
<tr>
<td></td>
<td>Prevalence of HPV infection 1 SR (2 studies)</td>
</tr>
<tr>
<td></td>
<td>Prevalence of genital warts 1 SR (3 studies)</td>
</tr>
<tr>
<td>School interventions</td>
<td>+</td>
</tr>
<tr>
<td>Reminder interventions</td>
<td>+</td>
</tr>
<tr>
<td>Healthcare provider</td>
<td></td>
</tr>
<tr>
<td>interventions</td>
<td>−</td>
</tr>
<tr>
<td>Social marketing</td>
<td></td>
</tr>
<tr>
<td>interventions</td>
<td></td>
</tr>
<tr>
<td>Nationwide interventions</td>
<td></td>
</tr>
</tbody>
</table>

Systematic review (SR); effect (+); mixed effect (+/−); no effect (−); not measured ■
Vaccine coverage

Reminder interventions, vaccine requirements in schools and national permissive recommendations are effective at improving vaccine coverage overall among youth.

Vaccine coverage was 78 per cent more likely among youth in a pooled analysis of vaccination requirements in schools, clinic staff training, reminders, or a national permissive recommendation relative to controls (RR 1.78, 95% CI 1.41 to 2.23, $I^2 = 99\%$) (13 studies). Further sub-group analyses found that vaccine coverage was 94 per cent more likely when vaccines were required in schools compared to controls (RR 1.94, 95% CI 1.39 to 2.71, $I^2 = 99\%$) (seven studies), and five times greater with a national permissive recommendation compared to no recommendation (RR 5.00, 95% CI 1.94 to 12.90) (one study). The permissive recommendation, provided by the Advisory Committee on Immunization Practices in the United States, allowed the three-dose series of quadrivalent HPV vaccine to be administered to males age 9-26 years. Vaccine coverage was 53 per cent more likely with reminders compared to controls (RR 1.53, 95% CI 1.37 to 1.72, $I^2 = 20\%$) (four studies). Reminders included:

- telephone calls;
- mailed letters; and/or
- text messages.

There was no effect on vaccine coverage with clinic staff training compared to controls (RR 1.31, 95% CI 0.81 to 2.11, $I^2 = 94\%$) (two studies). These interventions included:

- instruction to recommend vaccination at every clinic visit; or
- an educational webinar about adolescent vaccines and strategies to improve vaccine uptake (e.g., placing alerts on patient charts, recalls etc.).
HPV vaccine uptake

School-based clinics are effective at improving HPV vaccine uptake among children and youth.

In two studies, school-based immunization clinics had a significant effect on HPV vaccine uptake. In one study, HPV vaccine initiation was significantly higher among females age 10-17 years who were offered the vaccine at school-based clinics on four days throughout the school year compared to controls (I 6%, C 1%, OR 6.56 [CI 3.99 to 10.78]). In the other study, uptake of at least one HPV vaccine dose was significantly higher among females in the sixth grade (I 34% C 18%, aRR 1.69 [1.21 to 2.36]), as well as in the seven and eighth grades (I 20% C 7%, aRR 2.56 [1.34 to 4.88]) when the vaccine was offered at school-based clinics on three days throughout the school year compared to controls.

Reminder interventions have mixed effects on HPV vaccine uptake among children and youth.

In seven of twelve studies, reminder interventions had a significant effect on HPV vaccine uptake. HPV vaccine initiation was significantly higher among females age 11-18 years who received reminders compared to controls (three studies). Reminders included a combination of:

- mailed letters;
- telephone calls;
- outreach with home visits; and/or
- a web-based reminder system to prompt telephone calls paired with an educational brochure for parents and a 1:1 scripted provider intervention.

HPV vaccine completion was significantly higher among children and youth who received reminders compared to controls (four studies). Reminders included a combination of:
• e-mails;
• mailed letters;
• text messages;
• telephone calls;
• automated telephone messages; and/or
• a web-based reminder system to prompt telephone calls paired with an educational brochure for parents and a 1:1 scripted provider intervention.

In two studies, reminder interventions had mixed effects on HPV vaccine uptake.\textsuperscript{14} HPV vaccine initiation did not increase (I 18\%, C 16\%, HR 1.1 [CI 1.0 to 1.2]), but uptake of the second (I 71\%, C 65\%, HR 1.2 [CI 1.1 to 1.3]) and third doses (I 73\%, C 63\%, HR 1.4 [CI 1.2 to 1.5]) were significantly higher among females age 11-17 years who received automated telephone calls compared to controls (one study).\textsuperscript{14} In another study, uptake of the second dose did not increase (I 38\%, C1 21\%, \(p=0.137\), C2 21\%, \(p=0.035\)), but uptake of the third dose was significantly higher (I 14\%, C1 0\%, \(p=0.018\), C2 3\%, \(p=0.007\)) among those who had already initiated the series and received text message reminders compared to controls.\textsuperscript{14}

In three studies, reminder interventions had no effect on HPV vaccine uptake.\textsuperscript{13, 14} HPV vaccine completion did not increase among older youth age 18-26 years who received preference-based reminders compared to controls (two studies).\textsuperscript{13} Preference-based reminders included: telephone calls, mailed letters, text messages, e-mails and/or private Facebook messages as selected by the client or parents. The review authors reported that HPV vaccine initiation was higher in one study among females age 11-17 years who receive mailed letters or telephone reminders compared to controls, however these results were not statistically significant.\textsuperscript{13}
Healthcare provider interventions have mixed effects on HPV vaccine uptake among children and youth.

In three of seven studies, healthcare provider interventions had a significant effect on HPV vaccine uptake among children and youth age 9-17 years compared to controls. Healthcare provider interventions were multi-component and included:

- a 1:1 scripted provider intervention and a web-based reminder system to prompt telephone calls paired with an educational brochure for parents;
- a webinar on the CDC’s Assessment, Feedback, Incentives, and eXchange program and weekly follow-up e-mails; or
- a provider tip sheet and online continuing medical education training paired with posters, brochures, radio public service announcements and a website.

In three studies, healthcare provider interventions had mixed effects on HPV vaccine uptake. HPV vaccine initiation varied among females age 9-13 years following a healthcare provider intervention, which included: outreach to healthcare practices for provision of materials and guidance paired with posters and brochures, a web-site, a hotline and news releases during a three-month period compared to controls (I 7.1%, 6.8%, 3.2% and 1.9% [each intervention county], C 5.2% [other counties], 5.0% [state], p<0.01) (one study). In another study, HPV vaccination was significantly higher among females age 11-12 years (I 4.9% [in-person], 5.3% [webinar], C 3.5%, p<0.05), but not among females age 13-18 years (I 3.9% [in-person], 3.4% [webinar], C 3.5%, p>0.05) following in-person or webinar consultations with healthcare providers compared to controls. HPV vaccine uptake was significantly higher for the first dose (I 24%, C 16%, HR 1.5 [CI 1.2 to 2.0]), but not for the third dose (I 67%, C 63%, HR 1.1 [CI 0.9 to
1.3]) following a healthcare provider intervention, which included: education, audit and feedback, and electronic decision support and alerts compared to controls (one study).¹⁴

Healthcare provider interventions had no effect on HPV vaccine uptake in one study.¹⁴ Up-to-date (UTD) coverage did not increase among children age 13-14 years following prompts at visits with patients not UTD for the third dose compared to controls (data not reported).¹⁴ For this same study, the review authors reported that the timeliness of HPV vaccine uptake was higher among females age 12-14 years after providers received audit and feedback compared to providers who received electronic clinical decision support, however these results were not statistically significant (one study).¹⁴

**Social marketing interventions have mixed effects on HPV vaccine uptake among children and youth.**

In two studies, social marketing interventions had mixed effects on HPV vaccine uptake.¹⁴ HPV vaccine initiation varied among females age 9-13 years following a social marketing campaign with a physician-focused component described above, compared to controls (I 7.1%, 6.8%, 3.2% and 1.9% [each intervention county], C 5.2% [other counties], 5.0% [state], p<0.01) (one study).¹⁴ In another study, HPV vaccination was significantly higher among males age 9-13 years following a social marketing campaign compared to controls (I 7.3%, C 5.2%, HR 1.34, p=0.02).¹⁴

The social marketing campaigns in these studies included:

- a hotline;
- a website;
- a provider tip sheet;
- posters and brochures;
- news releases during a 3-month period;
• radio public service announcements; and/or
• online continuing medical education training.

Prevalence of HPV infection and genital warts

Countrywide provision of vaccines is effective at reducing the prevalence of HPV infection and genital warts among youth.

At a population level, the prevalence of HPV infection was reduced by 44 per cent (RR 0.56, 95% CI 0.38 to 0.82, $I^2= 77\%$) (two studies) and the prevalence of genital warts was reduced by 34 per cent (RR 0.66, 95% CI 0.52 to 0.84, $I^2= 75\%$) (three studies) among youth following countrywide provision of HPV vaccines through clinic-based delivery compared to controls (e.g., national immunization programs or schedules that did not include the HPV vaccine).\(^1\)^

10 Limitations

Of the three systematic reviews, the most recent was published in 2018. The search in this review captured evidence published until the end of 2016. Newer single studies relevant to this topic would not have been identified, potentially missing interventions with new technologies, forms of media or other settings (e.g., pharmacies). Most of the studies were conducted in the United States, which may limit generalizability of the findings.

The quality of included studies across the reviews was not clearly reported. Details regarding study quality were not provided for two systematic reviews and one of the reviews did not assess the quality of included studies at all.

Heterogeneity of the included studies was high. Findings were meta-analyzed in one of the reviews despite high (>90%) heterogeneity for pooled data.
Across the three reviews, there was limited data on intervention effectiveness for HPV vaccine uptake among males. Most studies included in the reviews focused on HPV vaccine uptake among females since the vaccine has been licensed for use in females for a longer time. There was no information regarding the cost of interventions across the three reviews.

Data pertaining to the prevalence of HPV infection and genital warts suggests an association between the intervention (countrywide provision of HPV vaccines) and these outcomes at a population level. However, inferences cannot be made about prevalence of these outcomes among individual participants in these studies.

11 Applicability and Transferability

The research review project team met with ROP – PH staff to discuss the research review findings and recommendations. Participants represented various roles and teams across the department including staff from: Communicable Disease, Health Protection, Chronic Disease and Injury Prevention, Family Health and the Office of the Medical Officer of Health. An applicability and transferability (A&T) worksheet was used to guide the discussion (Appendix E).

Applicability

Political uncertainty and resource constraints may affect implementation.

Consensus among participants was that the interventions would likely be politically acceptable, but that the current landscape may influence whether or how they are implemented.

Participants noted that although the interventions align with the legislation (e.g., ISPA), the mandate (e.g., Ontario Public Health Standards), as well as the goals of expert health organizations (e.g., Public Health Agency of Canada, NACI, CCO, The Society of Obstetricians and Gynecologists of Canada), anticipated funding changes and public health restructuring should be
considered. Scaling-up existing interventions (e.g., additional school and community-based clinics) and implementing new interventions (e.g., electronic reminders and consents) will require additional resources and infrastructure, which could be impacted by fiscal constraints.

**Partnerships with key stakeholders will be required for successful implementation.**

Participants agreed that most interventions will likely be socially accepted, but success will depend on stakeholder collaboration. Understanding the needs and preferences of target groups (e.g., parents and students), and partnering with school boards and administrators would be essential to implement new reminder strategies, inform social marketing campaigns and establish additional clinic days in schools. Expertise and support from other teams at ROP (e.g., Communications, Information Technology) would be needed to ensure the interventions (e.g., electronic reminders, social marketing) address the needs of Peel’s diverse community and adhere to client consent, privacy and confidentiality requirements.

Interventions targeting healthcare providers may not be effective because the HPV vaccine is not routinely administered by physicians in Peel. Healthcare providers may be more likely to accept interventions with a broad focus on immunization rather than on HPV vaccine uptake specifically.

**ROP – PH has expertise, but limited capacity to implement interventions.**

Participants agreed that findings concerning school-based immunization clinics and reminders validate current VPD program efforts to increase HPV vaccine uptake. The program already has public health nurses and vaccine coordinators, but scale-up would require additional staff, supplies and clinic availability. There are opportunities to collaborate with other program areas (e.g., Healthy Sexuality, Oral Health, Physician Outreach) to engage stakeholders (e.g., school
boards, physicians) and to utilize resources (e.g., clinic space) for additional school and community-based clinics. Significant organizational barriers (e.g., lack of funding, technological infrastructure) could impede the development of automated reminders, social marketing campaigns or healthcare provider interventions.

**Interventions should be adapted to the local context in Peel.**

Participants believed that HPV vaccine acceptance by the public has generally increased since it was first introduced and since it became recommended for both boys and girls. However, some parents are still opposed to, or uncomfortable with, vaccinating their child(ren) against HPV. Interventions should be culturally relevant (e.g., offered in multiple languages and formats), consider parental attitudes, beliefs and values related to HPV and immunization, and use targeted messaging for parents, students, school staff and healthcare providers. These should emphasize:

- the value of the HPV vaccine;
- the importance of completing the multi-dose vaccine series; and
- the benefits of receiving the vaccine at ROP – PH school or community-based clinics (e.g., publicly-funded for students, physicians do not routinely provide the HPV vaccine).

**Transferability**

The evidence from this research review may not be generalizable to the Peel population. Peel region is an ethnically diverse community with a different health care system than the United States, where most of the studies in this review were conducted. The eligibility criteria and funding for the HPV vaccine would be different in these studies compared to the Peel context. Various socio-demographic factors may also impact the effectiveness of the interventions in Peel.
Some statistically significant findings may not be clinically meaningful. In some studies, the absolute difference in vaccine uptake between intervention and control groups was small (e.g., a five per cent increase in HPV vaccine initiation rates following school-based immunization clinics). Also, in most studies, post-intervention HPV vaccination rates were lower than current HPV coverage rates among Peel students. This may impact the transferability of findings to students in Peel.

A multi-pronged approach may be necessary to reach all students eligible for the HPV vaccine in Peel. The recommendations have the potential to be far-reaching. However, it would be important to evaluate whether the interventions reach target populations (e.g., boys and girls in grades 7-12) and that they do not unintentionally exasperate health inequities in the community.

12 Recommendations

1. Continue to offer the HPV vaccine to eligible students at ROP – PH school and community-based clinics.
   a. Explore opportunities to optimize student attendance and HPV vaccine uptake at Peel clinics (e.g., more clinic days per school per year, additional clinic opportunities in high school).

2. Continue to provide reminders to students and parents about initiating and completing the HPV vaccine series.
   a. Examine current reminder methods (e.g., paper flyers) and explore alternative strategies to remind students and/or parents to get the HPV vaccine (e.g., preference-based and electronic reminders such as, e-mails or text messages).
3. Consider whether a multi-pronged approach (e.g., a combination of reminder, healthcare provider and social marketing interventions) is appropriate and feasible to improve HPV vaccine uptake in Peel.

4. Investigate opportunities to advocate to the Ministry of Health for province-wide provision of the HPV vaccine for school-aged children and youth.

5. Continue to monitor HPV vaccine uptake (e.g., series initiation and completion) among Peel students from Grade 7 until the end of the eligibility period in Grade 12 and report on trends over time.
13 Acknowledgements

Authors

Olivia Janeczek; Analyst, Research and Policy
Paulette Whyte, Supervisor
Crystal Frenette, Manager

Technical Support

Jackie Muresan; Advisor, Public Health Knowledge Brokering
Shant Alajajian, Librarian Specialist
Alicia Palmer, Health Analyst
Shilpa Raju, Epidemiologist
Text References


Data References


Appendices

Appendix A: Search Strategy

Appendix B: Literature Search Flowchart

Appendix C: Critical Appraisal Summary

Appendix D: Data Extraction Tables

Appendix E: Applicability and Transferability Worksheet
Appendix A: Search Strategy

MEDLINE Suite Search

Database: EBM Reviews - Cochrane Database of Systematic Reviews <2005 to December 5, 2018>, Global Health <1973 to 2018 Week 48>, Ovid Healthstar <1966 to October 2018>, Ovid MEDLINE(R) <1946 to December Week 1 2018>, Ovid MEDLINE(R) In-Process & Other Non-Indexed Citations <December 12, 2018>, PsycINFO <2002 to December Week 1 2018>

Search Strategy:

1 exp Papillomaviridae/ (59881)
2 exp Papillomavirus Infections/ (50242)
3 "human papillo**":ti,ab. (71339)
4 "hpv":ti,ab. (70756)
5 ("vaccin**" or "immuni**").ti,ab. (828909)
6 exp MASS VACCINATION/ or exp VACCINATION COVERAGE/ or exp VACCINATION/ (200695)
7 exp VACCINES/ (389276)
8 1 or 2 or 3 or 4 (104917)
9 5 or 6 or 7 (913337)
10 8 and 9 (27991)
11 exp Papillomavirus Vaccines/ (12280)
12 10 or 11 (28498)
13 ("school-aged" or "student**" or "youth**" or "teen**" or "adolesc**" or "child**").ti,ab. (3739713)
14 12 and 13 (6702)
15 ("review**" or "meta-analys**" or "synth**" or "guideline**" or "overview**").ti,pt. (5640219)
16 14 and 15 (872)
17 remove duplicates from 16 (437)
18 limit 17 to english language [Limit not valid in CDSR; records were retained] (406)
19 limit 18 to yr="2007 -Current" (352)
## Academic Search Premier and CINAHL Search

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<td>View Results (411)</td>
</tr>
<tr>
<td>S9 S1 AND S3</td>
<td>View Results (710)</td>
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<tr>
<td>S8 “review” OR “meta analysis” OR “synth” OR “guideline” OR “over view”</td>
<td>View Results (7,261,332)</td>
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<td>S7 S1 AND S3</td>
<td>View Results (6,543)</td>
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<td>S5 S3 OR S4</td>
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<td>S4 S1 AND S3</td>
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<td>CDC</td>
<td>(HPV* OR “Human Papillomavirus”) AND (vaccin* OR immuniz* OR immunis*)</td>
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<tr>
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<td>(HPV* OR “Human Papillomavirus”) AND (vaccin* OR immuniz* OR immunis*)</td>
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<tr>
<td>PHO</td>
<td>HPV vaccine</td>
</tr>
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<td>-------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>TRIP</td>
<td>(HPV* OR “Human Papillomavirus”) AND (vaccin* OR immuniz* OR immunis*)</td>
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<td>ECRI Guidelines Trust</td>
<td>(HPV* OR “Human Papillomavirus”) AND (vaccin* OR immuniz* OR immunis*)</td>
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<td>INSPQ</td>
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<td>NHMRC</td>
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<td>Guidelines for the American Academy of Pediatrics</td>
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<td>DuckDuckGo</td>
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Appendix B: Literature Search Flowchart


For more information, visit [www.prisma-statement.org](http://www.prisma-statement.org).
### Appendix C: Critical Appraisal Summary Table

<table>
<thead>
<tr>
<th>Review Author (Year)</th>
<th>Health Evidence Quality Assessment Tool – Review Articles Criteria</th>
<th>Rating</th>
<th>Reviewers</th>
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<tbody>
<tr>
<td>CrockerBuque, Edelstein &amp; MounierJack (2017)</td>
<td>Y Y N Y Y N N N N N</td>
<td>Weak, 4</td>
<td>OJ, PW</td>
</tr>
<tr>
<td>Das et al. (2016)</td>
<td>Y Y N Y Y N N Y Y Y</td>
<td>Moderate, 7</td>
<td>OJ, JM</td>
</tr>
<tr>
<td>Kang et al. (2018)</td>
<td>Y Y N Y Y N N Y Y Y</td>
<td>Moderate, 7</td>
<td>OJ, PW</td>
</tr>
<tr>
<td>Rodriguez et al. (2019)</td>
<td>Y N N Y Y N Y Y Y N</td>
<td>Moderate, 6</td>
<td>OJ, PW</td>
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<tr>
<td>Niccolai &amp; Hansen (2015)</td>
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<td>Moderate, 6</td>
<td>OJ, PW</td>
</tr>
<tr>
<td>Walling et al. (2016)</td>
<td>Y Y N Y N N N Y N N</td>
<td>Weak, 4</td>
<td>OJ, PW</td>
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## Appendix D: Data Extraction Tables

### Data Extraction Systematic Review #1

<table>
<thead>
<tr>
<th>Author(s), Date</th>
<th>Das et al. (2016)</th>
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<tr>
<td><strong>Health Evidence</strong></td>
<td>Rated moderate (7/10) by two independent reviewers (OJ &amp; JM) (Appendix B).</td>
</tr>
<tr>
<td><strong>Review Details</strong></td>
<td>(number of studies indicated in brackets)</td>
</tr>
<tr>
<td><strong>Objective</strong></td>
<td>To ascertain the effectiveness of interventions to improve immunization coverage among adolescents and youth.</td>
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<tr>
<td><strong>Search period</strong></td>
<td>Inception to December 2014</td>
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<tr>
<td><strong>Search Strategy</strong></td>
<td>Cochrane Library, Medline, PubMed, Popline, LILACS, CINAHL, EMBASE, World Bank’s JOLIS search engine, CAB Abstracts, British Library for Development Studies at IDS, and the World Health Organizations regional databases</td>
</tr>
<tr>
<td></td>
<td>Google and Google scholar</td>
</tr>
<tr>
<td><strong>Inclusion/exclusion criteria</strong></td>
<td>Inclusion criteria:</td>
</tr>
<tr>
<td></td>
<td>Adolescent population, ranging from 11 to 19 years old</td>
</tr>
<tr>
<td></td>
<td>Interventions to improve vaccination coverage</td>
</tr>
<tr>
<td></td>
<td>Studies focused on improving coverage for HPV; measles, mumps, rubella (MMR); TDaP; meningococcal conjugate; and varicella vaccines</td>
</tr>
<tr>
<td></td>
<td>Geographical limits – None</td>
</tr>
<tr>
<td></td>
<td>Publication language – Not specified</td>
</tr>
<tr>
<td></td>
<td>Study designs – randomized control trials (RCTs), quasitrials, and before-after studies</td>
</tr>
<tr>
<td></td>
<td>Exclusion criteria:</td>
</tr>
<tr>
<td></td>
<td>Any intervention aimed at comparing the efficacy/effectiveness of different vaccine preparations, assessing changes in antibody titers in individual subjects, or comparing various modes of delivering vaccines without control or baseline data</td>
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<tr>
<td></td>
<td>Any studies that did not report segregated data for the age group of interest</td>
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<tr>
<td><strong>Number and types of primary studies included</strong></td>
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<td>RCTs (4)</td>
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<td>Quasi-experimental trials (3)</td>
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<td>Before-after studies (16)</td>
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<td></td>
<td>Canada (2)</td>
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<tr>
<td></td>
<td>Australia (2)</td>
</tr>
</tbody>
</table>
**Quality of included studies**

Quality assessment of the included RCTs and quasi-randomized trials was done according to the Cochrane Risk of Bias (ROB) assessment tool.

Studies rated as high or low ROB in each of the following domains:
- Sequence generation
- Allocation concealment
- Blinding of participants and personnel
- Blinding of outcome assessment
- Attrition bias
- Selective reporting
- Other bias

*The review authors did not provide Risk of Bias ratings for each domain and for each included study.*

The quality of the evidence, indicating the strength of an effect for a specific health outcome, was rated as “high,” “moderate,” “low,” and “very low” according to the Grading of Recommendations Assessment, Development and Evaluation (GRADE) criteria.

*The quality of the evidence for each outcome was described narratively, however the review authors did not provide a GRADE assessment table.*

### Characteristics of the studies included in review (number of studies indicated in brackets)

<table>
<thead>
<tr>
<th>Study population(s)</th>
<th>Males and females ranging from nine to 24 years old.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Study settings</td>
<td>School (9) Countrywide (6) Clinic (5) Community (2) Hospital (1)</td>
</tr>
<tr>
<td>Description of interventions</td>
<td>Intervention formats included: vaccine requirement in school (9) national strategy (e.g., permissive recommendation, countrywide provision, supplementary immunization activities) (8) reminders (e.g., letters, telephone calls, texts) (4) clinic staff training (2)</td>
</tr>
<tr>
<td></td>
<td>Interventions focused on improving coverage of: multiple vaccines (11) one specific vaccine type (12): HPV (7) measles (1) MMR (1) varicella (1) rubella (1) Tdap (1)</td>
</tr>
</tbody>
</table>
Controls included:
- non-availability of population level vaccination
- absence of nationwide HPV availability
- HPV vaccine not included in routine immunization schedule
- vaccine availability at community-based clinics by appointment
- students not subject to vaccine requirement in school
- no recommendation
- no staff training
- no reminders
- no control

Outcome measures
- Vaccine coverage (13)
- Prevalence of HPV (2)
- Incidence of genital warts (3)
- Incidence of measles (1)
- Incidence of mumps (1)
- Incidence of pertussis (1)
- Rubella susceptibility (1)
- Varicella deaths (1)

Sources of outcome data were not reported.

Results of the Review

Vaccine coverage (13 studies, GRADE moderate)
- Vaccine coverage was 78% more likely in a pooled analysis of vaccination requirements in schools, clinic staff training, reminders, or national permissive recommendation relative to controls (Risk Ratio [RR]: 1.78, 95% Confidence Interval [CI]: 1.41 to 2.23, I² = 99%) (13 studies*).
  *Two studies were specific to the HPV vaccine.

Sub-group analyses found that:
  - Vaccine coverage was five times greater with a national permissive recommendation compared to no recommendation (RR: 5.00, 95% CI: 1.94 to 12.90) (1 study).
  - Vaccine coverage was 94% more likely where vaccination requirements in schools were implemented compared to controls (RR: 1.94, 95% CI: 1.39 to 2.71, I² = 99%) (7 studies).

---


High quality – Further research is very unlikely to change our confidence in the estimate of effect.

Moderate quality – Further research is likely to have an important impact on our confidence in the estimate of effect and may change the estimate.

Low quality – Further research is very likely to have an important impact on our confidence in the estimate of effect and is likely to change the estimate.

Very low quality – Any estimate of effect is very uncertain.
Vaccine coverage was 53% more likely when reminders were implemented compared to controls (RR: 1.53, 95% CI: 1.37 to 1.72, $I^2=20\%$) (4 studies).

Vaccine coverage was no more or less likely when clinic staff received training compared to controls (RR: 1.31, 95% CI: 0.81 to 2.11, $I^2=94\%$) (2 studies).

### Prevalence of HPV (2 studies, GRADE low)
- Prevalence of HPV was 44% less likely where there was countrywide provision of HPV vaccines delivered through clinics compared to controls (RR: 0.56; 95% CI: 0.38 to 0.82, $I^2=77\%$) (2 studies).

### Prevalence of genital warts (3 studies, GRADE low)
- Prevalence of genital warts was 34% less likely where there was countrywide provision of HPV vaccines delivered through clinics compared to controls (RR: 0.66; 95% CI: 0.52 to 0.84, $I^2=75\%$) (3 studies).

#### Comments & Limitations
- Included studies targeted various overlapping adolescent and youth age groups that might have led to variations in the outcome effect.
- Results pertaining to the prevalence of HPV and genital warts should be interpreted with caution as these results are based on low quality evidence and because the length of follow-up for these outcomes was not specified.
  - Outcome quality was downgraded due to non-robust designs, heterogeneity, and limited generalizability to high-income countries only.
- There is a lack of rigorously designed studies; most studies utilized pre- and post-implementation data after the approval of vaccine legislation or national launch of vaccination program without having a control site.
- Recent state mandatory vaccinations and exception policies could have affected the vaccination coverage rates.

*Notes with an asterisk in italics were added by the data extractor to improve clarity for the reader.*
## Completeness of Human Papilloma Virus Vaccination: A Systematic Review

### General Information and Quality Rating

<table>
<thead>
<tr>
<th>Author(s), Date</th>
<th>Kang et al. (2018)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Health Evidence Quality Assessment</td>
<td>Rated moderate (7/10) by two independent reviewers (OJ &amp; PW) (Appendix B).</td>
</tr>
</tbody>
</table>

### Review Details (number of studies indicated in brackets)

<table>
<thead>
<tr>
<th>Objective</th>
<th>To evaluate the impact of interventions implemented after the first dose of HPV vaccination on the rate of HPV vaccine completion in adolescents and young adults under the age of 26 years.</th>
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</thead>
<tbody>
<tr>
<td>Search period</td>
<td>January 2006 to December 2019</td>
</tr>
</tbody>
</table>
| Search Strategy | • CINAHL, EMBASE, PsycARTICLES, PubMed, SCOPUS, and Web of Science  
| | • Reference lists  
| | • Unpublished literature |
| Inclusion/exclusion criteria | **Inclusion criteria:**  
| | • Adolescents and young adults under 26 years of age  
| | • Interventions implemented after the first dose of HPV vaccination  
| | • Main outcome variable is HPV vaccination completion rate  
| | • Geographical limits – None  
| | • Publication language – English  
| | • Study designs – randomized controlled trials (RCTs) with a comparison group  
| | **Exclusion criteria:**  
| | • Males only  
| | • Studies that included non-HPV vaccines |
| Number and types of primary studies included | 5 studies:  
| | • RCTs (3)  
| | • Cluster-RCTs (2) |
| Countries | United States (5) |
| Quality of included studies | Assessment of risk of bias in all five studies was done according to Cochrane Risk of Bias (ROB) assessment tool.  
| | Study quality varied from high to low ROB in each of the following domains:  
| | • Random sequence generation  
| | • Allocation concealment  
| | • Blinding of participants and personnel  
| | • Blinding of outcome assessment  
| | • Incomplete outcome data  
| | • Selective reporting  
| | • Other bias  
| | *The review authors did not provide Risk of Bias ratings for each domain and for each included study.* |
The quality of the evidence, indicating the strength of an effect for a specific health outcome, was rated as “high,” “moderate,” “low,” and “very low” according to the Grading of Recommendations Assessment, Development and Evaluation (GRADE) criteria.

*The quality of the evidence for each outcome was described narratively, however the review authors did not provide a GRADE assessment table.*

<table>
<thead>
<tr>
<th>Synthesis</th>
<th>Narrative</th>
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</thead>
</table>

**Characteristics of the studies included in review** (number of studies indicated in brackets)

<table>
<thead>
<tr>
<th>Study population(s)</th>
<th>Males and females ranging from nine to 26 years old, who had received their first dose of the HPV vaccine.</th>
</tr>
</thead>
</table>
| Study settings      | • Pediatric clinics (2)  
                      • Community (1)  
                      • Reproductive health center (1)  
                      • University student health center (1) |
| Description of interventions | Intervention formats included:  
• reminders (electronic or automated, such as e-mails and texts, and non-electronic, such as mailed letters)  
• DVD-based education on HPV |
| Outcome measures    | HPV vaccine completion rate based on objective data from electronic medical records (EMR) or health records. |

**Results of the Review**

**Main results relevant to Rapid Review question**  
**HPV completion rate** (**5 studies, GRADE moderate**)

The effect of reminder interventions on HPV vaccine completion was mixed.

• Three studies reported increased HPV vaccine completeness after intervention compared to control groups.

**Reminder Letters (1 study)**

• Among females age 9 to 26 years, there was a significant difference in HPV completion rate between those who received reminder letters quarterly and those who received standard care (no reminder letters) (56.4% and 46.6%, respectively, *p*<0.001).

**DVD-based Instruction with Telephone Reminder (1 study)**

• Among females 18 to 26 years, there was a significant difference in HPV completion rate between those who screened a 13-minute

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2 GRADE quality of evidence definitions (Source: Guyatt G. H., et al. GRADE: an emerging consensus on rating quality of evidence and strength of recommendations. BMJ. 2008; 336; 924-926. Available from: [https://www.bmj.com/content/336/7650/924](https://www.bmj.com/content/336/7650/924)).

**High quality** – Further research is very unlikely to change our confidence in the estimate of effect.

**Moderate quality** – Further research is likely to have an important impact on our confidence in the estimate of effect and may change the estimate.

**Low quality** – Further research is very likely to have an important impact on our confidence in the estimate of effect and is likely to change the estimate.

**Very low quality** – Any estimate of effect is very uncertain.
educational DVD and received standard care (a pamphlet by the Centers for Disease Control and Prevention [CDC] and follow-up telephone reminders), and those who received standard care only (43.3% and 31.9%, respectively, with a percent relative difference of 35.7%, p = 0.03).

### Automated Reminder Messages (3 studies)

- Among male and female adolescents age 11 to 17 years, there was a significant difference in HPV completion rate between those who received preference-based reminders (texts, e-mails or automated telephone message reminders) and those who received standard care (no reminders) (63% and 38%, respectively, adjusted Risk Ratio: 1.47 (Confidence Interval: 1.38 to 1.57) (1 study).
- Among male and female college students age 18 to 26 years, there was no effect on HPV completion rate between those who received preference-based e-mails or text messages once a month for six months and those who received standard care (a paper card reminder with the next appointment date) (34% and 32%, respectively, p = 0.761) (1 study).
- Among females age 19 to 26 years, there was no effect on HPV completion rate between those who received preference-based reminders (texts, e-mails, phone calls, private Facebook messages or standard mail) and those who received standard care (no reminders) (17.2% and 18.9%, respectively, p = 0.881) (1 study).

### Comments & Limitations

- Overall applicability, external validity and generalizability of the evidence is limited.
- A meta-analysis could not be performed due to heterogeneity of the studies.
- It is difficult to determine which method was most effective since intervention modalities (i.e., number of reminder methods used, the frequency and timing of reminder messages sent, and the follow-up period assessed) and measurement of the primary outcome varied across the studies.
- Follow-up with study participants ranged from seven months to one year.
- A considerable number of participants were lost to follow-up in three studies.
- Grey literature and unregistered studies were not identified in the search.
- The number of RCTs assessing the completeness of HPV vaccination was limited.

*Notes with an asterisk in italics were added by the data extractor to improve clarity for the reader.*
Data Extraction Systematic Review #3
Last revised: 2019-07-22

Practice- and Community-Based Interventions to Increase Human Papillomavirus Vaccine Coverage: A Systematic Review

General Information and Quality Rating

<table>
<thead>
<tr>
<th>Author(s), Date</th>
<th>Niccolai &amp; Hansen (2015)</th>
</tr>
</thead>
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Review Details (number of studies indicated in brackets)

<table>
<thead>
<tr>
<th>Objective</th>
<th>To systematically review the literature on effectiveness of interventions conducted at the practice or community level to increase uptake of HPV vaccines in the United States.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Search period</td>
<td>Inception to July 2014</td>
</tr>
</tbody>
</table>
| Search Strategy | • PubMed, Web of Science, and MEDLINE  
| | • Reference lists |
| Inclusion/exclusion criteria | Inclusion criteria:  
| | • Adolescents 18 years and younger  
| | • Practice- and community-based interventions  
| | • Control arm included  
| | • Reported an outcome of actual HPV vaccination rates  
| | • Geographical limits – United States  
| | • Publication language – Not specified  
| | • Study designs – Randomized and nonrandomized study designs  
| Exclusion criteria: |  
| | • Young adults 18 years and older only  
| | • Studies that examined only intentions or attitudes  
| | • Development or feasibility studies  
| | • Conference abstracts |
| Number and types of primary studies included | 14 studies:  
| | • Randomized (6)  
| | • Quasi-experimental (7)  
| | • Used both designs for different components (1) |
| Countries | United States (14) |
| Quality of included studies | Review authors did not assess the quality of included studies. |
| Synthesis | Narrative |

Characteristics of the studies included in review (number of studies indicated in brackets)

| Study population(s) | Children ranging from nine to 20 years old.  
| | • Most studies focused on:  
| | o 11 to 17 year olds; or  
| | o Students in fifth through eighth grades.  
| | • Girls only (12)  
| | • Boys only (1)  
| | • Girls and boys (1) |
Privately insured, publicly or underinsured populations
- Mix of patient demographics

Study settings
- Urban, suburban and rural settings

Description of interventions

Intervention formats included:
- Reminder and recall systems (e.g. telephone calls, mailed letters, text messages and/or outreach visits) (7)
- Physician-focused interventions (e.g. education and training, audit and feedback, electronic decision support/alerts) (7)
- School-based programs (e.g. vaccination clinics) (2)
- Social marketing (e.g. posters, brochures, website, hotline, news releases, public service announcements, webinar, tip sheet) (2)

Studies used:
- One intervention approach (6)
- More than one intervention approach (8)

Interventions focused on:
- HPV vaccine only (7)
- Multiple vaccines, including HPV (7)

Outcome measures
HPV vaccine uptake, measured as: initiation, completion, being up-to-date (UTD), timeliness, and/or receiving at least one dose.

Results of the Review

HPV vaccine uptake (14 studies)
Overall, the effect of interventions on HPV vaccine uptake was mixed:
- Twelve studies reported a significant increase in at least one HPV outcome.
- One study reported non-significant results.
- One study reported mixed effects.

Reminder and recall systems (7 studies)

Evidence from randomized designs (4 studies) found:
- Among females age 11 to 18 years, HPV vaccine initiation rate was significantly higher in those who received reminder interventions (mailed letters and telephone calls) compared to usual care (Intervention [I]: 11.4%, Control [C]: 4.4%, \( p<0.05 \)) (1 study).
- Among females age 11 to 15 years, HPV vaccine initiation rate was significantly higher in those who received reminder interventions (telephone, mail, and outreach with home visits) compared to usual care (I: 58.5%, C: 42.9%, adjusted Risk Ratio (aRR)=1.4 [Confidence Interval (CI): 1.2 to 1.5]) (1 study).
- Among females age 11 to 17, HPV vaccine initiation rates were higher in those who received mailed letters (I: 27%, C: 21%, Hazard Ratio (HR)= 1.3 [CI: 0.9 to 1.9]) or telephone reminders (I: 27%, C: 21%, HR=1.1 [CI: 0.8 to 1.7]) compared to usual care (1 study).

*The review authors indicated that these results were significant, however the confidence intervals cross the line of no difference, which indicates no effect.*

- Among females age 11 to 17 years, vaccination rates for first, second and third HPV doses were significantly higher in those whose families received a family-focused intervention with automated telephone reminders compared to no intervention (1 study).
  - Dose 1: I: 18%, C: 16%, HR= 1.1 (CI: 1.0 to 1.2)*
  - Dose 2: I: 71%, C: 65%, HR= 1.2 (CI: 1.1 to 1.3)
  - Dose 3: I: 73%, C: 63%, HR= 1.4 (CI: 1.2 to 1.5)

*The confidence interval touches the line of no difference, which indicates no effect.*

---

Evidence from quasi-experimental designs (3 studies) found:

- Among females age 11 to 12 years, HPV vaccine initiation, completion and completion rates were significantly higher following an intervention that included an educational brochure for parents, 1:1 scripted provider intervention and a web-based reminder system for electronic alerts to prompt telephone calls compared to historical controls (1 study).
  - Initiation: I: 75.0%, C: 24.1%, Odds Ratio (OR)= 9.4 (CI: 2.7 to 33.1)*
  - Completion: I: 62.5%, C: 6.9%, OR= 22.5 (CI: 4.3 to 118.0)*
  - Completion rate (% completed among those who initiated): I: 83.3%, C: 28.6%, OR= 12.5 (CI: 1.6 to 97.6)*

*Imprecise confidence intervals due to small sample size.*

- Among those who already received their first HPV vaccine dose, vaccination rates for second and third HPV doses were higher in those who received text message reminders compared to control groups (2 studies):
  - Receipt within 1 month of due date (1 study)
    - I: 51.6% (CI: 42.8% to 60.4%), C1 (eligible parents who did not enroll): 35.0% (CI: 29.6% to 40.3%), \( p < 0.005 \), adjusted Odds Ratio (aOR)=2.03 (CI: 1.29 to 3.22), \( p = 0.003 \), C2 (historical controls): 38.1% (CI: 35.2% to 41.0%) \( p < 0.005 \), aOR= 1.83 (CI: 1.23 to 2.71), \( p = 0.002 \)
On-time receipt of subsequent dose (1 study)
  - Dose 2: I: 38%, C1 (interested patients and parents who began enrollment but did not complete the process): 21%, $p=0.137^*$, C2 (standard care for patients and parents who were not offered text reminders or declined them): 21%, $p=0.035$
  - Dose 3: I: 14%, C1: 0%, $p=0.018$, C2: 3%, $p=0.007$

*The p-value is greater than 0.05, which indicates that the result is not significant.

Physician-focused interventions (7 studies)

Evidence from randomized designs (3 studies) found:

- HPV vaccine initiation rate was significantly higher following physician-focused interventions, which included electronic decision support and alerts, audit and feedback and education, compared to no intervention. Vaccination rate for the third HPV dose was higher following the same intervention but was not statistically significant (1 study).
  - Dose 1: I: 24%, C: 16%, HR: 1.5 (CI: 1.2 to 2.0)
  - Dose 3: I: 67%, C: 63%, HR: 1.1 (CI: 0.9 to 1.3)
- Among females age 12 to 14 years, timeliness of HPV vaccine uptake was higher following physician-focused intervention, which used an audit and feedback approach, compared to those whose providers received electronic clinical decision support (HR= 1.27, 95% CI: 0.91 to 1.77)*. There was no effect on the proportion of 13- and 14-year old children who were not up-to-date (UTD) following physician-focused intervention where providers received prompts through electronic clinical decision support at visits with patients not UTD for Dose 3 compared to historical controls (Data not reported) (1 study).
  *The confidence interval crosses the line of no difference, which indicates no effect.
- Among females age 11 to 12 years, HPV vaccine coverage was significantly higher at five months following physician-focused interventions, which included in-person or webinar consultations to vaccine coordinators, compared to no consultation. The same intervention did not significantly increase HPV vaccine coverage at five months among females age 13 to 18 years (1 study).
  - 11 to 12 years: 4.9%, 5.3% and 3.5% increase in vaccine coverage for in-person, webinar and control groups, respectively, $p<0.05$ for both comparisons with control group.
o 13 to 18 years: 3.9%, 3.4% and 3.5% increase in vaccine coverage for in-person, webinar and control groups, respectively, p>0.05 for both comparisons with control group.

Evidence from quasi-experimental designs (5 studies) found:

- Among males age 9 to 13 years, HPV vaccination was significantly higher during a social marketing campaign, which included posters, brochures, radio PSAs, online continuing medical education (CME) training, a provider tip sheet, and a website compared to those in counties that did not receive social marketing (1 study).
  o Pre-campaign: I: 4.3%, C: 4.0%
  o During campaign: I: 7.3%, C: 5.2%, HR= 1.34, p=0.02

- Among females age 11 to 12 years, HPV vaccine initiation, completion and completion rates were significantly higher following an intervention that included an educational brochure for parents, 1:1 scripted provider intervention and a web-based reminder system for electronic alerts to prompt telephone calls compared to historical controls (1 study)*.

*Findings reported above in the first bullet under Reminder and recall systems, Evidence from quasi-experimental designs, because this was a combined reminder/recall and physician-focused intervention.

- Among females age 12 to 17 years, HPV vaccination rates were significantly higher following exposure to a provider-based approach with clinical coordinators, which included a webinar on CDC's Assessment, Feedback, Incentives, and eXchange (AFIX) program and weekly follow-up e-mails compared to baseline vaccination rates (1 study).
  o Dose 1: Pre-campaign: 52.4%, Post-campaign: 54.0%, p=0.029
  o Dose 2: Pre-campaign: 35.0%, Post-campaign: 36.1%, p=0.001
  o Dose 3: Pre-campaign: 21.0%, Post-campaign: 22.0%, p=0.001

- Among females age 9 to 13 years, HPV vaccine initiation rates were mixed in those whose mothers were targeted in a social marketing campaign, which included posters and brochures in local retail establishments, a web-site, a hotline, news releases during a 3-month period and outreach to healthcare practices for provision of materials and guidance compared to other counties in the region and the state (I: 7.1%, 6.8%, 3.2% and 1.9% [each intervention county], C: 5.2% [other counties], 5.0% [state], p<0.01 for the two counties with higher initiation rates and the two counties with lower initiation rates) (1 study).
### School-based Programs (2 studies)

Evidence from a randomized design (1 study) found:
- Among female students, HPV vaccination was significantly higher in those who received at least one dose of the HPV vaccine at school-based clinics, which were offered on three days throughout the year and billed health insurance, compared to those in schools with no program (1 study).
  - 6th graders: I: 34%, C: 18%, aRR= 1.69 (CI: 1.21 to 2.36)
  - 7th and 8th graders: I: 20%, C: 7%, aRR= 2.56 (CI: 1.34 to 4.88)

Evidence from a quasi-experimental design (1 study) found:
- Among females age 10 to 17 years, HPV vaccine initiation was significantly higher in those who were offered school-based clinics in four, 1-day sessions in partnership with local health departments, compared to those in schools without clinics (I: 6%, C: 1%, OR=6.56 [CI: 3.99 to 10.78]) (1 study).

### Social Marketing (2 studies)

Evidence from quasi-experimental designs (2 studies) found:
- Among males age 9 to 13 years, HPV vaccination was significantly higher during a social marketing campaign, which included posters, brochures, radio public service announcements, continuing medical education webinar, provider tip sheet, and website, compared to counties that did not receive social marketing (1 study)*.
  *Findings reported above in the first bullet under Physician-focused interventions, Evidence from quasi-experimental designs, because this was a combined social marketing and physician-focused intervention.

- Among females age 9 to 13 years, HPV vaccination rates were mixed in those whose mothers were targeted in a social marketing campaign compared to other counties in the region and the state (1 study)*.
  *Findings reported above in the last bullet under Physician-focused interventions, Evidence from quasi-experimental designs, because this was a combined social marketing and physician-focused intervention.

### Comments & Limitations

- Clinical relevance of findings is uncertain since some effect sizes were modest, some increases were not sustained over time, and some HPV vaccination outcomes did not improve.
- Only two interventions included boys, and few focused on younger adolescents at the target ages for routine immunization (11 and 12 years old).
<p>| | |</p>
<table>
<thead>
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|   | • Some technological innovations (i.e. social media) were not tested in the interventions.  
|   | • Study designs and sample sizes varied considerably.  
|   | • Several studies used nonrandomized designs, historical controls or a small number of participants in the intervention group.  
|   | • The quality of included studies is unknown. |

*Notes with an asterisk in italics were added by the data extractor to improve clarity for the reader.*
## Appendix E: Applicability and Transferability Worksheet

### Starting/Modifying a Program

#### Applicability and Transferability Worksheet

<table>
<thead>
<tr>
<th>Factors</th>
<th>Questions</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Applicability (feasibility)</td>
<td></td>
<td></td>
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<tr>
<td>Political acceptability or leverage</td>
<td>Will the intervention be allowed or supported in current political climate?</td>
<td>• Scheduling additional clinics in schools may be resource-intensive; may get push-back from teachers and/or school administrators</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Changes in provincial funding for public health and education sectors, and to sexual education curriculum. PPH does not know what is covered in the sex ed curriculum (is HPV taught or mentioned?)</td>
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<tr>
<td></td>
<td></td>
<td>• Other PHUs may not have the same type of relationships with school boards and healthcare providers in their jurisdictions; pending public health restructuring may have impact interventions; reaching a broader audience might take more work if those relationships don’t already exist</td>
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<tr>
<td></td>
<td></td>
<td>• Opportunities might come with the restructuring (e.g., cost-sharing and collaboration, interventions might be more effective under a bigger authority)</td>
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<tr>
<td></td>
<td></td>
<td>• Consent form is a legal document; a very busy and long document for parents to read; printed on large paper; it would be difficult to get that type of consent online</td>
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<tr>
<td></td>
<td></td>
<td>• Some of the recommendations are current practice</td>
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<td></td>
<td></td>
<td>• Reminders could be incorporated into EMR systems; political will/support is there but it’s been a challenge to implement internally</td>
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<td></td>
<td></td>
<td>• Historically, council has been supportive of immunization initiatives</td>
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<td></td>
<td></td>
<td>• ROP-PPH’s reputation will be enhanced if the initiative increases vaccine uptake and decreases the rate of HPV infections</td>
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<tr>
<td></td>
<td></td>
<td>• There would be more opportunities to vaccinate children at school if we could advocate to the Ministry to have the vaccine administered beginning in Grade 6</td>
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<tr>
<td></td>
<td></td>
<td>• Interventions align with PPH’s strategic plan and conform to existing legislation/regulations:</td>
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<tr>
<td></td>
<td></td>
<td>• MOHLTC mandate</td>
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<tr>
<td></td>
<td></td>
<td>• Peel’s “Staying Ahead of the Curve” – Strategic Plan</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Health Protection and Promotion Act</td>
</tr>
<tr>
<td>Will this program enhance the stature of the organization?</td>
<td>• For example, are there reasons to do the program that relate to increasing the profile and/or creative a positive image of public health?</td>
<td></td>
</tr>
<tr>
<td>Will the public and target groups accept and support the intervention in its current format?</td>
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</tbody>
</table>
### Social acceptability

**Will the target population find the intervention socially acceptable? Is it ethical?**

- Consider how the program would be perceived by the population.
- Consider the language and tone of the key messages.
- Consider any assumptions you might have made about the population. Are they supported by the literature?
- Consider the impact of your program and key messages on non-target groups.

- There are always concerns about vaccines no matter the type (parents worry about something “impure or “unnatural” in their child’s bodies).
- The public and target groups are familiar with the HPV vaccine; recommended interventions will build on the current program so unlikely to be rejected or changes. Parents will likely favour interventions that will make getting the vaccine easier/more convenient or accessible. Interventions will likely be socially accepted unless individuals are anti-vax or have an exemption on file.
- Letters, reminders and increased social media presence will get messaging out but the language and tone needs to be respectful and not directed; only use evidence-informed messaging.
- Equity consideration – electronic reminders would require everyone to have a cellphone. Preference-based reminders would be an equitable approach (this is the approach used with Healthy Sexuality intake forms – ask clients how they would like to be contacted).
- Schools are inconsistent in their reminders and communications to parents.
- We should know more about those parents and/or students who do are not vaccinated (Are they ambivalent? Needle-phobic? Vaccine-hesitant? Did they not get the reminders? Is there a language or accessibility barrier? Etc.).
- Some students do consent to the vaccine as they get older at catch-up clinics; age and cost may be factors because the cost of the vaccine not publicly-funded once youth leave the school system (parents want their kids to get the vaccine free of charge).
- Acceptability is rising because the vaccine is now recommended for boys and girls and because parents want their children protected against more strains (calling ROP to get the HPV 9 vaccine instead of HPV 4). However, some parents are still uncomfortable with the vaccine (because it is a relatively new vaccine and a “sex” vaccine).
- Consent form is only in English and French; this may be a barrier to uptake with Peel being such an ethnically diverse community.
- Preference-based reminders is a good idea but implementing reminder systems needs to consider patient privacy and confidentiality.
- Healthcare providers might be difficult target group to engage because they are so busy.
- Since HPV is associated with sex and sexuality, HPV vaccination must be publicly managed with care (e.g., consider parental and political pushback).
- The immunization program already exists so it is already socially acceptable/ethical; focus on interventions at different levels (school, reminder and health care provider interventions) and expanding work that is already being done.
- We are assuming that low rates of HPV vaccine completion (dose 2) is because students/parents have forgotten and that reminders will help increase uptake.
- There are a variety of ethnic groups in Peel, which differ from those in the literature; key messages should be clear, concise and consider different cultures and understandings of HPV.
- Limited impact for non-target groups through school-based clinics; Non-target groups may feel excluded.
- Additional clinics and supporting physicians to educate the public will increase immunization opportunities and increase in vaccine uptake.
- Parents and students may not notice; strategies usually don’t work unless we target under vaccinators—Do we know who they are? Could we find out?
- Interventions targeting healthcare providers may not be accepted:
  - in Ontario, HPV is provided by the local public health unit in schools. In Peel, physicians rarely administer this vaccine, unless released to them for specific reasons. Given that it is not routinely administered by physicians, it is likely not discussed much in physician visits unless prompted by parents.
  - According to the updated Physician Communication Rapid Review printed educational materials were effective at influencing practice when the desired behaviour change was related to processes such as vaccination. However, this is likely the case the physicians are providing the service, i.e., providing the immunization. However, with HPV, physicians are not providing the immunization, therefore printed materials may be of little value or influence. Other proposed educational materials, i.e., webinars, CME events, could have a broader focus on immunization, rather than just HPV vaccine. Again, since HPV is not routinely provided by primary care providers, providing educational materials related to immunization more broadly including both vaccines provided by primary care and those not always provided by primary care, i.e., HPV, travel vaccines, flu vaccine (which can be administered by pharmacists), may be beneficial and well received.
In Ontario, HPV is provided in grade 7 when children are 12 years of age. Most routine immunizations in childhood end with the 4-6-year booster. After that, children are not seeing their physician often except for acute illness, where a full assessment and discussion about immunizations likely does not occur. Not all parents take their children for yearly “well-child” visits where a discussion about immunization may take place.

- Many Family Physicians use the Bourke Baby Record which notes HPV vaccine at age 9 (when it is licensed). Even if physicians are having a visit with parents when their children are 9 years of age, they may not recall this information by the time the child is 12 years of age and is offered the vaccine in school.

- Adolescents are required to receive a booster dose of tetanus-containing vaccine at 14-16 years of age, which is after the ‘routine’ administration of HPV vaccine in grade 7/age 12, therefore a physician recommendation at that point would be too late to receive in school.

- Physicians who are seeing newcomers and catching them up on vaccinations may have an opportunity to discuss HPV vaccination with parents of children closer to the age of 12 when it will be offered in school.

- We could further explore if healthcare providers are hesitant to recommend HPV vaccine to their patients? If providers are not seeking an HPV recommendation from their healthcare provider, then focusing on providers as a means of increasing HPV vaccine uptake may hold limited value.

- In Peel, although students can still receive the HPV vaccine if they missed it in grade 7, this requires 2 or 3 (depending on age). Appointments at catch-up clinics offered on Saturdays throughout the year, are not convenient for parents nor cost-effective for health units as receiving the vaccine in school in grade 7.

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Available essential resources (personnel and financial)

- Who/what is available/essential for the local implementation?
- Are they adequately trained? If not, is training available and affordable?
- What is needed to tailor the intervention locally?
- What are the full costs?

- ROP – PH is reimbursed for the HPV vaccine by the MOHLTC.
- There is a need for a more robust reminder system, but we need to be cognizant of cost and resources. Budget may be an issue due to changes in provincial funding, however there could be a case made for more resources despite the current climate; PHUs don’t have to go into the community and explain what immunization is and we have compelling indicators related to cancer etc., to demonstrate that the incremental health benefits are the reason why the costs are worth implementing the interventions. Perhaps new interventions (e.g., text message reminders) could be a pilot with volunteers first.
• Consider: In-kind staffing, supplies, systems, space requirements for staff, training, and technology/administrative supports.

Are the incremental health benefits worth the costs of the intervention?

• Consider any available cost-benefit analyses that could help gauge the health benefits of the intervention.

• Consider the cost of the program relative to the number of people that benefit/receive the intervention.

• If the program implements additional school-based and/or catch-up clinics, increased staffing (PHNs and immunization staff) and resources (needles, vaccines, syringes etc.) must be available. A financial analysis would need to be conducted of the workflow, current and projected costs and reach to conduct more clinics. New staff (and potentially casual staff) would need to be trained on vaccinating, scheduling etc., at the beginning of each school year.

• Implementing additional clinic days in each school would require cooperation from schools and school boards to accommodate activities, curriculum and space. Schools are already taxed with us going in with immunization clinics and the student population in Peel continues to grow.

• Catch-up clinics are offered once a month and we currently service 300-400 people at those clinics. We could increase letters/reminders, but appointment availability is limited (it is August now and we are currently booking for February).

• Healthy Sexuality clinics carry school-based HPV vaccines, but it is very rare that people come to these clinics for the vaccines. Perhaps there is an opportunity to use HS resources for catch-up clinics? (there is Panorama access at the clinics). Another option for vaccination clinics is a van, however this may not work given our need to monitor clients for 15 minutes post-injection.

• RE: In-service education and training to HCP - Currently we do Rounds but do not know if they work. We also reach physicians by HPUs which are written by subject matter experts. Additional training would be required to program staff on how to deliver key messages in timely and effective manner.

• Collaborate with school boards to determine how to implement reminders to students and parents. VPD meets with both school boards once a year in the fall. Other teams/divisions (e.g., Oral Health, Health Protection) may be able to facilitate communication and uptake. Currently, VPD partners with OH and HP when meeting with school board reps. There is no linkage b/w SH and VPD because the mandate is so different (the Health and Safety reps from the school boards that VPD meets with are not the same people that School Health collaborates with).

Interventions would require collaboration and communication with stakeholders in the community to ensure feasibility of interventions. Schools and HCPs must be on-board with interventions. Provide information on evenings and weekends or through social marketing channels (e.g., Facebook, Twitter) to clients, parents, schools and communities. Would need an evaluation to show intervention effectiveness w/r/t success and challenges, costs of training and resource development, impact etc.
**Is the intervention to be offered in line with Peel Public Health’s 10-Year Strategic Plan (i.e., 2009-2019, “Staying Ahead of the Curve”)?**

- Does the intervention conform to existing legislation or regulations (either local or provincial)?
- Does the intervention overlap with existing programs or is it symbiotic (i.e., both internally and externally)?
- Does the intervention lend itself to cross-departmental/divisional collaboration?
- Any organizational barriers/structural issues or approval processes to be addressed?
- Is the organization motivated (learning organization)?

**ROP—PH is motivated since the goal for vaccination coverage is 90% coverage and previous health promotion strategies to attain this goal have not achieved this goal. Build on existing HPV vaccination clinic programs in schools is a good idea, but budget may be an barrier due to changes to provincial funding.**

- Technology is a big barrier at the corporate level; the internal infrastructure is not there for a large-scale, automated reminder system (may be coming with EMR). The program currently has mobile IMS and tablets.
- Currently, we have vaccine coordinator (who verbally tell students what to expect at an immunization clinic) and 16-20 immunizers a day (4-8 people per school), seeing from 54600 students at a school. School-Based Immunization Catch-up Clinic (SBICC) availability may be a barrier.
- Some interventions do not overlap with existing programs, rather are an extension of what is currently being done. Interventions are symbiotic and the organization is motivated because ROP—PH is already working on school-based and community clinics to improve vaccination rates.

- The interventions will involve cross-divisional collaboration with multiple teams/departments (e.g., immunization team, CD call center, OMOH (HPUs/physician outreach), IS and OH teams, Policy, Communications and Web/IT departments etc.)
- With all our interventions we need to be transparent, but also empower parents to decide to immunize their child. With increased exposure, we may build more trust in the community. E.g., parent/teacher meetings, open-hall – is this an opportunity to share information? Public health does not have a long-standing presence at schools (compared to Peel Police who are always there talking about bike safety). On the other hand, we know information does not change behaviour (e.g., this is the last year School Health is doing one-off events and education to parents).
- Consider a health equity angle – Want to decrease health disparities and inequities - Are there groups who are being systematically denied HPV coverage because of their parents’ beliefs etc. What do we know about the people who are saying no? The more we understand, the better (e.g. In our consents, we ask yes or no but we don’t know the reason for no as well as those who did not send the consents back at all).
### Transferability (generalizability)

<table>
<thead>
<tr>
<th>Magnitude of health issue in local setting</th>
<th>What is the baseline prevalence of the health issue locally?</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>What is the difference in prevalence of the health issue (risk status) between study and local settings?</td>
</tr>
<tr>
<td></td>
<td>Consider the Comprehensive Health Status Report, and related epidemiological reports.</td>
</tr>
</tbody>
</table>

- Baseline immunization rates were much lower than Peel’s; we may be dealing with some other factors impacting uptake (e.g., What do we know demographically and psychologically about those who opt out of or do not consent to HPV vaccinations?)
- Between 2003-2012, 1,857 HPV related cancers were reported in Peel; 900 attributed to HPV infection
- Cancer Care Ontario – 1,300 cancer cases caused by HPV can be prevented by vaccination, screening and treatment
- It is important to maintain high vaccine coverage locally as infectious diseases are still common in other parts of the world

<table>
<thead>
<tr>
<th>Magnitude of the “reach” and cost effectiveness of the intervention above</th>
<th>Will the intervention appropriately reach the priority population(s)?</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>What will be the coverage of the priority population(s)?</td>
</tr>
</tbody>
</table>

- The USA has a completely different health care system from ours. The CDC's attitude toward vaccination is the responsibility of the individual not the public; here we have a responsibility to our community
- The intervention will appropriately reach priority populations; coverage should be high because all eligible students will be targeted and because the interventions will reach different groups and levels (students, parents, school administrators and healthcare providers). Additional documents/formal process may need to be established to ensure reach.
### Target population characteristics

<table>
<thead>
<tr>
<th>Are they comparable to the study population?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Will any difference in characteristics (e.g., ethnicity, socio-demographic variables, number of persons affected) impact intervention effectiveness locally?</td>
</tr>
<tr>
<td><strong>Consider if there are any important differences between the studies and the population in Peel.</strong></td>
</tr>
</tbody>
</table>

- Must be mindful of various minority groups, cultural differences, languages, educational backgrounds and attitudes re: HPV; children receiving a “sex vaccine”; Peel has a diverse population, so a multipronged approach would probably increase intervention effectiveness.
- Target and study populations are comparable because school-aged children and youth, however most of the studies were conducted in the US which may limit generalisability (Peel is an ethnically diverse community).
- Age groups between studies and Peel’s population are comparable (children and youth 9-18 years old) but possible differences in ethnicity, socio-demographic variables could impact effectiveness. Only 1 SR provided insight outside of age into the type of population (privately insured etc.).

### Proposed Direction (after considering the above factors):

- Implement a multi-pronged approach to increase HPV series completion and uptake, and improve population health by preventing HPV infection in Peel.
- Involve and engage with schools, parents and communities to develop the strategies and approaches to increase immunization rates.
- Define process for different level of interventions (audience-specific approaches).
- Collaborate with school boards to explore the option of and plan for additional HPV vaccination in each school.

**Form Completed by:** O.J. (ARP, CD)

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