Human Papillomavirus (HPV)  

Research Report  
April 2016
About RiskAnalytica for Economic Analysis

RiskAnalytica provides objective, independent and evidence-based analysis dedicated to a comprehensive and collaborative understanding of the short and long term risks and returns behind policy decisions and economic outcomes.

RiskAnalytica serves municipalities, regions, provinces and industry sectors that seek a best-of-breed understanding of the issues facing them using expertise combined with a many variable computational socio-economic and population health policy evaluation platform.

About This Report

This report was prepared by RiskAnalytica on behalf of the Ontario Pharmacists Association. In keeping with RiskAnalytica’s guidelines for funded research, the design and method of research, as well as the content of this study, were determined solely by RiskAnalytica. The research was conducted by Paul Smetanin, Douglas McNeil, and Charles Burger.

Statistics Canada data and relevant literature was used to inform the computer simulation models used to produce the results of this report. All quantitative methods used are documented herewith.

The interpretation and reporting of the results of the mathematical modelling contained within this report do not necessarily represent policy position or the opinion of the Ontario Pharmacists Association.

Forecasts and research often involve numerous assumptions and data sources, and are subject to inherent risks and uncertainties. This information is not intended as specific investment, accounting, legal, or tax advice.

Citation:

EXECUTIVE SUMMARY

RESULTS AT A GLANCE

Over the next 30 years, if pharmacists’ roles were expanded in Ontario to provide the human papillomavirus (HPV) vaccine, then it is estimated that:

- 275,000 additional HPV vaccines could be administered to Ontarians each year;
- A combined 7,600 cases of genital warts, cervical cancer, and anal cancer could be prevented each year;
- 23,000 healthcare visits\(^1\) due to genital warts, cervical cancer, and anal cancer could be prevented per year; and
- $11.4 million (\$2015) in average annual healthcare utilization costs\(^2\) associated with genital warts, cervical cancer, and anal cancer could be prevented.

At a public cost of $7.50 (\$2015) per pharmacy-administered HPV vaccine, the substantial health and healthcare utilization benefits outlined above still allow the expanded HPV immunization program in Ontario to have a potential average net benefit of $9.3 million (\$2015) per year over the next 30 years\(^3\).

SCOPE AND ANALYSIS

Using RiskAnalytica’s *Life at Risk* modelling platform, a comprehensive simulation of HPV and its associated diseases was developed to evaluate the health and healthcare impacts of an expanded pharmacist immunization program against HPV. This addendum will focus on evaluating how healthcare utilization, intervention costs (costs to increase pharmacists’ scope to issue immunizations), and symptomatic cases change in response to changing immunization rates for HPV. The HPV-associated diseases that are tracked in the analysis are:

- Genital warts;
- Cervical cancer; and
- Anal cancer

The healthcare metrics that were evaluated in association with the aforementioned diseases include:

- Incidence and mortality;
- Physician, emergency room (ER), and hospital visits; and
- Physician, ER, and hospital costs.

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1 Healthcare visits refers only to visits to physicians, ERs, and hospitals.
2 Healthcare utilization costs refers only to the costs associated with visits to physicians, ERs, and hospitals.
3 Technically 31 years.
The following evaluation limits the eligible population for the HPV vaccination to females between the ages of 18 and 45\(^4\) and males between the ages of 9 and 26\(^5\). Moreover, the eligible population is assumed to reach a 100% vaccination rate after a 5-year program ramp-up period\(^6\).

For a more detailed overview of the scope, methodology, and sensitivity analysis applied in this analysis please refer to section 2.0 and/or the original analysis (Smetanin, Miloucheva, McNeil, & Burger, 2016).

**RESULTS\(^7\)**

Over the next 30 years, if the immunization program in Ontario were expanded to allow pharmacists to administer the HPV vaccine, an average of 275,000 additional HPV vaccines per year could be administered to Ontarians. By 2045, a cumulative total of 8.5 million additional HPV vaccines could be administered by pharmacists in Ontario.

Increasing the immunization rate of HPV could prevent 37%, 50%, and 14% of the incident cases of genital warts, cervical cancer, and anal cancer in Ontario, respectively. By preventing the incidence of these HPV-associated diseases, the program could also prevent 46% of the deaths caused by cervical cancer and 13% of those caused by anal cancer (there is no mortality associated with genital warts). Table 1 outlines the estimated results in terms of incident cases and mortality cases prevented as annual averages and cumulative totals over the next 30 years.

<table>
<thead>
<tr>
<th>HPV-Associated Diseases</th>
<th>Average Annual Incidence</th>
<th>Average Annual Mortality</th>
<th>30-Year Total Incidence</th>
<th>30-Year Total Mortality</th>
</tr>
</thead>
<tbody>
<tr>
<td>Genital Warts</td>
<td>7,200</td>
<td>-</td>
<td>223,000</td>
<td>-</td>
</tr>
<tr>
<td>Cervical Cancer</td>
<td>380</td>
<td>100</td>
<td>12,000</td>
<td>3,000</td>
</tr>
<tr>
<td>Anal Cancer</td>
<td>40</td>
<td>13</td>
<td>1,200</td>
<td>390</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>7,600</strong></td>
<td><strong>113</strong></td>
<td><strong>237,000</strong></td>
<td><strong>3,390</strong></td>
</tr>
</tbody>
</table>

\(^4\) Females in grade 8-12 were excluded due to the school-based vaccination programs.

\(^5\) The male evaluation does not include the sub-population of males who have sex with males (MSM), though an evaluation within this population should be considered for future research.

\(^6\) Sensitivity analysis was done on the ability of pharmacist’s to fully vaccinate the entire eligible population. Please refer to section 2.7 and section 3.6 for more details.

\(^7\) All references to healthcare visits and healthcare costs refer to the visits and costs associated with physician, ER, and hospital resources.

\(^8\) Note that figures may not correspond due to rounding.
By preventing the above incident cases of the HPV-associated diseases, the expanded immunization program could prevent significant portions of the healthcare utilization and costs associated with genital warts, cervical cancer, and anal cancer. Over the analysis period, 37%, 50%, and 14% of genital warts, cervical cancer, and anal cancer-associated healthcare visits, respectively, could be prevented in Ontario. This is estimated to result in a 37%, 53%, and 16% reduction in the associated healthcare costs across the same three diseases, respectively. Table 2 outlines the average annual and 30-year total healthcare visits and costs prevented across the three diseases.

### Table 2  Potential Healthcare Utilization Impact (Prevention) Summary Results

<table>
<thead>
<tr>
<th>HPV-Associated Diseases</th>
<th>Average Annual</th>
<th>30-Year Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Genital Warts</td>
<td>15,600</td>
<td>$1.67M</td>
</tr>
<tr>
<td>Cervical Cancer</td>
<td>6,830</td>
<td>$8.2M</td>
</tr>
<tr>
<td>Anal Cancer</td>
<td>706</td>
<td>$1.52M</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>23,000</strong></td>
<td><strong>$11.4M</strong></td>
</tr>
</tbody>
</table>

Taking into consideration the healthcare utilization benefits achieved by the expanded HPV immunization program and the added vaccine administration costs ($7.50 per vaccine), the expanded immunization program could have an average net benefit of $9.3 million ($2015) per year over the next 30 years. By 2045, the cumulative total net benefit achieved by the program could reach $289 million ($2015).

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9 Note that figures may not correspond due to rounding.
CONCLUSION

Expanding the immunization capabilities for pharmacists allows vaccines to be administered by the most accessible healthcare providers and will have the added benefit of alleviating some of the burden placed on physicians and other healthcare resources. If pharmacists had theirs roles expanded in Ontario to provide immunization for HPV, then over the next 30 years, on average, an additional 275,000 HPV vaccines per year could be administered to Ontarians. Providing these additional vaccinations will have health and healthcare utilization impacts in Ontario. Over the next 30 years, on average, expanding the HPV immunization program in Ontario could prevent:

- A combined 7,600 annual cases of genital warts, cervical cancer, and anal cancer (a cumulative total of 237,000 incident cases prevented by 2045);
- 23,000 annual healthcare visits\(^{10}\) associated with genital warts, cervical cancer, and anal cancer (a cumulative total of 717,000 healthcare visits prevented by 2045); and

Accounting for the added cost of $7.50 per vaccination, the expanded immunization program is estimated to have a potential average annual net benefit over the next 30 years of $9.3 million ($2015) in Ontario. By 2045, the program could have a cumulative total net benefit of $289 million ($2015).

\(^{10}\) Healthcare visits refers only to visits to physicians, ERs, and hospitals.

\(^{11}\) Healthcare utilization costs refers only to the costs associated with visits to physicians, ERs, and hospitals.