FEDERATION OF MEDICAL WOMEN OF CANADA

FÉDÉRATION DES FEMMES MÉDECINS DU CANADA

2024 FMWC HPV Task Force

Addressing the HPV Vaccination Crisis in Canada with a Focus on Ontario

A White Paper with Twelve Actionable Recommendations

October 2024

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Summary of Key Messages

- **HPV-Related Cancer Impact**: Human papillomavirus (HPV)-related cancers affect thousands of Canadians, leading to premature death, aggressive treatments, and millions of dollars in health care costs.
- **Vaccination Gap**: HPV-related cancers are preventable by vaccination, but fewer than 20% of Canadians are vaccinated. Adopt cancer prevention as a core value and guiding principle.
- **Gender-Neutral Programs**: HPV-related cancers affect both males and females. Create vaccine programs that are gender-neutral and accessible to all.
- **Public and Health Care Provider Education Campaigns:** Implement targeted education campaigns for both health care providers and diverse populations, including young adults and parents, to raise awareness about HPV and the importance of cancer prevention through vaccination.
- **Maintain Multi-Dose Regimens**: Continue to offer multi-dose schedules for HPV vaccination. These regimens are approved by Health Canada and provide rigorously proven, long-term protection.
- **Caution on Single-Dose Recommendations**: The evidence for single-dose vaccination is limited, and a single dose is currently an off-label recommendation. A multi-dose schedule remains essential for effective HPV-related cancer prevention.
- **Access to Vaccination:** To eliminate cervical cancer and to drastically reduce other HPV-related cancers, initiate concerted efforts involving the Ministry of Health, Public Health Units, and health care providers to ensure that HPV vaccination is accessible to all Ontarians.
- **Pharmacists' Roles:** Pharmacists have the knowledge and training to immunize. To provide more immunization opportunities for people in Ontario, authorize pharmacists to administer the publicly funded HPV vaccine.
- **Dentists' Roles:** To provide more seamless immunization opportunities for people in Ontario, authorize dentists to prescribe the HPV vaccine for the prevention of oropharyngeal (mouth and throat) cancer.
- **Coordinated Vaccine Registry**: Establish a province-wide, accessible vaccine registry to expand vaccination coverage and facilitate HPV research.
- **Actionable Recommendations**: This document presents 12 actionable recommendations for the Ontario Ministry of Health, Public Health Units, and health care providers to expand cancer prevention by increasing vaccination rates and improving awareness of HPV-related cancers in Ontario.

2024 FMWC HPV Task Force

Addressing the HPV Vaccination Crisis in Canada with a Focus on Ontario

Summary

Cancers caused by the human papillomavirus (HPV) affect thousands of people in Canada, leading to premature death, the need for aggressive and disfiguring treatments, and millions of dollars in health care costs. These cancers are largely preventable by vaccination, but fewer than one in five Canadians is vaccinated. The World Health Organization (WHO) has called for 90% of girls to be fully vaccinated against HPV by age 15, as part of their initiative to eliminate cervical cancer globally within the next century.[1] Many countries, including Canada, are supporting this initiative and have implemented HPV vaccination programs; Canada's goal is to fully vaccinate 90% of 17-year-olds (both girls and boys) by 2025.[2] To eliminate cervical cancer and to drastically reduce other HPV-related cancers, we must increase HPV vaccination coverage.

In this document, we present 12 actionable recommendations to increase vaccination rates and to improve awareness of HPV-related diseases and cancers in Ontario. Our recommendations include creating a central vaccination registry, offering multi-dose HPV vaccine regimens, promoting awareness of HPV-related diseases and cancers in males, extending eligibility for publicly funded vaccine, eliminating regulatory barriers, and addressing equity through programs for vulnerable populations. Existing initiatives and networks should be leveraged and expanded to support these objectives, ensuring that all people in Canada have access to lifesaving HPV vaccination.

1. Why is prevention important?

Cancer is the leading cause of death in Canada.[3,4] While cancer affects most Canadian families, many people are unaware that some cancers are caused by viruses and can be prevented with vaccines.

Human papillomaviruses (HPV) are DNA viruses that infect the skin and mucosal body surfaces through direct contact.[5] These viruses cause nearly all cervical cancers as well as most anal cancers (80-90%), most oral and throat cancers (74%), up to half of penile cancers (40-50%), and 40% of vaginal and vulvar cancers.[6,7,8] Notably, the majority of HPV-related cancers occur beyond the cervix, and these cancers can affect both females and males.[9] HPV is most often transmitted by intimate sexual contact and can also be transmitted nonsexually through skin contact, injury, or from mother to child during pregnancy or delivery.[10-12] Sadly, the majority of Canadians continue to believe that HPV infection only affects young women and is only linked to cervical cancer.[13] Ongoing education is essential.

HPV is common, and over 75% of people in Canada will be exposed and/or infected at least once during their lifetimes.[9] Since the initial infection causes no symptoms, most people are unaware of it.[14] Most people will clear their HPV infections within two years, but the virus persists in about 20% of cases.[15,16] This persistence can lead to precancerous changes and eventually cancer. Progression to cancer can be slow, often requiring ten years or more after the original infection.[17]

Despite progress in cancer research, rates of HPV-related cervical cancer, oral cancer, and throat cancer are increasing in Canada.[18-20] Cervical cancer is now the most rapidly increasing cancer in Canada.[20] However, oropharyngeal (mouth and throat) cancer is also rising rapidly and is 4.5 times more prevalent in males than in females, emphasizing the need for all Canadians to be vaccinated.[21]

At the same time, cancer care has been impacted by the pandemic, with extreme demands on health care practitioners (HCPs) and high pressure on limited resources.[22-24] Lower rates of oncology consultations and cancer screening, delays in cancer diagnosis, and poor physical health have been noted among cancer patients.[25-28] There have been reports of increases in cancer deaths and increases in diagnoses of advanced-stage cancers.[25-28]

The treatment of HPV-related cancers is often aggressive and severely disrupts patients' lives.[29] Cervical cancer patients commonly have high levels of anger, grief, and stress, as well as a loss of self-esteem and a high risk of suicide.[30] After cancer treatment, patients with HPV-positive oropharyngeal cancers can experience lifelong difficulty with swallowing, speaking, and taste, along with severe dry mouth, dental decay, trismus and fibrosis.[31-34] They also experience chronic pain, anxiety, depression, and body image disorder.[31-34] Affected individuals are four times more likely to die by suicide than the general population.[35] HPV prevention and screening are crucial to reduce the burden of disease, lower health care costs, prevent deaths by suicide, and build healthier communities.[2,36,37]

"**These patients are almost never happy again**". – Deborah Saunders, BSc, DMD, Medical Director, Department of Dental Oncology at Health Sciences North, describing individuals with HPV-related oropharyngeal (mouth and throat) cancer

2. HPV-related cancers are preventable by vaccination

Two HPV vaccines are currently approved by Health Canada, namely a bivalent vaccine (2vHPV; Cervarix®) and a nonavalent vaccine (9vHPV; Gardasil® 9).[38,39] A quadrivalent vaccine (4vHPV; Gardasil®) was available from 2006-2019.[9] These are among the **most efficacious vaccines ever developed**.[40] 9vHPV is used in all provincial school-based vaccination programs in Canada.[41] This vaccine protects against the two most common low-risk HPV strains (6 and 11), as well as the seven most common high-risk oncogenic strains (16, 18, 31, 33, 45, 52, and 58). 9vHPV is almost 100% effective against cervical disease caused by HPV types 16 and 18, and 96% effective against disease caused by types 31, 33, 45, 52, and 58.[9] Immunization against HPV types 16 and 18 prevents about 70% of anogenital cancers and 60% of precancerous cervical lesions.[9] Immunization against the other types in the nonavalent vaccine prevents another 90% of vaccine-type oropharyngeal cancers, 14% of anogenital cancers, and 30% of precancerous cervical lesions, as well as about 90% of genital warts.[9,42]

The efficacy and safety of HPV vaccines has been demonstrated in both males and females.[43] HPV immunization programs for girls have been established in 125 countries, and 47 countries vaccinate boys.[44] Over 500 million doses of HPV vaccine have been delivered worldwide.[44] HPV vaccines are extremely safe, with no association with Guillain-Barré syndrome, Bell's palsy, complex regional pain syndrome (CRPS), postural orthostatic tachycardia syndrome (POTS), or infertility.[44] Serious adverse events occurred in fewer than 0.1% of recipients of 9vHPV.[44] HPV vaccines are effective not only in clinical trials, but also in real-world settings.[45,46] For example, Australia has achieved almost complete elimination of external genital warts and

significant declines in cervical pre-cancers as a result of extremely high HPV vaccine coverage rates in their national immunization program.[47] In one American study, the prevalence of HPV vaccine types decreased by 56% within four years of a recommendation for 4vHPV vaccination for girls aged 11-12 years, even though the vaccine coverage rates achieved were low.[46] According to studies carried out in Canada, the USA, and the UK, the prevalence of HPV, precancerous cervical lesions, and anogenital warts (in females) decreased significantly in countries with at least moderate vaccination coverage (>50%).[45] Importantly, the incidence of anogenital warts also decreased in males, indicating herd protection. However, no herd effect was observed in countries with <50% vaccine coverage.[45]

Overall, HPV vaccines represent an **exciting and unprecedented opportunity to eliminate one type of cancer and drastically reduce several others**. The WHO has set a goal to **eliminate cervical cancer globally within the next century**,[48] and Canada has an action plan that aligns with this goal.[2]

"**Why are we looking at rising incidence rates of these cancers when we have the tools to eradicate them?"** – Marla Shapiro C.M., MDCM, CCFP, FCFP, FRCPC, FRCPC, MHSC, MSCP, Family Physician, Toronto and Professor, Department of Family and Community Medicine, University of Toronto

3. Progress toward HPV-related cancer prevention

Unfortunately, Canada is not yet on track to eliminate cervical cancer. Knowledge and awareness of HPV-related cancers are low.[49,50] In a survey of over 700 Canadians, 40% were unaware of HPV infection as a cancer risk factor.[51] A study of 176 young men in British Columbia found that most were aware of HPV as the cause of cervical cancer, but only one-third knew that HPV vaccines for men are available, and even fewer were aware that HPV causes oropharyngeal and anal cancers.[52] Even individuals with HPV-positive oropharyngeal cancer often do not know that HPV is the cause of their cancer.[53] Surveys have also identified a lack of awareness of HPV among HCPs.[54,55]

Correspondingly, Canada's HPV vaccination rates are low. According to the National Immunization Coverage Survey (NICS), only 17.7% of adults 18 years of age and older are vaccinated, including 22.5% of females and 12% of males.[56] Vaccination coverage is higher among younger people, estimated at 62.9% for adults aged 18-26 years and 84.0% among 14-year-olds.[57] However, the sample size for the 2021 NICS included only 758 parents, and NICS data are based on immunization booklets and personal recollections.[57] Therefore, these data may overestimate coverage. According to Public Health Ontario, only 68.5% of 17-year-olds were fully vaccinated by the end of the 2023 school year.[58] This figure falls short of the goal outlined in Canada's Action Plan to Eliminate Cervical Cancer, which is 90% of 17-year-olds (both girls and boys) fully vaccinated by 2025.[2]

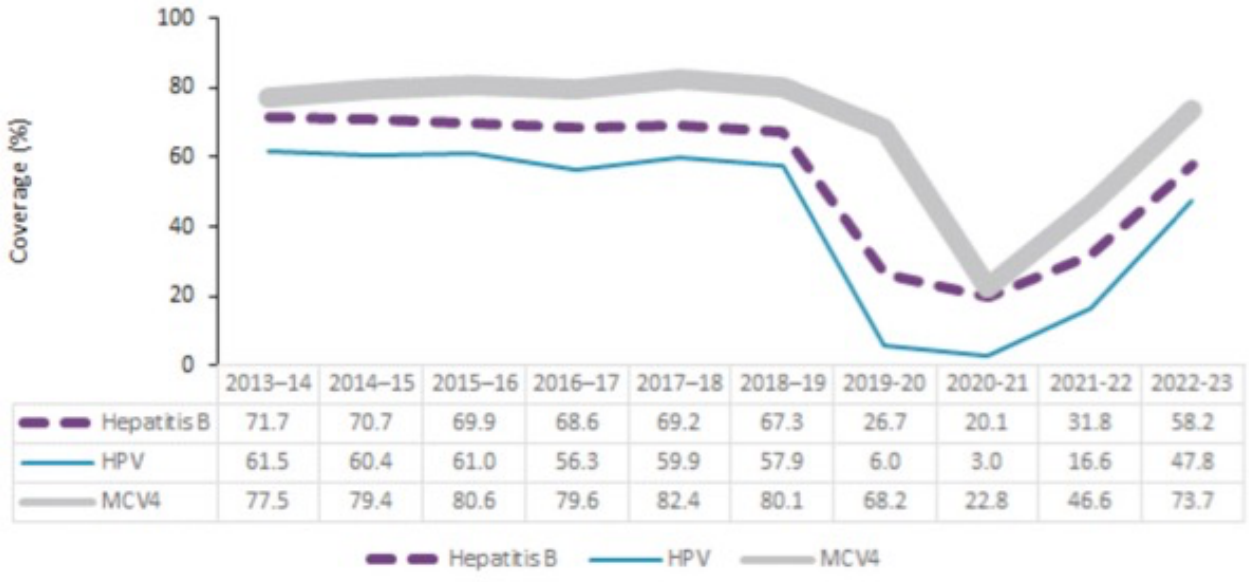
Vaccination rates are generally lower among males, people living in rural areas and smaller communities, Indigenous people, and people with lower socioeconomic status.[56,59] Surveys conducted by the Sex Information and Education Council of Canada (SIECCAN) indicate very low levels of HPV vaccination among young adults. Among people 18-24 years of age, only 68% of females and 23% of males reported that they

had received at least one dose of the HPV vaccine.[60] Among females 35-44 years of age, only one-quarter had been vaccinated .[61]

"**These folks still have 50+ years of life expectancy and are going to be highly vulnerable to HPV-related cancer. To just let them go after so many people have made it through [school] unvaccinated is a huge, missed opportunity that we're going to pay the price for.**" – Alex McKay, PhD, of the Sex Information and Education Council of Canada (SIECCAN)

The COVID-19 pandemic disrupted public health efforts and led to a dramatic drop in immunization rates.[62] In 2020-2021, only 2.6% of Ontario 12-year-olds completed the recommended school-based HPV vaccine series.[63] Although partial recovery has taken place thanks to the catch-up efforts of Public Health Ontario, the latest data show that only 47.8% of 12-year-olds completed the vaccine series on schedule in 2022-23 (Figure 1). One-third of students had not received any dose of the HPV vaccine multi-dose schedule.[58] These levels are even lower than pre-pandemic levels (estimated at 57.8% of 12-year-olds in the 2018-19 school year).[63]

If we do not act to improve these immunization rates, thousands of Ontarians will develop cancers in the future, which could have been prevented by vaccination. If HPV vaccine coverage is not increased to 90%, and if screening and testing targets are not reached by 2025, **6,810 women in Canada will develop preventable cancers, and 1,750 women in Canada will die of preventable disease by 2050**.[2] Canada can still get back on track, but it will require focused efforts. An HPV vaccination rate of over 90% by 2025, along with improved cancer screening and treatment, could **eliminate cervical cancer in Canada by 2040**.[2]



	2013–14	2014–15	2015–16	2016–17	2017–18	2018–19	2019-20	2020-21	2021-22	2022-23
Hepatitis B	71.7	70.7	69.9	68.6	69.2	67.3	26.7	20.1	31.8	58.2
HPV	61.5	60.4	61.0	56.3	59.9	57.9	6.0	3.0	16.6	47.8
MCV4	77.5	79.4	80.6	79.6	82.4	80.1	68.2	22.8	46.6	73.7

Figure 1. Immunization coverage for the quadrivalent meningococcal conjugate (MCV4), human papillomavirus (HPV), and hepatitis B (Hep B) vaccines among 12-year-olds in Ontario: 2013-14 to 2022-23 school years. Reproduced from reference 58.

4. FMWC advocacy for awareness, education, and action on HPV-related cancers

The Federation of Medical Women of Canada (FMWC) HPV Task Force is composed of HCPs and other experts in HPV research and HPV-related cancer treatment. The task force advocates for action to prevent HPV-related cancers. White papers published in 2022 and 2023 outlined recommendations across stakeholders to improve HPV-related cancer prevention in Ontario.[64,65] We conducted awareness campaigns that included media appearances, social media discussions, news articles, and meetings with representatives. In response, the Ontario Ministry of Health extended eligibility for the publicly-funded HPV vaccine to students who were born between 2002 and 2006 and who graduated between 2020 and 2023.[66] This extended eligibility allowed students to receive catch-up doses until August 31, 2024. These steps represent valuable progress toward our goals, but much more remains to be done.

5. Vaccine science and new dose schedules

HPV vaccines have proven efficacy in randomized controlled trials (RCTs) as well as real-world studies. In a randomized, double-blind, international study of 14,215 females aged 16-26 years, the vaccine efficacy (VE) was 97.4%, and efficacy was sustained for up to 6 years.[67] Antibody responses persisted for up to 14 years in females and 9.5 years in males.[38]

In recent years, research has turned to studies of dose schedules. The manufacturer's recommended schedule for 9vHPV consists of three doses, with the second dose given two months after the first, and the third dose given six months after the first.[38] A two-dose regimen may be employed for people aged 9-14 years.[38] The efficacy of the two-dose regimen is similar to that of the 3-dose regimen in children up to age 14.[68]

Observational studies have demonstrated that some protection against HPV can be induced by only one dose in females. For example, the Costa Rica HPV Vaccine trial (CVT) examined the efficacy of the 2vHPV vaccine.[69] In a cohort of 384 women 18-25 years of age who received a single dose of the three-dose series, the VE against persistent HPV infection was 100%, whereas the VE was 80.9% for three doses and 84.1% for two doses.[70] After 11.3 years, the VE against HPV infection remained similar among all three dose groups.[71] However, antibody levels were lower in the single-dose group.[71] Another study, the International Agency for Research on Cancer (IARC) India HPV trial, examined the efficacy of a single dose of 4vHPV in females aged 10-18 years, compared with two or three doses.[72] After a median follow-up of 9.0 years, the VE against persistent HPV infection was 95.4% in the single-dose group, 93.1% in the two-dose group, and 93.3% in the three-dose group.[72] It is important to note that in both of these observational studies, the single-dose group was not randomized.

The first prospective RCT to investigate a single dose was carried out in Kenya, in which 2,275 females aged 15-20 years received either one dose of 9vHPV, one dose of 2vHPV, or one dose of meningococcal vaccine (as a control). After three years, the VE against persistent HPV infection was >95% for both HPV vaccine groups.[73] Another prospective RCT, DoRIS, tested one, two, or three doses of 2vHPV or 9vHPV in females aged 9-14 years in Tanzania. Antibody levels were lower among those who received one dose, compared to two or three

doses.[74] To date, **no prospective RCTs have examined single-dose HPV vaccination in males, in females aged >20 years, or in people with immunocompromising conditions, such as HIV.**[75]

Conversely, other studies have suggested a lower level of protection from a single dose. For example, Palmer *et al*. investigated the population impact of Scotland's HPV immunization program on cervical cancer.[76] Individuals aged ≥14 years required three doses for vaccine effectiveness.[76] Similarly, the IARC India study found that a single dose of 9vHPV was effective against cervical infection, but did not protect against oral infection.[72,77] Modeling studies predict that the impact of vaccination on future cervical cancer depends on the duration of protection. Even with 20 years of protection, which has not been demonstrated, single-dose vaccination will prevent "substantially fewer" cervical cancers than two-dose vaccination.[78] **In other words, a single-dose regimen is expected to increase cervical cancer cases in the future relative to multi-dose regimens**.

Taken together, the studies supporting a single-dose regimen are promising, but much less comprehensive than the data on multi-dose regimens. As correlates of protection are not known, longer-term studies in various populations must be performed to ensure adequate protection from a single dose. A much larger prospective RCT, ESCUDDO, will compare a single dose to two doses of the 2vHPV and 9vHPV vaccines in over 20,000 females aged 12-16 years in Costa Rica.[79] Data from this trial will be reported within the next year. These results will help us better understand the efficacy of a single dose compared to our existing dosing schedule.

6. National decisions on vaccine dosing

In 2022, the WHO recommended the transition to a single-dose regimen, and several countries, including the UK, Mexico, Australia, and India, are considering the change.[44,75,80] Other countries have opted to wait for upcoming clinical trial evidence before deciding to switch from a multi-dose to a single-dose schedule.[75] In July 2024, Canada's National Advisory Committee on Immunization (NACI) published updated recommendations for HPV vaccination.[81] In this publication, NACI continues to recommend the HPV vaccine for all people aged 9 to 26 years, but in contrast to earlier publications, individuals aged 9 to 20 years should receive a single dose, whereas individuals aged 21-26 years should receive two doses.[81] Three doses are recommended for individuals with immunocompromising conditions.

"Making changes to our established provincial programs should only be considered if disease rates are falling, like in Australia and the United Kingdom." - Nancy Durand, MDCM, FRCSC, Associate Professor, University of Toronto and Sunnybrook Hospital

NACI statements focus on the benefits of vaccines to public programs and population health, and are directed to policy staff and government decision-makers.[82] NACI recommendations may differ from those of Health Canada, which authorizes specific indications that are expected to be effective, safe, and immunogenic.[83] Since the late 2010s, NACI's mandate has included the economic, ethical, equity, feasibility, and acceptability considerations of vaccine programs.[84,85] Thus, NACI considers not only immunogenicity, safety, and efficacy, but also cost-effectiveness and demand for vaccine programs.[84] The recommendations under this mandate may differ from the product monographs issued by Canadian vaccine manufacturers,[38,39] i.e., off-label

recommendations.[83] "Off-label" refers to the use of a drug or vaccine in a manner that has not been approved by a regulatory agency such as Health Canada, and this may include applications that have not been tested for efficacy and safety.[86,87]

> "**The fact that a single-dose regimen is clearly off-label is really important for the average family doctor to understand, and the fact that it's a discretionary option as opposed to what the product monograph says.**" – Vivien Brown, MDCM, CCFP, FCFP, MSCP, Chair of the FMWC HPV Task Force

Provincial and territorial ministries of health are responsible for planning and delivering immunizations to their respective populations. Ministries must consider the input of local experts, patients, and HCPs, as well as different interpretations of the evidence. In response to the NACI statement, the provinces are considering the impact of switching to the single-dose regimen. We believe that this would be premature since the science behind this regimen is still limited. Although this regimen would have potential benefits in terms of population health and short-term cost savings, the possible drawbacks are significant. If the single-dose regimen proves to be less effective in preventing cancer, further changes will be needed in the future, leading to confusion and a loss of trust in government-funded vaccine programs. The cost to Canada's economy in lost productivity and the additional costs to health systems will also be high. It is unlikely that a single-dose regimen will increase vaccine coverage, as most people who decline vaccination do so for other reasons.[88] For instance, parents may decline vaccination for their children due to safety concerns, religious beliefs, misunderstandings regarding disease risks and vaccine benefits, or a desire for more information.[88,89] Furthermore, **increasing coverage rates will not remove the uncertainties regarding the duration and degree of protection from a single dose**.

Therefore, any vaccine program changes must be considered carefully and transparently. We must consider the need for robust research, transparent decision-making and communication to the public, the importance of mitigating potential failures, and the impact on vulnerable communities.

> "**The harm of getting this wrong, going prematurely to a one-dose schedule without adequate evidence, and then the messaging of walking that back and having to recall people for second doses, at a time when we're already battling non-scientific information circulating… from an average person standpoint, it would cause me to question a fair bit more than just [the regimen] and it could have more widespread implications in terms of vaccine confidence**." – Jen Belcher, BScPharm, MBA, Pharmacist, Toronto and Vice President, Strategic Initiatives & Member Relations, Ontario Pharmacists Association, Toronto

As advocates of evidence-based medicine, the FMWC task force members believe that high-quality RCTs provide the foundation for sound decision-making. It is essential to prioritize well-designed RCTs to establish the efficacy of a single-dose regimen in preventing HPV-related cancers, fostering confidence in this potential approach, prior to the broad adoption of a single-dose regimen. The studies supporting a single-dose regimen are limited and include only two prospective RCTs, of which only one examined efficacy.[73,74] **Randomized trials of single-dose HPV vaccination are still needed in other populations such as males, older females, and people with immunocompromising conditions such as HIV**.[75] The durability of protection from a single dose has not been established, and as Canada's national vaccination rate is less than 20%,[56] there is no herd effect to protect

individuals whose antibody levels wane over the long term or those who remain unvaccinated. Herd protection typically requires 70% vaccination coverage, although some studies have observed herd protection at 50% coverage.[45,90] Given the distribution of HPV-related cancers, it is paramount that all Canadians are effectively vaccinated against HPV.

The impact of a new regimen on vulnerable communities is an important aspect to consider. The FMWC is deeply committed to safeguarding the health of vulnerable populations, including Indigenous communities and immunocompromised individuals. It is crucial to consider the specific needs and challenges of these communities and to assess the potential impact of a single-dose regimen in this context. By prioritizing the well-being of communities through tailored approaches and inclusive decision-making, we can ensure equitable access to the benefits of HPV vaccination, rather than seeing a single-dose regimen as a quick fix to improve the optics of coverage rates.

"Policy should follow the science, not the other way around." - Nancy Durand, MDCM, FRCSC, Associate Professor, University of Toronto and Sunnybrook Hospital

Hence, the FMWC recommends that the three-dose regimen (for individuals 15 years of age and over and for immunocompromised individuals),[68] and either the three-dose regimen or the two-dose regimen (for individuals 9-14 years of age)[68] continue to be used by public health agencies and government-funded programs until further data are available. A large-scale trial, ESCUDDO, is ongoing with data expected in 2025-2026, and two new RCTs sponsored by Merck will investigate single-dose schedules in both girls and boys.[79,91] A single-dose regimen should not be implemented broadly before this science is known.

We encourage stakeholders to embrace a proactive approach to public health and to consider the potential risks versus the benefits of a single-dose HPV vaccine regimen. **The impact of insufficient protection will be seen in the progression to cancer years or even decades after the initial infection**. We advocate for moving ahead cautiously with program changes to safeguard public confidence in existing vaccine programs. We propose the use of strong evidence-based decision-making, addressing infrastructure challenges, and ensuring the safeguarding of vulnerable populations.

In the section below, we present **updated, actionable recommendations for HCPs, government, and the public** for improving cancer prevention through vaccination within the evolving landscape of research on HPV-related cancer and vaccination.

Recommendations

Short-term recommendations: to be addressed over the next 3-6 months

1. *Multi-dose regimens.* HCPs and public health agencies should continue to offer a three-dose schedule of the nonavalent HPV vaccine (9vHPV) for individuals 15 years of age and over and for immunocompromised individuals,[68] and either the three-dose regimen or the two-dose regimen for individuals 9-14 years of age. Until there is high-quality evidence for the efficacy of the off-label, single-dose schedule, individuals should be

offered multi-dose regimens, which protect against HPV infection and cancer over the long term. Implementing a single-dose schedule before prospective clinical trials are available could place thousands of people at risk of HPV-related diseases and cancers. Robust data from prospective, randomized, large-scale clinical trials are needed to demonstrate the efficacy and durability of responses to the single-dose schedule, in both males and females. HCPs and public health agencies could consider switching to a single-dose schedule only if and when data become available to show that the benefits of single-dose vaccination outweigh the risks.

2. *Consistent messaging.* Health care providers, public health agencies, and governments should uniformly communicate support for the multi-dose schedules. The multi-dose schedules of 9vHPV have been rigorously proven to confer a high level of protection against HPV-related cancers over the long term.[38,92] In the absence of robust data on alternative schedules, it is important to communicate a consistent message that HPV vaccines, when administered according to the manufacturers' recommendations, are safe and effective. Nongovernmental organizations (NGOs), with their close ties to communities and experience in conveying complex health messages, should play a central role in this communication effort.

Researchers and HCPs will continue to debate the complexities of the evidence for different schedules, and improved vaccination protocols may eventually be recommended. Changes that are based on limited data could cause confusion and undermine trust. In a time of growing medical misinformation, it is crucial that government-supported programs rely on sound evidence, with adjustments made only when strongly supported by science.

"**It's going back to basics: this prevents cancer. The communication has to be very clear**". – Vivien Brown, MDCM, CCFP, FCFP, MSCP, Chair of the FMWC HPV Task Force

3. *Expanding eligibility.* The Ontario Ministry of Health should expand eligibility for the publicly funded HPV vaccine. Currently, the lack of public funding for the HPV vaccine represents a major barrier to immunization. Many individuals miss the opportunity to be immunized in school-based programs but wish to be immunized later on. Ideally, individuals of all ages should be eligible (though at the present time, this may be unrealistic). Expanding eligibility is vital to promote health equity and to ensure that all Ontarians have access to lifesaving HPV vaccination.

A given individual is unlikely to be exposed to all HPV types, and significant benefit has been demonstrated from vaccination against the additional viral types covered by the 9vHPV vaccine. In other words, even if an individual has been exposed to certain strains of HPV in the past, vaccination will protect them against the additional strains that are included in the 9vHPV vaccine. Although the strongest immune responses are observed in adolescents, the 9vHPV vaccine is effective in adults.[68] NACI has recommended no upper age limit for vaccination[68] because all people, regardless of age, are at risk of HPV infection if they have ongoing exposures. This policy is consistent with over 50 countries globally which have no upper age limit for HPV vaccination. Correspondingly, Manitoba, Alberta, Yukon, and the Northwest Territories offer robust catch-up opportunities for adults, such as catch-up of missed doses until age 26 and until older ages for

immunocompromised individuals.[93-96] In 2022, a petition to expand public funding of the HPV vaccine in Ontario collected over 33,000 signatures, indicating strong public support for such an initiative.[97]

"**In my experience from the work we've done surveying people, expanding eligibility to people who are not school-age but rather are college or university age would remove a huge obstacle to vaccination amongst people who are in their early twenties**." – Alex McKay, PhD, of the Sex Information and Education Council of Canada

4. Expanding pharmacists' and dentists' immunization authority. **The Ontario Ministry of Health should authorize Ontario pharmacists to prescribe and administer the publicly funded HPV vaccine. Ontario dentists should be given regulatory authority to prescribe the vaccine.** Although Ontario pharmacists are authorized to administer the HPV vaccine, they are restricted to immunizing patients who wish to pay privately. Regulatory barriers prevent them from offering the publicly funded vaccine. During the pandemic, pharmacists played essential roles in facilitating access to health care.[98] Pharmacists have the knowledge and training to immunize and often have strong relationships with their patients.[99] These advantages could be leveraged to facilitate HPV immunization, especially for underserved populations with restricted access to other types of health care. Almost all Canadians (about 95%) live within five kilometers of a community pharmacy. Furthermore, the majority of Canadians have expressed a desire to increase the scope of pharmacists' ability to administer vaccines.[100] To provide more immunization opportunities for people in Ontario, pharmacists should be given the regulatory authority to prescribe the HPV vaccine, and also the ability to access and administer the publicly funded HPV vaccine for individuals who are eligible.

Dentists and dental hygienists have historically participated in prevention efforts for oral cancer, diabetes, cardiovascular disease, HIV, and other conditions.[101] They are well positioned to participate in HPV prevention for both males and females through screening, patient education, and immunization. According to Alberta researchers, dentists have unique opportunities to prevent oropharyngeal cancer by discussing and recommending HPV vaccination.[102] To provide more seamless immunization opportunities for people in Ontario, dentists should be given the regulatory authority to prescribe the HPV vaccine for the prevention of oropharyngeal cancer.

5. ***Education for the public.*** **The Ontario Ministry of Health and other public health agencies should increase communication with the public, including young adults, parents of schoolchildren, and community groups, to raise awareness of cancer prevention through HPV vaccination.** Many people are not aware that HPV causes cancer in both females and males, or that there are effective and safe vaccines to prevent cancer. Communication and education will be crucial to reduce the incidence of HPV-related cancers in Ontario. Education should address vaccine hesitancy and should be customized for different populations. NGOs should lead these communication initiatives, given their established connections with communities and their ability to effectively engage diverse populations. Education campaigns should be inclusive and tailored to resonate with different demographic groups. Additionally, peer-to-peer education should be promoted, as personal connections are powerful motivators for behavior change. The task force also recommends that officials build relationships with community groups to provide HPV education and increase access to immunization opportunities throughout Ontario.

6*. Promoting health equity.* **The Ministry of Health and other public health agencies should promote equitable access to HPV prevention through targeted education and communication strategies.** Certain populations face barriers to immunization, cancer screening, and cancer treatment. Indigenous people, rural communities, newcomers to Canada, and people with lower socioeconomic status have lower vaccination rates than the general population.[103-105] Other populations, such as immunocompromised people and people living with HIV, may require tailored education and specific vaccine recommendations.

Addressing inequities is a fundamental goal of the *Action Plan for the Elimination of Cervical Cancer in Canada, 2020-2030*.[2] To eliminate cervical cancer and reduce the incidence of other HPV-related cancers in Canada, all individuals should have quick and easy access to HPV education and cancer prevention. NGOs should be at the forefront of these initiatives, leveraging their on-the-ground experience to reach marginalized populations, while also building upon existing initiatives and networks to effectively promote health equity.

7. *HPV-related cancers in males.* **The Ministry of Health, other public health agencies, and HCPs should communicate the importance of HPV -related cancer prevention in males.** Historically, immunization efforts and vaccine development focused primarily on females, and vaccination programs for HPV-related cancers in males had lower uptake.[106] At the same time, the incidence of HPV-related cancers that affect males, such as oropharyngeal cancer and anal cancer, is increasing rapidly.[107] About one-third of HPV-related cancers occur in males.[108] Fortunately, the 9vHPV vaccine is effective in males, with VE rates of 100% against penile, perineal, and perianal neoplasia (PIN) and 73-78% against anal intraepithelial neoplasia (AIN).[38]

To address this concerning trend and to achieve health equity, it is critical to improve awareness of HPV -related cancers in males and increase vaccination rates. This will require a concerted effort from the Ministry of Health, public health agencies, and HCPs to ensure that messaging is gender-neutral and that vaccination programs are equally accessible to all. In addition to promoting awareness, officials should advocate for increased funding and research on HPV-related cancers in males.

8. *Multipronged communication*. The Ontario Ministry of Health and Ontario public health units (PHUs) should implement multipronged strategies to communicate with parents, schoolchildren, and young adults to raise awareness of HPV and advertise opportunities for vaccination. This should include using various communication channels, such as text messages, emails, and social media, to reach different audiences. NGOs can play a pivotal role in these efforts, using their expertise in community engagement to ensure that messages are culturally relevant and accessible to diverse populations.

Parents may not know that their child is eligible for the publicly funded HPV vaccine, which is available at no cost until the end of grade 12. According to Ms. Karen Mulvey, task force member and Manager of Vaccine-Preventable Disease in the Wellington-Dufferin-Guelph Public Health Unit, a multipronged communication strategy is essential. In the 2022-23 school year, this PHU employed text messages, mail, school emails, social media, and robocalls to both students and parents to increase awareness. Mailing letters directly to high school students was a particularly successful strategy, with 25% of students who received the letters choosing to be vaccinated.

The task force also recommends that Cancer Care Ontario communicate with the parents of students in grade 7, as well as high school students and recent graduates, to inform them of their eligibility for catch-up programs and other vaccination opportunities. Individuals should be informed about vaccine access points outside the school system, such as their primary care provider. In addition, local PHU representatives should visit high schools to educate adolescents about the HPV vaccine, promote discussion of HPV, and inform them of their options for immunization.

"**People don't always know about when [a vaccine] is publicly funded, how long it is publicly funded for, how much it will cost later. What we do know is: this prevents cancer. Consistent communication from the province and trusted health care professionals is essential.**" - Karen Mulvey, RN, MN, Manager, Vaccine-Preventable Diseases, Wellington-Dufferin-Guelph Public Health

9. *Education for HCPs.* The Ontario Ministry of Health and Public Health Ontario should produce educational materials for HCPs and HCP student associations. HCPs are tasked with large patient loads and extensive administrative responsibilities, making it difficult to keep up with the advances in all areas of medicine. Some HCPs lack an awareness of HPV as a cause of cancer and the role of vaccination. For instance, a global survey found "worrying gaps in health care professionals' knowledge levels".[109]

HCPs should be provided with clear summaries of the most recent scientific evidence (e.g., discussion guides, toolkits) so that they are better prepared to discuss the benefits and risks of HPV vaccination with their patients. In particular, HCPs should be aware of the extensive research supporting the **long-term safety and efficacy of the multi-dose 9vHPV regimens** and the more limited evidence regarding the single-dose regimen. HCPs should know that they may offer a single dose of HPV vaccine as an off-label strategy at their discretion.

In addition, public health agencies should collaborate with medical and dental student associations to educate about HPV awareness and the science of vaccination. Medical and dental students should be encouraged to increase their comfort level for discussing HPV with patients, and to promote HPV awareness among their patients and colleagues.

Long-term recommendations: to be addressed over the next 1-5 years

1. *Prevention as a core value.* The Ontario Ministry of Health should adopt cancer prevention as a core value and guiding principle. The importance of cancer prevention for the physical, social, psychological and economic health of Ontarians cannot be overstated. Cancer prevention, including HPV vaccination, is a top priority in the Canadian Strategy for Cancer Control developed by the Canadian Partnership Against Cancer.[110] The cancer action plans developed by the provinces of BC and PEI emphasize prevention as a key focus area.[111,112] Likewise, the WHO describes prevention as "the most cost-effective long-term strategy for the control of cancer".[113] The task force recommends that cancer prevention remain a core area of focus that receives consistent effort and funding. Given the potential benefits of cancer prevention strategies, this area of public health should not be subject to changing priorities or budget cuts.

2. ***Centralized registries.*** **The Ontario Ministry of Health should establish a coordinated provincial vaccine registry that is easily accessible to all health care providers, parents, and individuals.** The current registries (such as Panorama) are not available to most HCPs. Tracking of immunizations requires parents to inform local PHUs when their child receives a vaccine. Alternatively, HCPs may inform local PHUs by fax, a long-outdated technology. A central electronic registry would record each individual's real-time immunization status, facilitating progress toward vaccination goals and avoiding under- or over-vaccination. For individuals who receive a single dose of HPV vaccine, a registry would facilitate additional doses if needed.

The need for a vaccine registry has also been emphasized by the Ontario Medical Association (OMA) and the Ontario Immunization Advisory Committee (OIAC). The OMA has stated that the current system can easily lead to missed or duplicate vaccines and has the potential to create "**significant risks to patient safety**".[114] In a 2024 position paper, the OIAC notes that Ontario lacks a "reliable, complete, or timely" method of recording immunizations, and that the current system is outdated.[115] The OIAC "**strongly urges**" the Ministry of Health to create a provincial immunization registry.[115]

The registry should be easily accessible to both patients and HCPs, including pharmacists and dentists. The registry should be capable of forecasting vaccine due dates and generating letters to individuals and families to notify them of upcoming clinics. We recommend the models of Alberta NetCare (https://www.albertanetcare.ca/) and BC's Health Gateway (https://www.healthgateway.gov.bc.ca/), which are electronic health records (EHRs) that are easily accessible to both patients and HCPs, including pharmacists. Any patient can view and print their own immunization history; providers can view and record information. All immunizers should be obligated to record the vaccines they administer.

A registry to record cancer screening and incident HPV-related cancers should also be created. Research on oropharyngeal cancer is challenging because this cancer is often grouped under the umbrella of head and neck cancer, which includes non-HPV-related cases. This obscures the tracking of HPV-related cases and makes it difficult to discover trends. The proposed registries would facilitate research on HPV vaccination outcomes and other public health goals, such as increasing access to care, improving individuals' agency in their health care, and improving the transfer of information between HCPs.

3. ***Public health funding.*** **Funding for Public Health Ontario should be increased to allow further expansion of immunization programs.** Across Canada, public health agencies have been underfunded for many years. PHUs often lack the staff and funding for effective catch-up programs. Catch-up vaccine clinics for high schools would provide immunization opportunities for students who declined or missed vaccines in Grade 7. This would also promote individual agency and autonomy for each student to choose to be protected from HPV-related cancers.[81]

More resources are needed to improve vaccine clinic offerings in Ontario schools, including a higher frequency of vaccination opportunities for Grade 7 students. Vaccine catch-up clinics should allow students in grades 8-12 who missed previous vaccinations to participate. The provincial government should mandate that local PHUs offer catch-up clinics in all PHUs (currently this is at the discretion of each PHU). Additional funding would also enable local PHU staff to offer educational sessions about the HPV vaccine.

Conclusion

Ontario children, both male and female, will be **highly vulnerable to HPV-related cancers unless we act now**. The twelve recommendations described above should be implemented promptly. The guidelines described here could save thousands of lives and greatly reduce the burden on our health care system in the future.

Appendix 1: Task Force Members

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