Human Papillomavirus and Related Diseases Report

CANADA

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ICO
Institut Català d'Oncologia

Executive summary

Human papillomavirus (HPV) infection is now a well-established cause of cervical cancer and there is growing evidence of HPV being a relevant factor in other anogenital cancers (anus, vulva, vagina and penis) as well as head and neck cancers. HPV types 16 and 18 are responsible for about 70% of all cervical cancer cases worldwide. HPV vaccines that prevent HPV 16 and 18 infections are now available and have the potential to reduce the incidence of cervical and other anogenital cancers.
This report provides key information for Canada on: cervical cancer; other anogenital cancers and head and neck cancers; HPV-related statistics; factors contributing to cervical cancer; cervical cancer screening practices; HPV vaccine introduction; and other relevant immunisation indicators. The report is intended to strengthen the guidance for health policy implementation of primary and secondary cervical cancer prevention strategies in the country.

Table 1: Key Statistics

Population			
Women at risk for cervical cancer (Female population aged >=15 years)			15.6 million
Burden of cervical cancer and other HPV-related cancers			
Annual number of cervical cancer cases			1,434
Annual number of cervical cancer deaths			586
Crude incidence rates per 100,000 and year:		Male	Female
	Cervical cancer	-	7.7
	Anal cancer ‡	0.0-2.3	0.0-2.8
	Vulvar cancer ‡	-	0.0-5.2
	Vaginal cancer ‡	-	0.0-3.5
	Penile cancer ‡	0.0-2.3	-
	Oropharyngeal cancer	4.7	1.3
Burden of cervical HPV infection			
Prevalence (%) of HPV 16 and/or HPV 18 among women with:			
	Normal cytology		6.2
	Low-grade cervical lesions (LSIL/CIN-1)		33.5
	High-grade cervical lesions (HSIL/CIN-2/CIN-3/CIS)		67.0
	Cervical cancer		74.0
Other factors contributing to cervical cancer			
Smoking prevalence (%), women			13.6 [11.2-15.8]
Total fertility rate (live births per women)			1.6
Oral contraceptive use (%) among women			43.7
HIV prevalence (%), adults (15-49 years)			-
Sexual behaviour			
Percentage of 15-year-old who have had sexual intercourse (men/women)			22 / 21
Range of median age at first sexual intercourse (men/women)			- / 16.0
Cervical screening practices and recommendations			
Cervical cancer screening coverage, % (age and screening interval, reference)	72.8% (All women aged 18-69 screened every 3y, CANSIM 2009a)		
Screening ages (years)	21-65/69/70 varies by region		
Screening interval (years) or frequency of screens	Varies among regions: Manitoba, Ontario, Québec, Nova Scotia: every 3 years (ages 21- 65/69). Prince Edward island: every 2 years (ages 21-65). Other regions every 2-3 years (ages 21-70) after 3 consecutive annual negative tests		
HPV vaccine			
HPV vaccine introduction			
	HPV vaccination programme		National program
	Date of HPV vaccination routine immunization programme start		2007

‡Please see the specific sections for more information.

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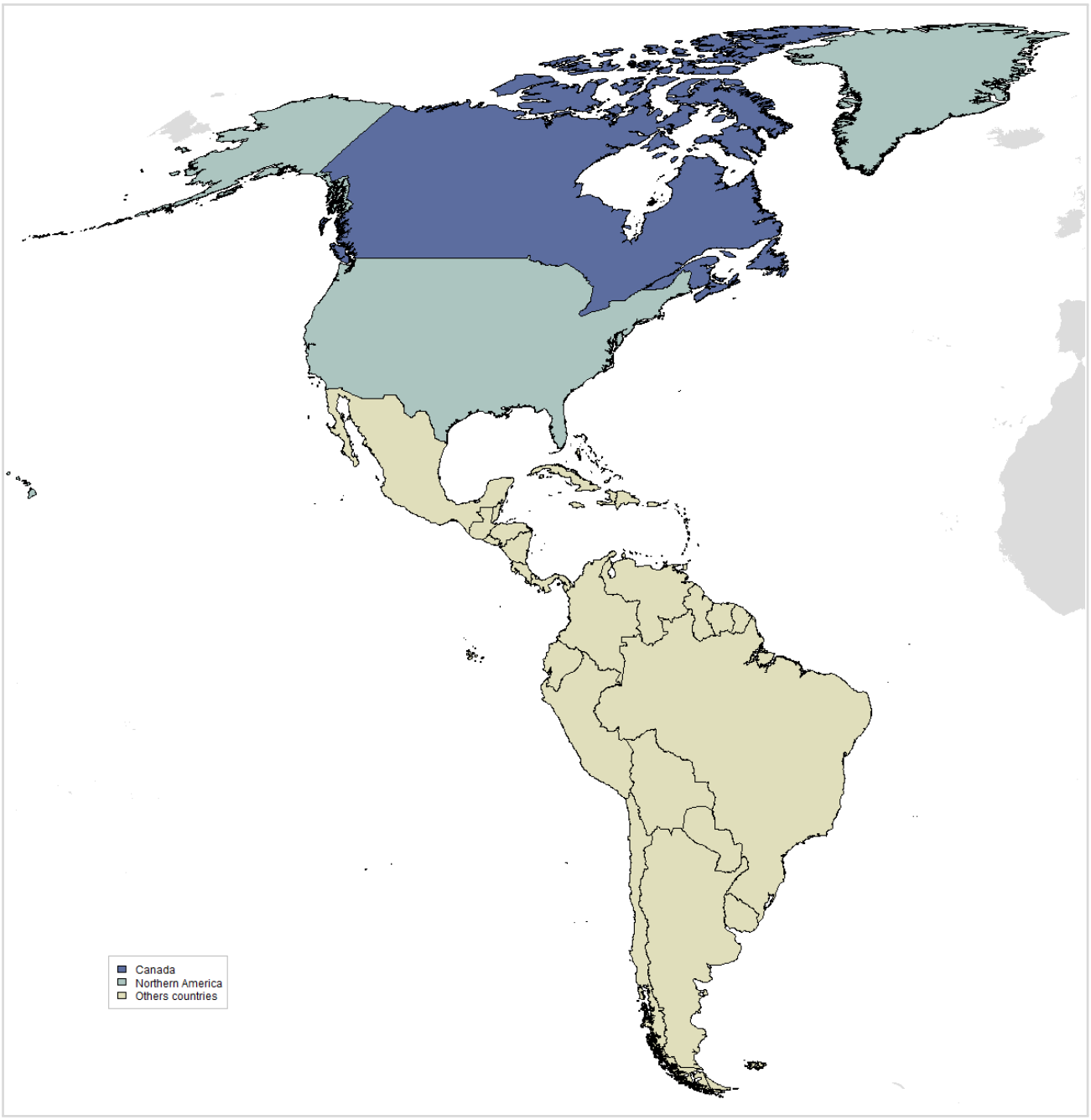
1 Introduction

Figure 1: Canada and Northern America



The HPV Information Centre aims to compile and centralise updated data and statistics on human papillomavirus (HPV) and related cancers. This report aims to summarise the data available to fully evaluate the burden of disease in Canada and to facilitate stakeholders and relevant bodies of decision makers to formulate recommendations on cervical cancer prevention. Data include relevant cancer statistic estimates, epidemiological determinants of cervical cancer such as demographics, socioeconomic factors, risk factors, burden of HPV infection, screening and immunisation. The report is structured into the following sections:

Section 2, Demographic and socioeconomic factors. This section summarises the socio-demographic profile of country. For analytical purposes, Canada is classified in the geographical region of Northern America (Figure 1, lighter blue), which is composed of the following countries: Bermuda,

Canada, Greenland, St Pierre and Miquelon, USA. Throughout the report, Canada estimates will be complemented with corresponding regional estimates.

Section 3, Burden of HPV related cancers. This section describes the current burden of invasive cervical cancer and other HPV-related cancers in Canada and the Northern America region with estimates of prevalence, incidence, and mortality rates.

Section 4, HPV related statistics. This section reports on prevalence of HPV and HPV type-specific distribution in Canada, in women with normal cytology, precancerous lesions and invasive cervical cancer. In addition, the burden of HPV in other anogenital cancers (anus, vulva, vagina, and penis) and men are presented.

Section 5, Factors contributing to cervical cancer. This section describes factors that can modify the natural history of HPV and cervical carcinogenesis such as smoking, parity, oral contraceptive use, and co-infection with HIV.

Section 6, Sexual and reproductive health behaviour indicators. This section presents sexual and reproductive behaviour indicators that may be used as proxy measures of risk for HPV infection and anogenital cancers.

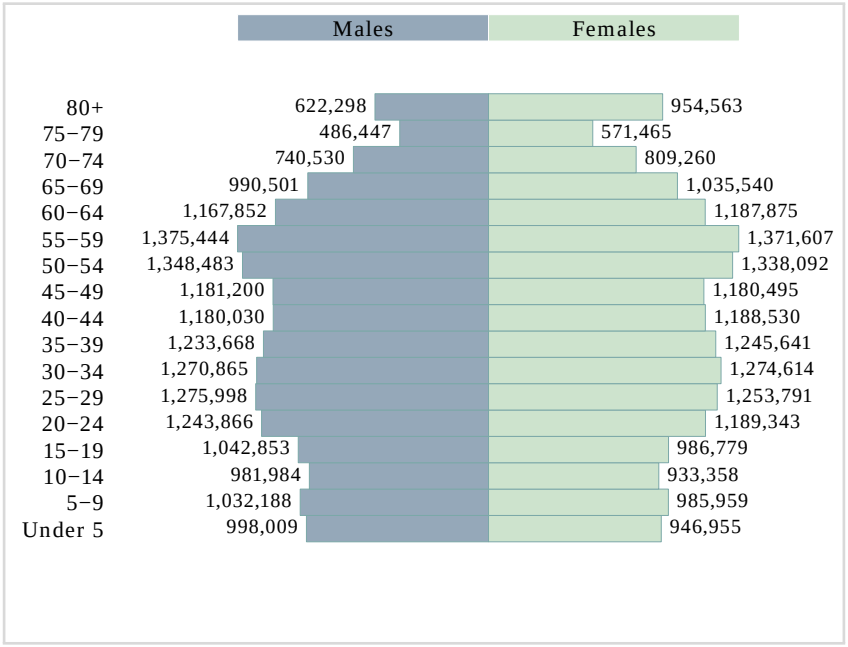
Section 7, HPV preventive strategies. This section presents preventive strategies that include basic characteristics and performance of cervical cancer screening status, status of HPV vaccine licensure introduction, and recommendations in national immunisation programmes.

Section 8, Protective factors for cervical cancer. This section presents the prevalence of male circumcision and condom use.

Section 9, Indicators related to immunisation practices other than HPV vaccines. This section presents data on immunisation coverage and practices for selected vaccines. This information will be relevant for assessing the country's capacity to introduce and implement the new vaccines. The data are periodically updated and posted on the WHO immunisation surveillance, assessment and monitoring website at http://www.who.int/immunization_monitoring/en/.

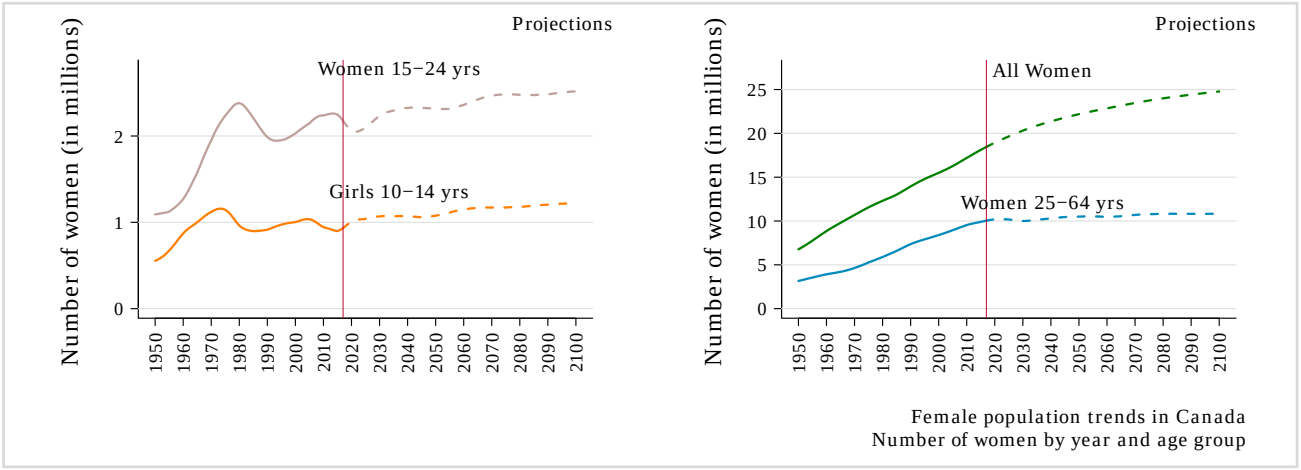
2 Demographic and socioeconomic factors

Figure 2: Population pyramid of Canada for 2017



Data accessed on 27 Mar 2017.
Please refer to original source for methods of estimation.
Year of estimate: 2017;
Data sources:
United Nations, Department of Economic and Social Affairs, Population Division (2015). World Population Prospects: The 2015 Revision, DVD Edition. Available at: https://esa.un.org/unpd/wpp/Download/Standard/Population/. [Accessed on March 21, 2017].

Figure 3: Population trends in four selected age groups in Canada



Data accessed on 27 Mar 2017.
Please refer to original source for methods of estimation.
Year of estimate: 2017;
Data sources:
United Nations, Department of Economic and Social Affairs, Population Division (2015). World Population Prospects: The 2015 Revision, DVD Edition. Available at: https://esa.un.org/unpd/wpp/Download/Standard/Population/. [Accessed on March 21, 2017].

Table 2: Sociodemographic indicators in Canada

Indicator	Male	Female	Total
Population in thousands[1,±]	18,172.2	18,453.9	36,626.1
Population growth rate (%)[1,∓]	-	-	1
Median age of the population (in years)[1,*]	-	-	40.6
Population living in urban areas (%)[2,*]	-	-	81.8
Crude birth rate (births per 1,000)[1,∓]	-	-	10.9
Crude death rate (deaths per 1,000)[1,∓]	-	-	7.3
Life expectancy at birth (in years)[3,a,b,*]	80.2	84.1	82.2
Adult mortality rate (probability of dying between 15 and 60 years old per 1,000)[4,*]	78	50	64
Maternal mortality ratio (per 100,000 live births)[3,c,*]	-	-	7
Under age five mortality rate (per 1,000 live births)[3,d,*]	-	-	4.9
Density of physicians (per 1,000 population)[5,e,⋆]	-	-	2.477
Gross national income per capita (PPP current international $)[6,f,*]	-	-	43900
Adult literacy rate (%) (aged 15 and older)[7]	-	-	-
Youth literacy rate (%) (aged 15-24 years)[7]	-	-	-
Net primary school enrollment ratio[7]	99.7°	99.9°	99.5•
Net secondary school enrollment ratio[7]	-	-	-

Data accessed on 27 Mar 2017.

Please refer to original source for methods of estimation.

[a] World Population Prospects, the 2015 revision (WPP2015). New York (NY): United Nations DESA, Population Division.

[b] WHO annual life tables for 1985–2015 based on the WPP2015, on the data held in the WHO Mortality Database and on HIV mortality estimates prepared by UNAIDS. WHO Member States with a population of less than 90 000 in 2015 were not included in the analysis.

[c] WHO, UNICEF, UNFPA, World Bank Group and the United Nations Population Division. Trends in maternal mortality: 1990 to 2015. Estimates by WHO, UNICEF, UNFPA, World Bank Group and the United Nations Population Division. Geneva: World Health Organization; 2015 (http://www.who.int/reproductivehealth/publications/monitoring/maternal-mortality-2015/en/, accessed 25 March 2016). WHO Member States with a population of less than 100 000 in 2015 were not included in the analysis.

[d] Levels & Trends in Child Mortality. Report 2015. Estimates Developed by the UN Inter-agency Group for Child Mortality Estimation. New York (NY), Geneva and Washington (DC): United Nations Children's Fund, World Health Organization, World Bank and United Nations; 2015 (http://www.unicef.org/publications/files/Child_Mortality_Report_2015_Web_9_Sept_15.pdf, accessed 26 March 2016).

[e] Number of medical doctors (physicians), including generalist and specialist medical practitioners, per 1 000 population.

[f] GNI per capita based on purchasing power parity (PPP). PPP GNI is gross national income (GNI) converted to international dollars using purchasing power parity rates. An international dollar has the same purchasing power over GNI as a U.S. dollar has in the United States. GNI is the sum of value added by all resident producers plus any product taxes (less subsidies) not included in the valuation of output plus net receipts of primary income (compensation of employees and property income) from abroad. Data are in current international dollars based on the 2011 ICP round.

Year of estimate: ±2017; ∓2010-2015; *2015; ⋆2012; °1999; •2013;

Data sources:

[1] United Nations, Department of Economic and Social Affairs, Population Division (2015). World Population Prospects: The 2015 Revision, DVD Edition. Available at: https://esa.un.org/unpd/wpp/Download/Standard/Population/. [Accessed on March 21, 2017].

[2] United Nations, Department of Economic and Social Affairs, Population Division (2014). World Urbanization Prospects: The 2014 Revision, CD-ROM Edition. Available at: https://esa.un.org/unpd/wup/CD-ROM/. [Accessed on March 21, 2017].

[3] World Health Statistics 2016. Geneva, World Health Organization, 2016. Available at: http://who.int/entity/gho/publications/world_health_statistics/2016/en/index.html. [Accessed on March 21, 2017].

[4] World Health Organization. Global Health Observatory data repository. Available at: http://apps.who.int/gho/data/view.main.1360?lang=en. [Accessed on March 21, 2017].

[5] The 2016 update, Global Health Workforce Statistics, World Health Organization, Geneva (http://www.who.int/hrh/statistics/hwfstats/). [Accessed on March 21, 2017].

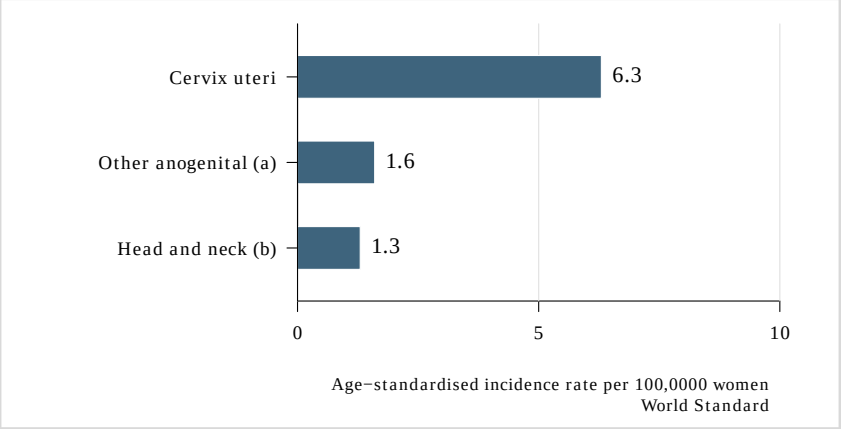
[6] World Bank, World Development Indicators Database. Washington, DC. International Comparison Program database. Available at: http://databank.worldbank.org/data/reports.aspx?source=world-development-indicators#. [Accessed on March 21, 2017].

[7] UNESCO Institute for Statistics Data Centre [online database]. Montreal, UNESCO Institute for Statistics. Available at: http://stats.uis.unesco.org [Accessed on March 21, 2017].

3 Burden of HPV related cancers

HPV is the cause of almost all cervical cancer cases and is responsible for an important fraction of other anogenital and head and neck cancer. Here, we present the most recent estimations on the burden of HPV-associated cancer.

Figure 4: HPV-related cancer incidence in Canada (estimates for 2012)



Data accessed on 08 May 2017.
[a] Other anogenital cancer cases (vulvar, vaginal, anal, and penile).
[b] Head and neck cancer cases (oropharynx, oral cavity and larynx).
ASR: Age-standardized rate, rates per 100,000 per year.
Please refer to original source for methods.
GLOBOCAN quality index for availability of incidence data: High quality national data or high quality regional (coverage greater than 50%).
GLOBOCAN quality index of methods for calculating incidence: Methods to estimate the sex- and age-specific incidence rates of cancer for a specific country: Rates projected to 2012
Data sources:
de Martel C, Plummer M, Vignat J, Franceschi S. Worldwide burden of cancer attributable to HPV by site, country and HPV type. Int J Cancer. 2017

3.1 Cervical cancer

Cancer of the cervix uteri is the 3rd most common cancer among women worldwide, with an estimated 569,847 new cases and 311,365 deaths in 2018 (GLOBOCAN). The majority of cases are squamous cell carcinoma followed by adenocarcinomas. *(Vaccine 2006, Vol. 24, Suppl 3; Vaccine 2008, Vol. 26, Suppl 10; Vaccine 2012, Vol. 30, Suppl 5; IARC Monographs 2007, Vol. 90)*

This section describes the current burden of invasive cervical cancer in Canada and in comparison to geographic region, including estimates of the annual number of new cases, deaths, incidence, and mortality rates.

3.1.1 Cervical cancer incidence in Canada

KEY STATS.

About **1,434 new cervical cancer cases** are diagnosed **annually** in **Canada** (estimates for 2018).

Cervical cancer **ranks* as the 14^{th} leading cause** of female cancer in **Canada**.

Cervical cancer is the **4^{th} most common** female cancer in **women aged 15 to 44 years in Canada**.

* Ranking of cervical cancer incidence to other cancers among all women according to highest incidence rates (ranking 1st) excluding non-melanoma skin cancer and considering separated colon, rectum and anus. Ranking is based on crude incidence rates (actual number of cervical cancer cases). Ranking using age-standardized rate (ASR) may differ.

Table 3: Cervical cancer incidence in Canada (estimates for 2018)

Indicator	Canada	Northern America	World
Annual number of new cancer cases	1,434	15,502	569,847
Crude incidence rate[a]	7.7	8.4	15.1
Age-standardized incidence rate[a]	5.7	6.4	13.1
Cumulative risk (%) at 75 years old[b]	0.5	0.6	1.4

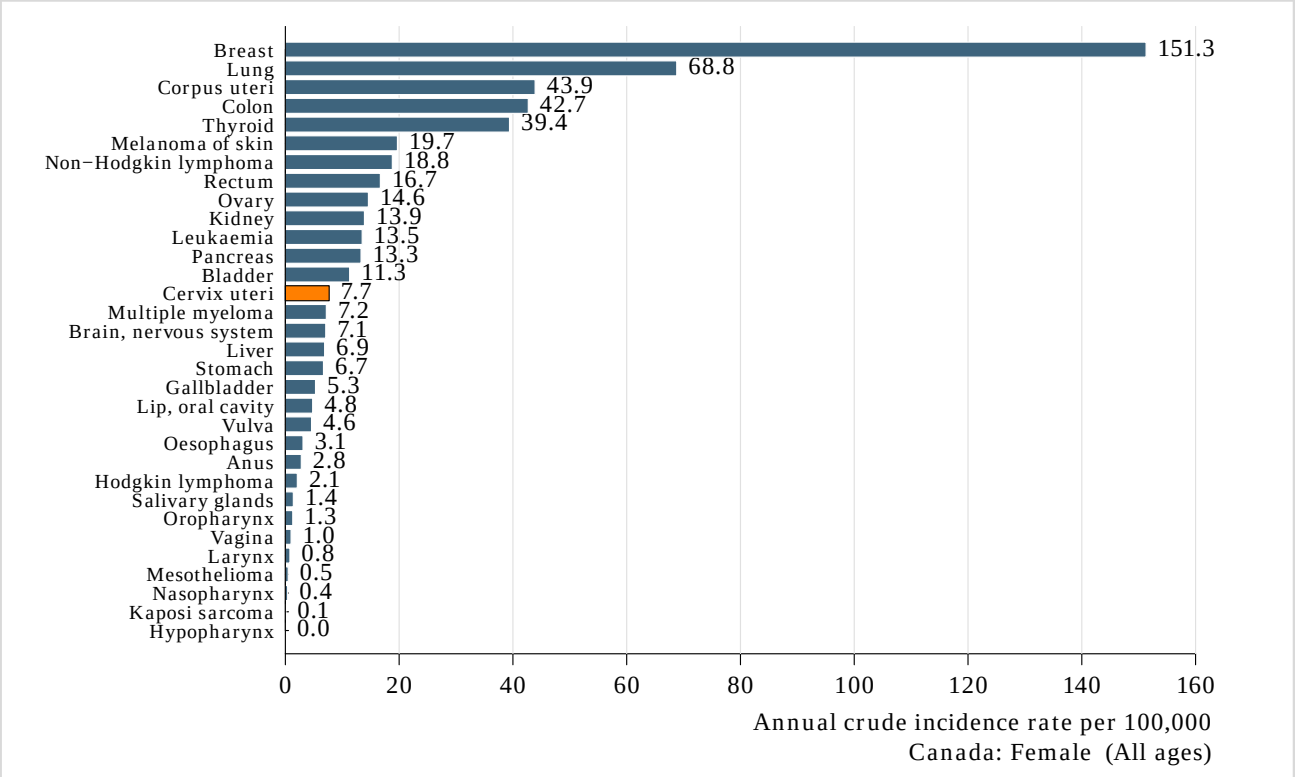
Data accessed on 05 Oct 2018.
For more detailed methods of estimation please refer to http://gco.iarc.fr/today/data-sources-methods
[a] Rates per 100,000 women per year.
[b] Cumulative risk (incidence) is the probability or risk of individuals getting from the disease during ages 0-74 years. For cancer, it is expressed as the % of new born children who would be expected to develop from a particular cancer before the age of 75 if they had the rates of cancer observed in the period in the absence of competing causes.
Data sources:
Ferlay J, Ervik M, Lam F, Colombet M, Mery L, Piñeros M, Znaor A, Soerjomataram I, Bray F (2018). Global Cancer Observatory: Cancer Today. Lyon, France: International Agency for Research on Cancer. Available from: https://gco.iarc.fr/today, accessed [05 October 2018].

Table 4: Cervical cancer incidence in Canada by cancer registry

Cancer registry[1]	Period	N cases[a]	Crude rate[b]	ASR[b]
Alberta	2008-2012	735	8.0	6.2
British Columbia	2008-2012	883	7.9	5.7
Manitoba	2008-2012	248	7.9	6.1
New Brunswick	2008-2012	146	7.7	5.5
Newfoundland and Labrador	2008-2012	147	11.1	8.4
Northwest Territories	2008-2012	8	7.6	6.0
Nova Scotia	2008-2012	207	8.6	6.2
Nunavut	2008-2012	5	6.2	5.6
Ontario	2008-2012	2,822	8.4	6.3
Prince Edward Island	2008-2012	34	9.4	6.9
Saskatchewan	2008-2012	230	8.6	7.1
Yukon	2008-2012	8	9.5	6.7

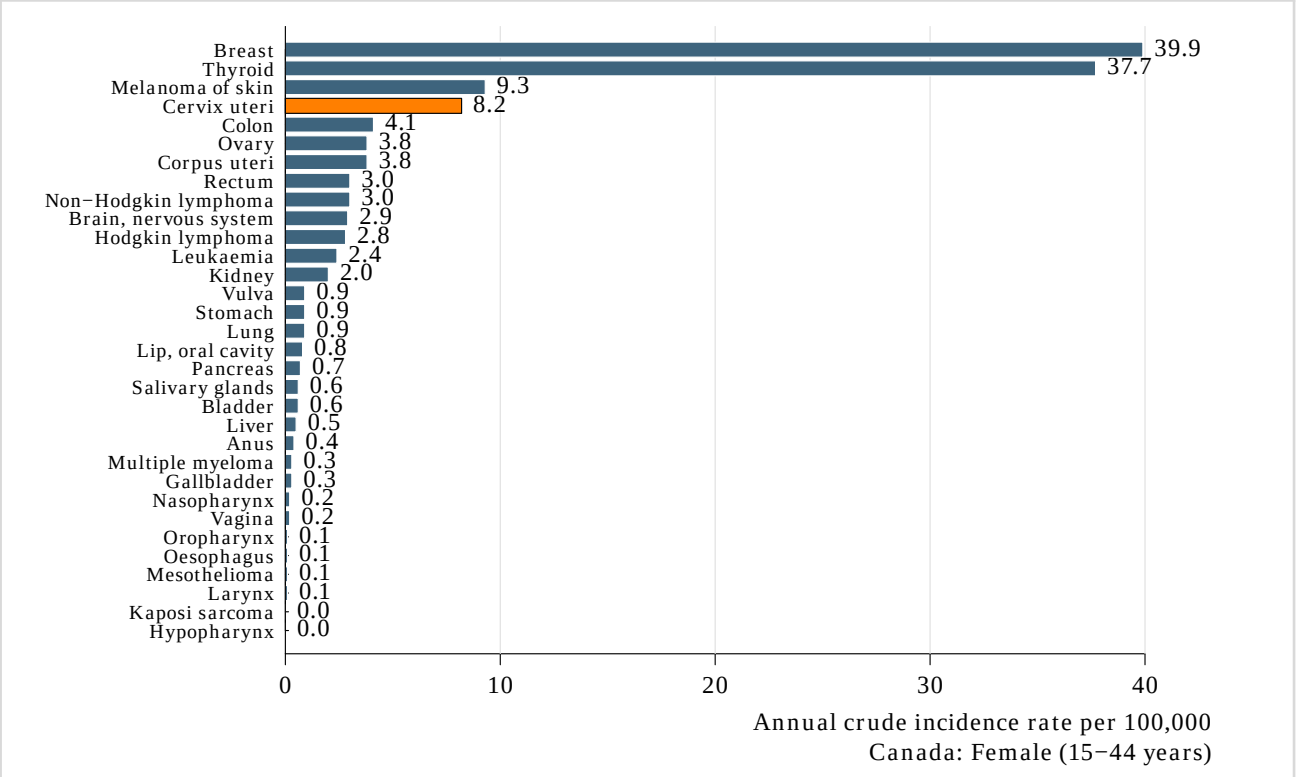
Data accessed on 05 Oct 2018.
ASR: Age-standardized rate, Standardized rates have been estimated using the direct method and the World population as the reference;
Please refer to original source (available at http://ci5.iarc.fr/CI5-XI/Default.aspx)
[a] Accumulated number of cases during the period in the population covered by the corresponding registry.
[b] Rates per 100,000 women per year.
Data sources:
[1] Bray F, Colombet M, Mery L, Piñeros M, Znaor A, Zanetti R and Ferlay J, editors (2017). Cancer Incidence in Five Continents, Vol. XI (electronic version). Lyon: International Agency for Research on Cancer. Available from: http://ci5.iarc.fr, accessed [05 October 2018].

Figure 5: Comparison of cervical cancer incidence to other cancers in women of all ages in Canada (estimates for 2018)



Data accessed on 07 Oct 2018.
Non-melanoma skin cancer is not included.
Rates per 100,000 women per year.
Data sources:
Ferlay J, Ervik M, Lam F, Colombet M, Mery L, Piñeros M, Znaor A, Soerjomataram I, Bray F (2018). Global Cancer Observatory: Cancer Today. Lyon, France: International Agency for Research on Cancer. Available from: https://gco.iarc.fr/today, accessed [05 October 2018].

Figure 6: Comparison of age-specific cervical cancer to age-specific incidence of other cancers among women 15-44 years of age in Canada (estimates for 2018)



Data accessed on 07 Oct 2018.

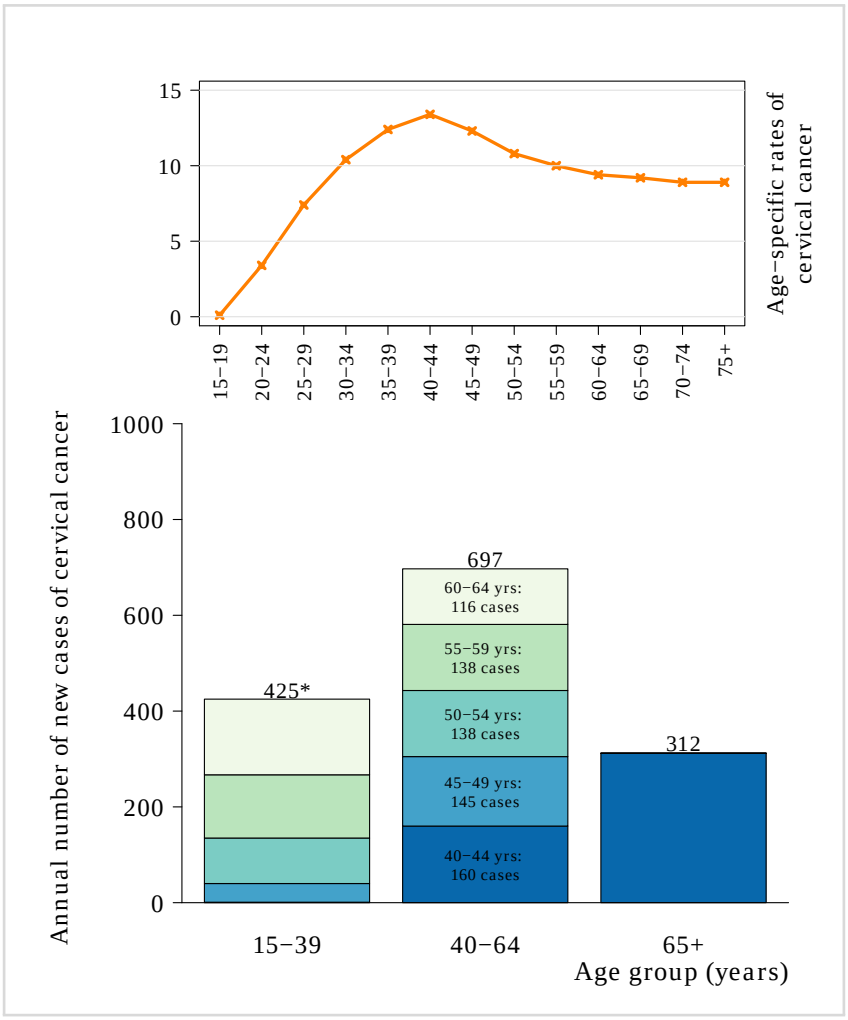
Non-melanoma skin cancer is not included.

Rates per 100,000 women per year.

Data sources:

Ferlay J, Ervik M, Lam F, Colombet M, Mery L, Piñeros M, Znaor A, Soerjomataram I, Bray F (2018). Global Cancer Observatory: Cancer Today. Lyon, France: International Agency for Research on Cancer. Available from: https://gco.iarc.fr/today, accessed [05 October 2018].

Figure 7: Annual number of cases and age-specific incidence rates of cervical cancer in Canada (estimates for 2018)



*15-19 yrs: 1 cases. 20-24 yrs: 39 cases. 25-29 yrs: 95 cases. 30-34 yrs: 132 cases. 35-39 yrs: 158 cases.

Data accessed on 05 Oct 2018.

Rates per 100,000 women per year.

Data sources:

Ferlay J, Ervik M, Lam F, Colombet M, Mery L, Piñeros M, Znaor A, Soerjomataram I, Bray F (2018). Global Cancer Observatory: Cancer Today. Lyon, France: International Agency for Research on Cancer. Available from: https://gco.iarc.fr/today, accessed [05 October 2018].

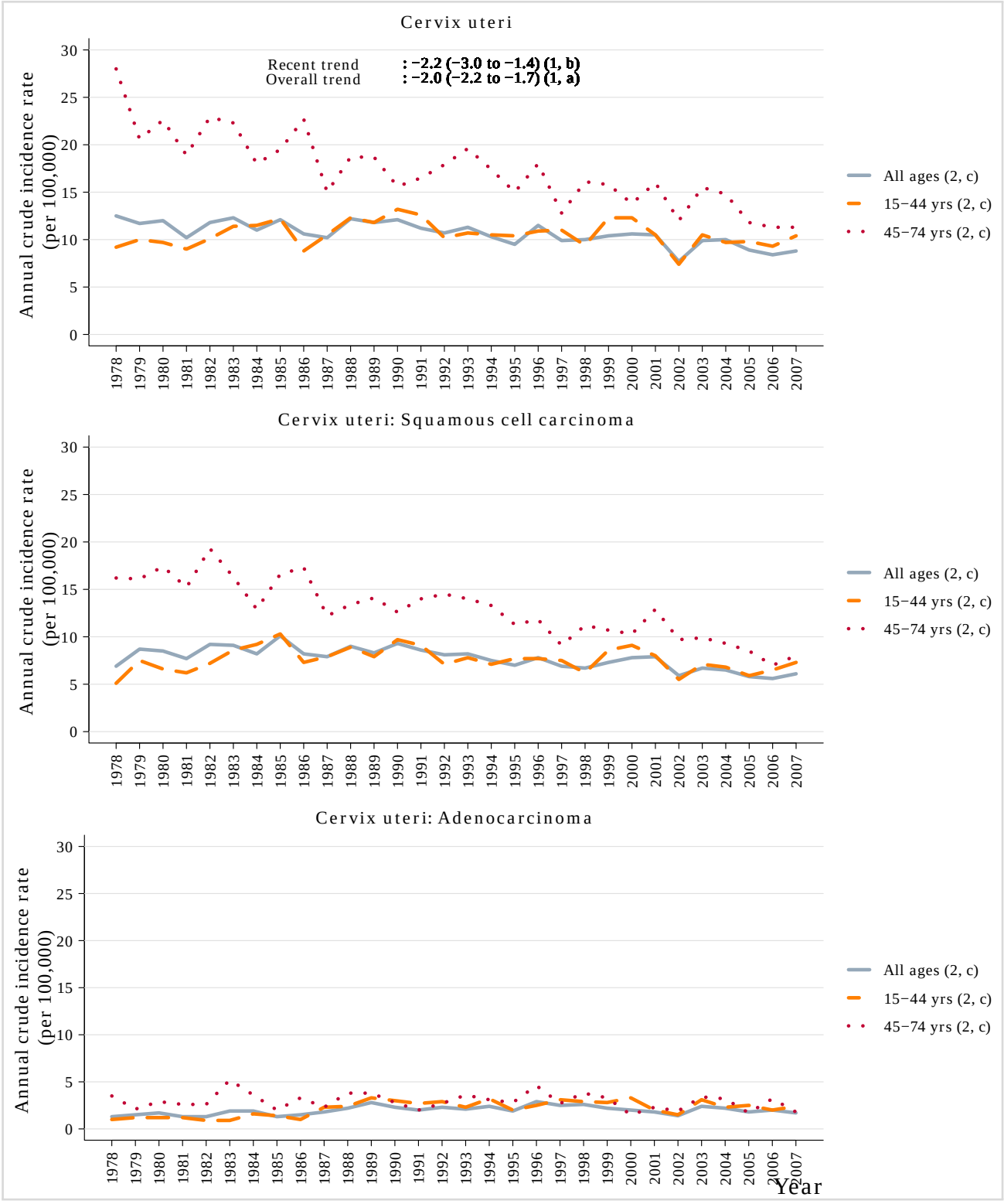
3.1.2 Cervical cancer incidence by histology in Canada

Table 5: Age-standardised incidence rates of cervical cancer in Canada by histological type and cancer registry

Cancer registry	Period	Carcinoma			
		Squamous	Adeno	Other	Unspec.
Alberta	2008-2012	4.4	1.2	0.4	0.1
British Columbia	2008-2012	3.9	1.3	0.3	0.0
Manitoba	2008-2012	3.6	1.8	0.2	0.3
New Brunswick	2008-2012	3.6	1.4	0.3	0.1
Newfoundland and Labrador	2008-2012	5.8	1.8	0.3	0.3
Northwest Territories	2008-2012	4.0	0.7	1.4	-
Nova Scotia	2008-2012	3.9	1.5	0.3	0.4
Nunavut	2008-2012	4.2	1.4	-	-
Ontario	2008-2012	3.1	1.2	0.3	0.1
Prince Edward Island	2008-2012	4.1	1.2	1.2	0.4
Saskatchewan	2008-2012	4.8	1.5	0.6	0.2
Yukon	2008-2012	3.8	1.6	1.3	-

Data accessed on 05 Oct 2018.
Adeno: adenocarcinoma; Other: Other carcinoma; Squamous: Squamous cell carcinoma; Unspec: Unspecified carcinoma;
Rates per 100,000 women per year.
Standarized rates have been estimated using the direct method and the World population as the references.
Data sources:
[1]Bray F, Colombet M, Mery L, Piñeros M, Znaor A, Zanetti R and Ferlay J, editors (2017). Cancer Incidence in Five Continents, Vol. XI (electronic version). Lyon: International Agency for Research on Cancer. Available from: http://ci5.iarc.fr, accessed [05 October 2018].

Figure 8: Time trends in cervical cancer incidence in Canada (cancer registry data)



Data accessed on 27 Apr 2015.

[a] Estimated annual percentage change based on the trend variable from the net drift for the most recent two 5-year periods.

[b] Estimated annual percentage change based on the trend variable from the net drift for 20 years, from 1983-2002.

[c] The following regional cancer registries provided data and contributed to their national estimate: Manitoba, Nova Scotia, Saskatchewan.

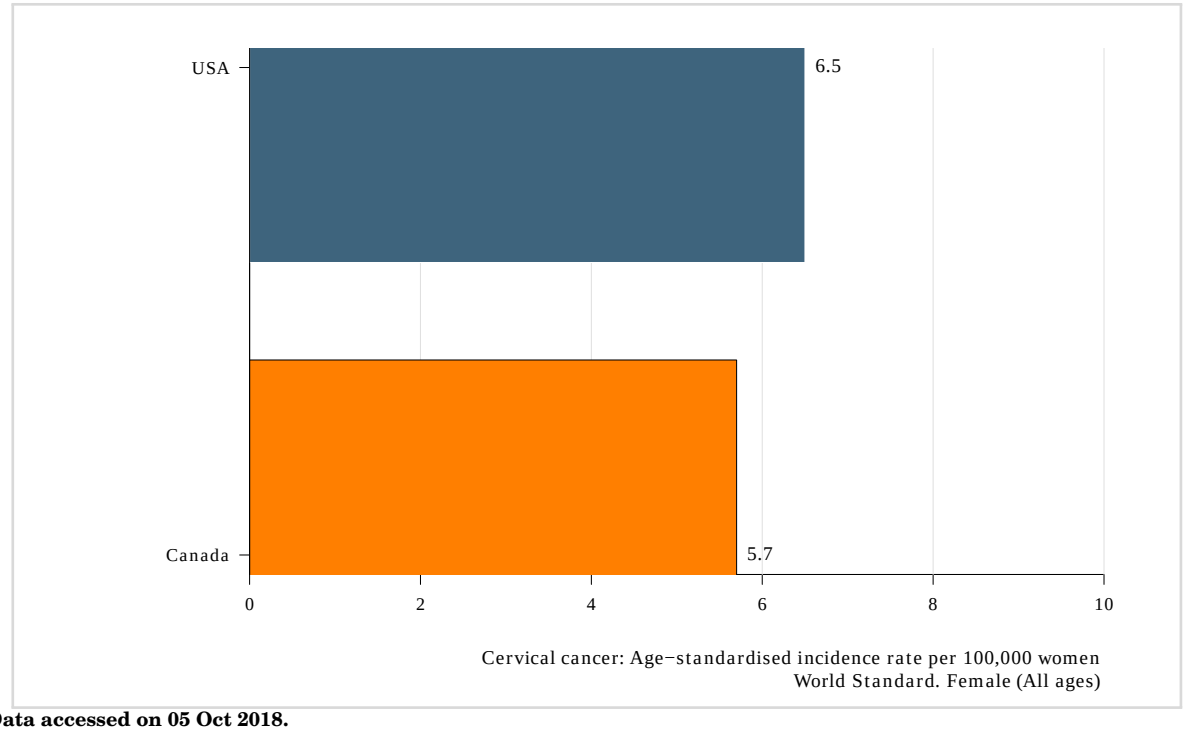
Data sources:

[1] Vaccarella S, Lortet-Tieulent J, Plummer M, Franceschi S, Bray F. Worldwide trends in cervical cancer incidence: Impact of screening against changes in disease risk factors. eur J Cancer 2013;49:3262-73.

[2] Ferlay J, Bray F, Steliarova-Foucher E and Forman D. Cancer Incidence in Five Continents, CI5plus: IARC CancerBase No. 9 [Internet]. Lyon, France: International Agency for Research on Cancer; 2014. Available from: http://ci5.iarc.fr

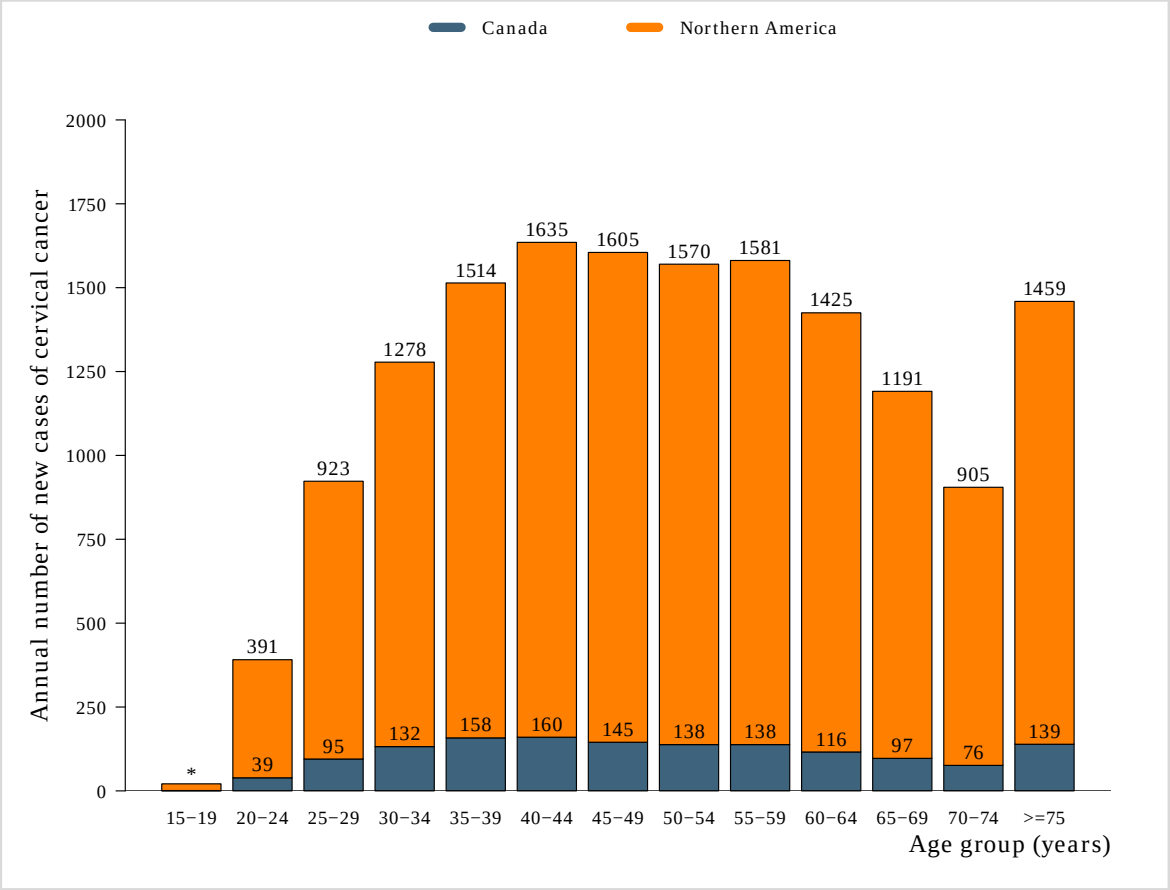
3.1.3 Cervical cancer incidence in Canada across Northern America

Figure 9: Age-standardised incidence rates of cervical cancer of Canada (estimates for 2018)



Data accessed on 05 Oct 2018.
Rates per 100,000 women per year.
Data sources:
Ferlay J, Ervik M, Lam F, Colombet M, Mery L, Piñeros M, Znaor A, Soerjomataram I, Bray F (2018). Global Cancer Observatory: Cancer Today. Lyon, France: International Agency for Research on Cancer. Available from: https://gco.iarc.fr/today, accessed [05 October 2018].

Figure 10: Annual number of new cases of cervical cancer by age group in Canada (estimates for 2018)



*1 cases for Canada and 21 cases for Northern America in the 15-19 age group.

Data accessed on 05 Oct 2018.

Data sources:

Ferlay J, Ervik M, Lam F, Colombet M, Mery L, Piñeros M, Znaor A, Soerjomataram I, Bray F (2018). Global Cancer Observatory: Cancer Today. Lyon, France: International Agency for Research on Cancer. Available from: https://gco.iarc.fr/today, accessed [05 October 2018].

3.1.4 Cervical cancer mortality in Canada

KEY STATS.

About **586 cervical cancer deaths occur annually in Canada** (estimates for 2018).

Cervical cancer **ranks* as the 16^{th} leading cause** of female cancer deaths in **Canada**.

Cervical cancer is the **3^{rd} leading cause of cancer deaths** in **women aged 15 to 44 years in Canada**.

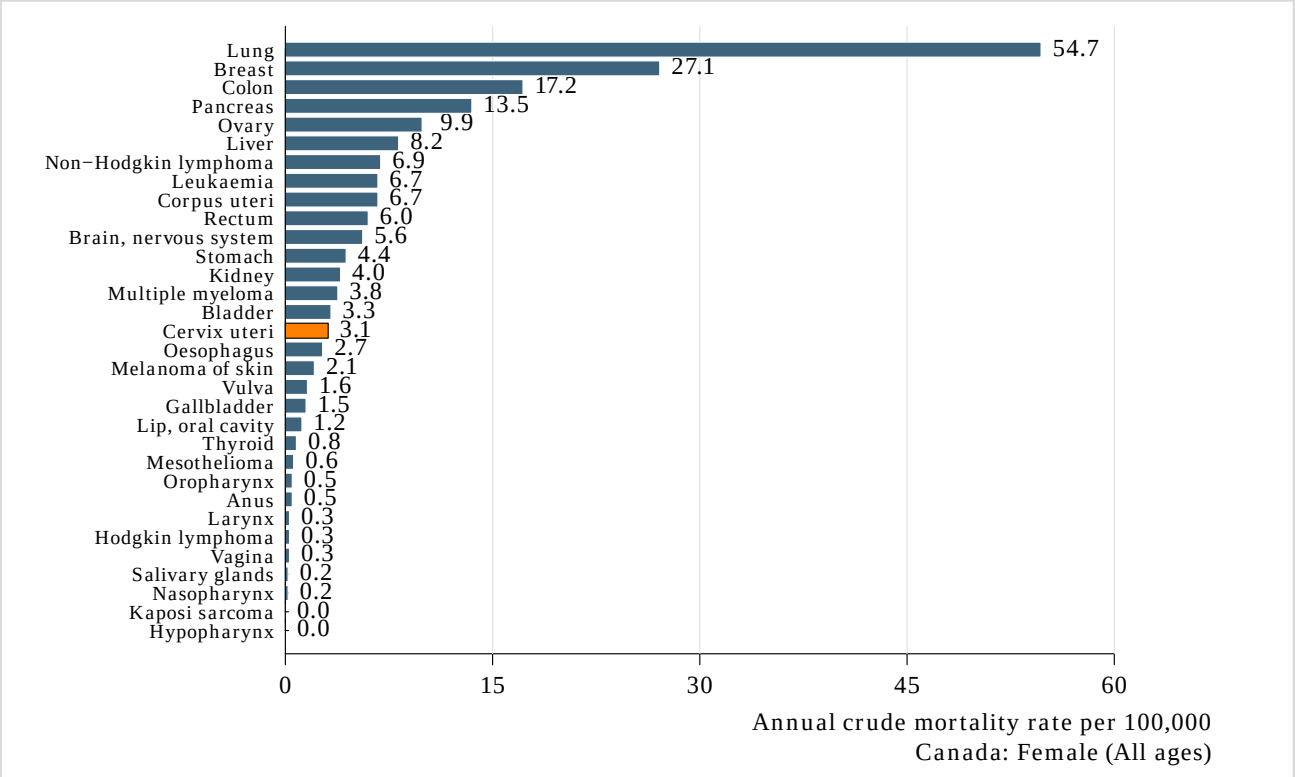
* Ranking of cervical cancer incidence to other cancers among all women according to highest incidence rates (ranking 1st) excluding non-melanoma skin cancer and considering separated colon, rectum and anus. Ranking is based on crude incidence rates (actual number of cervical cancer cases). Ranking using age-standardized rate (ASR) may differ.

Table 6: Cervical cancer mortality in Canada (estimates for 2018)

Indicator	Canada	Northern America	World
Annual number of deaths	586	5,852	311,365
Crude mortality rate[a]	3.1	3.2	8.2
Age-standardized mortality rate[a]	1.7	1.9	6.9
Cumulative risk (%) at 75 years old[b]	0.2	0.2	0.8

Data accessed on 05 Oct 2018.
For more detailed methods of estimation please refer to http://gco.iarc.fr/today/data-sources-methods
[a] Rates per 100,000 women per year.
[b] Cumulative risk (mortality) is the probability or risk of individuals dying from the disease during ages 0-74 years. For cancer, it is expressed as the % of new born children who would be expected to die from a particular cancer before the age of 75 if they had the rates of cancer observed in the period in the absence of competing causes.
Data sources:
Ferlay J, Ervik M, Lam F, Colombet M, Mery L, Piñeros M, Znaor A, Soerjomataram I, Bray F (2018). Global Cancer Observatory: Cancer Today. Lyon, France: International Agency for Research on Cancer. Available from: https://gco.iarc.fr/today, accessed [05 October 2018].

Figure 11: Comparison of cervical cancer mortality to other cancers in women of all ages in Canada (estimates for 2018)



Data accessed on 07 Oct 2018.

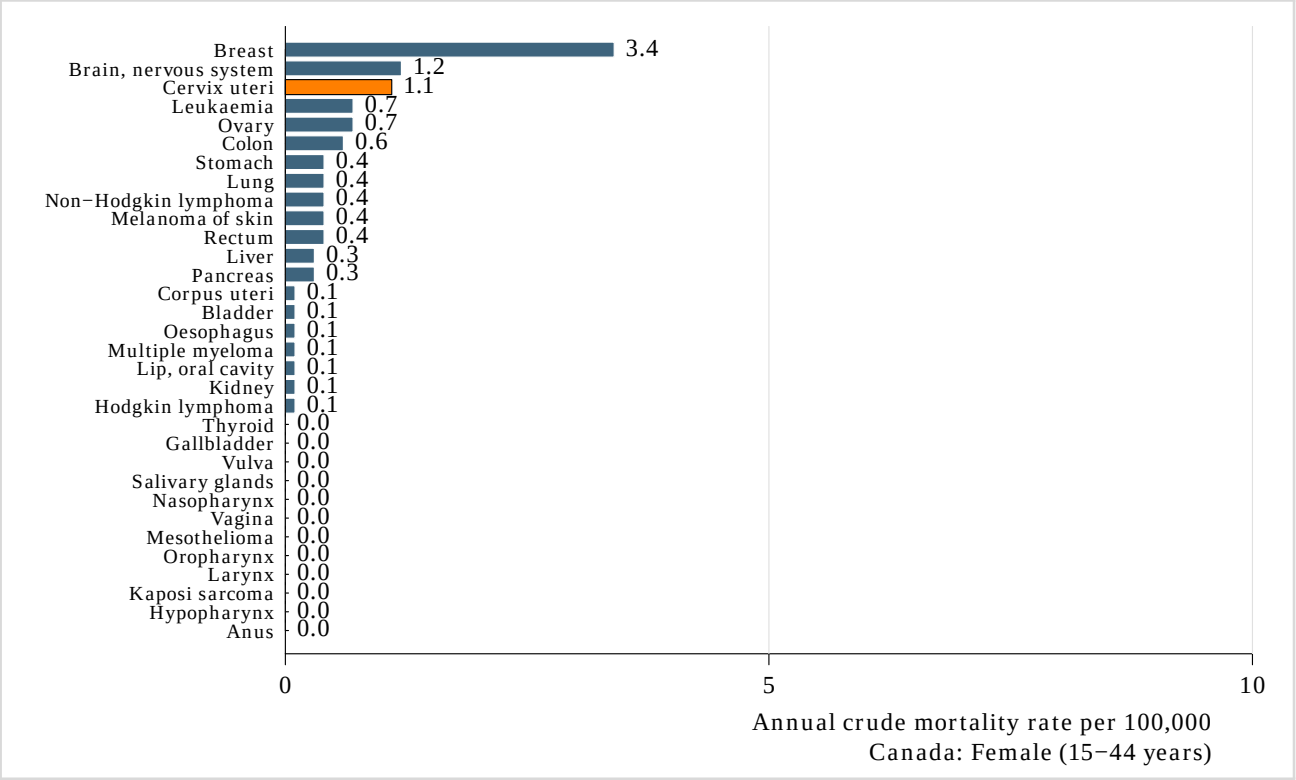
Non-melanoma skin cancer is not included.

[a] Rates per 100,000 women per year.

Data sources:

Ferlay J, Ervik M, Lam F, Colombet M, Mery L, Piñeros M, Znaor A, Soerjomataram I, Bray F (2018). Global Cancer Observatory: Cancer Today. Lyon, France: International Agency for Research on Cancer. Available from: https://gco.iarc.fr/today, accessed [05 October 2018].

Figure 12: Comparison of age-specific mortality rates of cervical cancer to other cancers among women 15-44 years of age in Canada (estimates for 2018)



Data accessed on 07 Oct 2018.

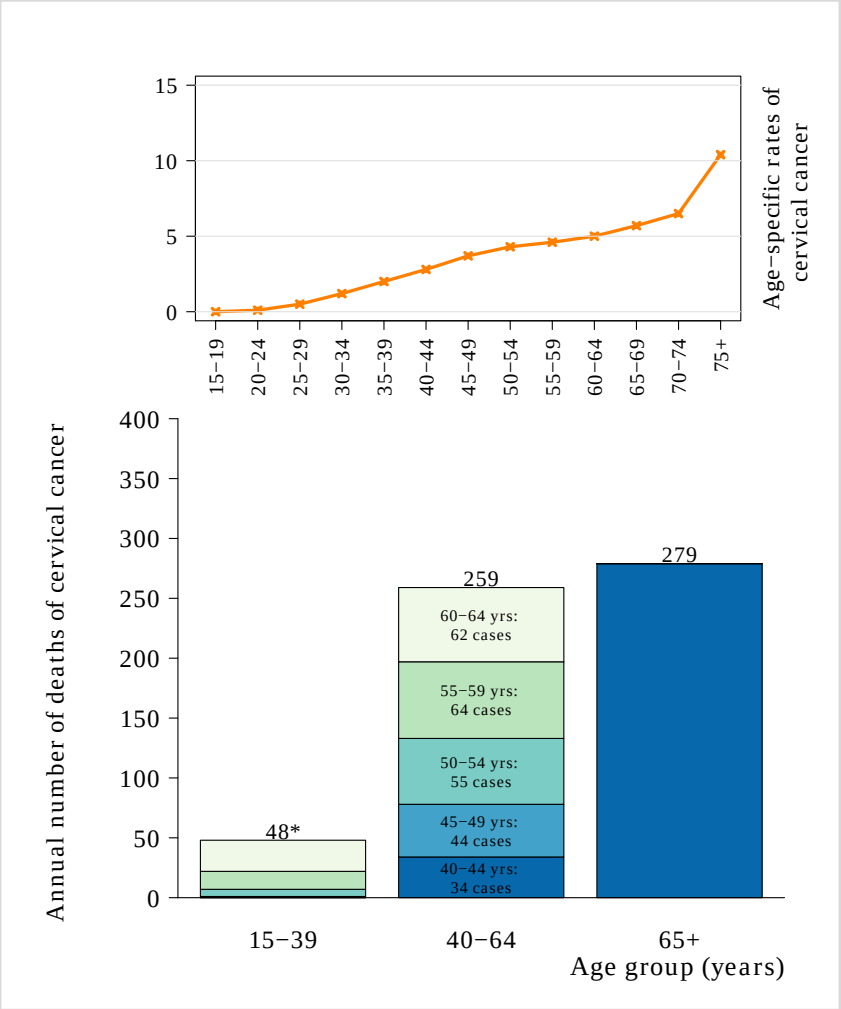
Non-melanoma skin cancer is not included.

[a] Rates per 100,000 women per year.

Data sources:

Ferlay J, Ervik M, Lam F, Colombet M, Mery L, Piñeros M, Znaor A, Soerjomataram I, Bray F (2018). Global Cancer Observatory: Cancer Today. Lyon, France: International Agency for Research on Cancer. Available from: https://gco.iarc.fr/today, accessed [05 October 2018].

Figure 13: Annual number of deaths and age-specific mortality rates of cervical cancer in Canada (estimates for 2018)



* 15-19 yrs: 0 cases. 20-24 yrs: 1 cases. 25-29 yrs: 6 cases. 30-34 yrs: 15 cases. 35-39 yrs: 26 cases.

Data accessed on 05 Oct 2018.

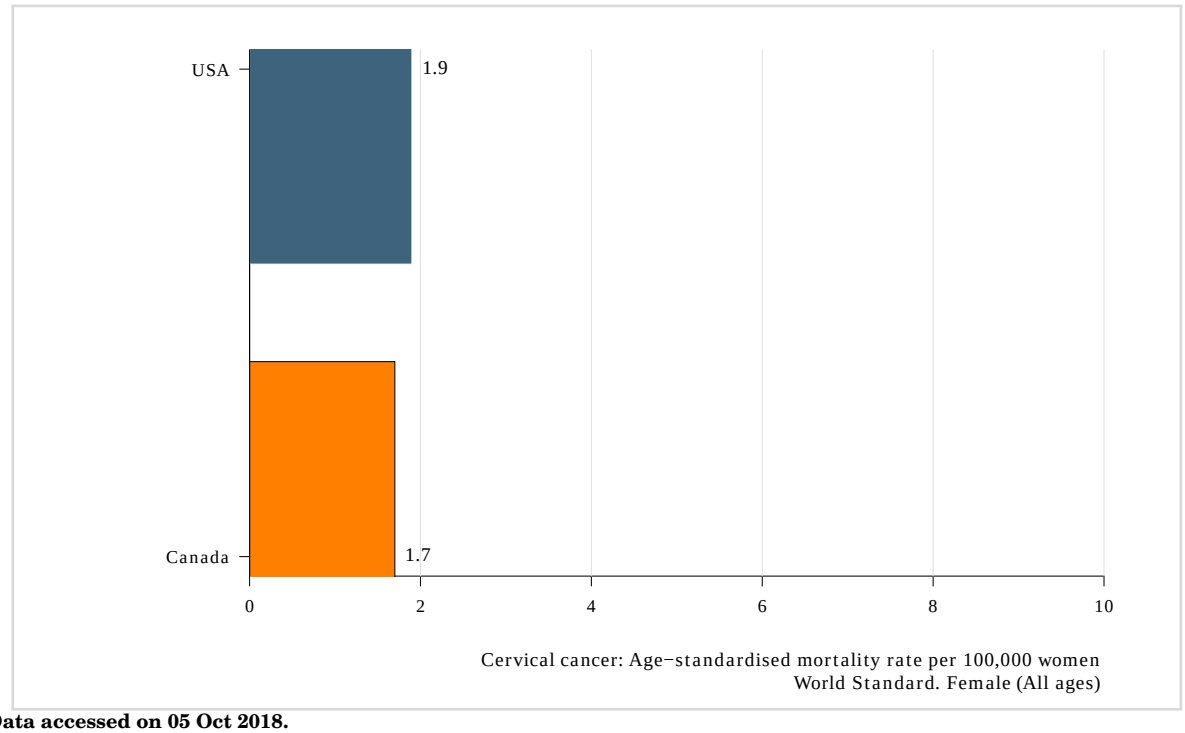
Rates per 100,000 women per year.

Data sources:

Ferlay J, Ervik M, Lam F, Colombet M, Mery L, Piñeros M, Znaor A, Soerjomataram I, Bray F (2018). Global Cancer Observatory: Cancer Today. Lyon, France: International Agency for Research on Cancer. Available from: https://gco.iarc.fr/today, accessed [05 October 2018].

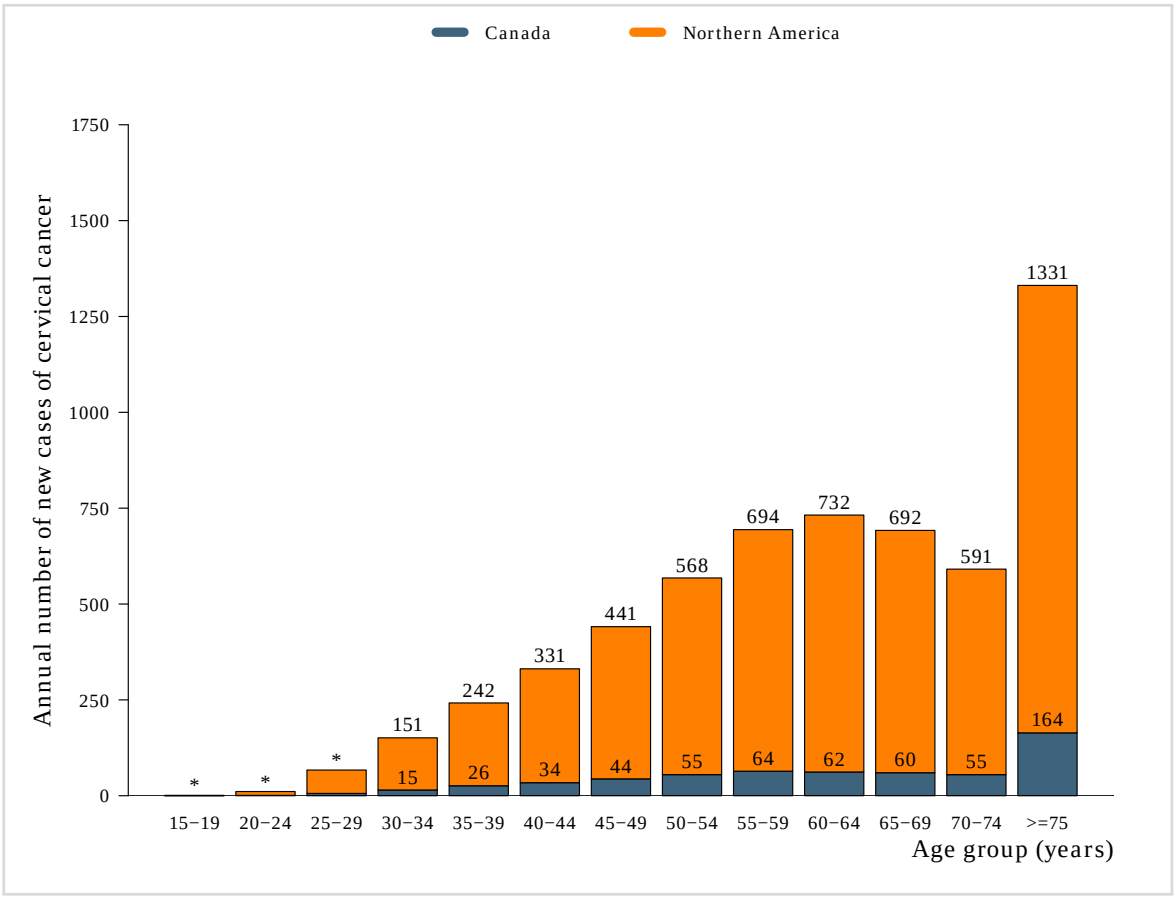
3.1.5 Cervical cancer mortality in Canada across Northern America

Figure 14: Comparison of age-standardised cervical cancer mortality rates in Canada and countries within the region (estimates for 2018)



Data accessed on 05 Oct 2018.
Rates per 100,000 women per year.
Data sources:
Ferlay J, Ervik M, Lam F, Colombet M, Mery L, Piñeros M, Znaor A, Soerjomataram I, Bray F (2018). Global Cancer Observatory: Cancer Today. Lyon, France: International Agency for Research on Cancer. Available from: https://gco.iarc.fr/today, accessed [05 October 2018].

Figure 15: Annual deaths number of cervical cancer by age group in Canada (estimates for 2018)



*0 cases for Canada and 1 cases for Northern America in the 15-19 age group. 1 cases for Canada and 11 cases for Northern America in the 20-24 age group. 6 cases for Canada and 67 cases for Northern America in the 25-29 age group.

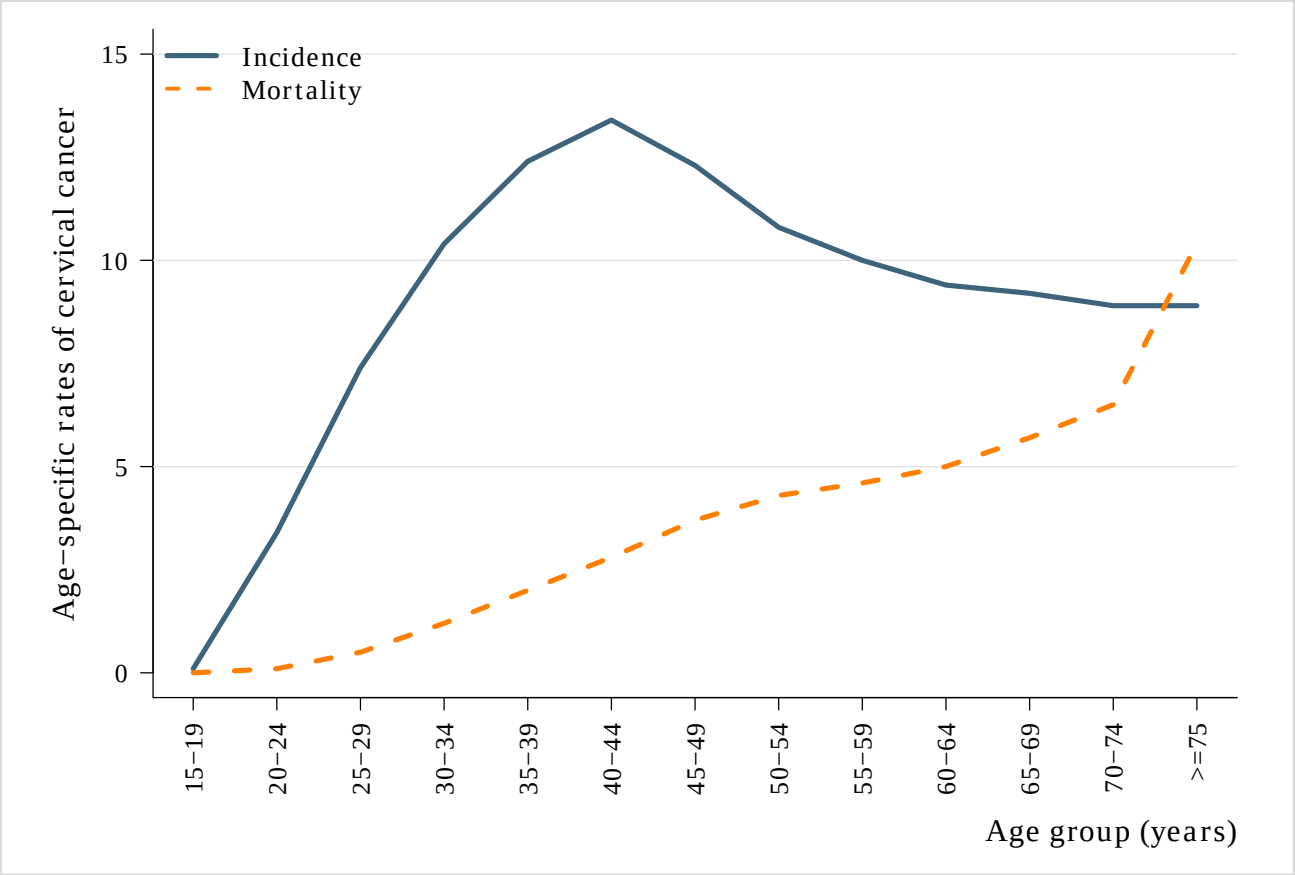
Data accessed on 05 Oct 2018.

Data sources:

Ferlay J, Ervik M, Lam F, Colombet M, Mery L, Piñeros M, Znaor A, Soerjomataram I, Bray F (2018). Global Cancer Observatory: Cancer Today. Lyon, France: International Agency for Research on Cancer. Available from: https://gco.iarc.fr/today, accessed [05 October 2018].

3.1.6 Cervical cancer incidence and mortality comparison, Premature deaths and disability in Canada

Figure 16: Comparison of age-specific cervical cancer incidence and mortality rates in Canada (estimates for 2018)



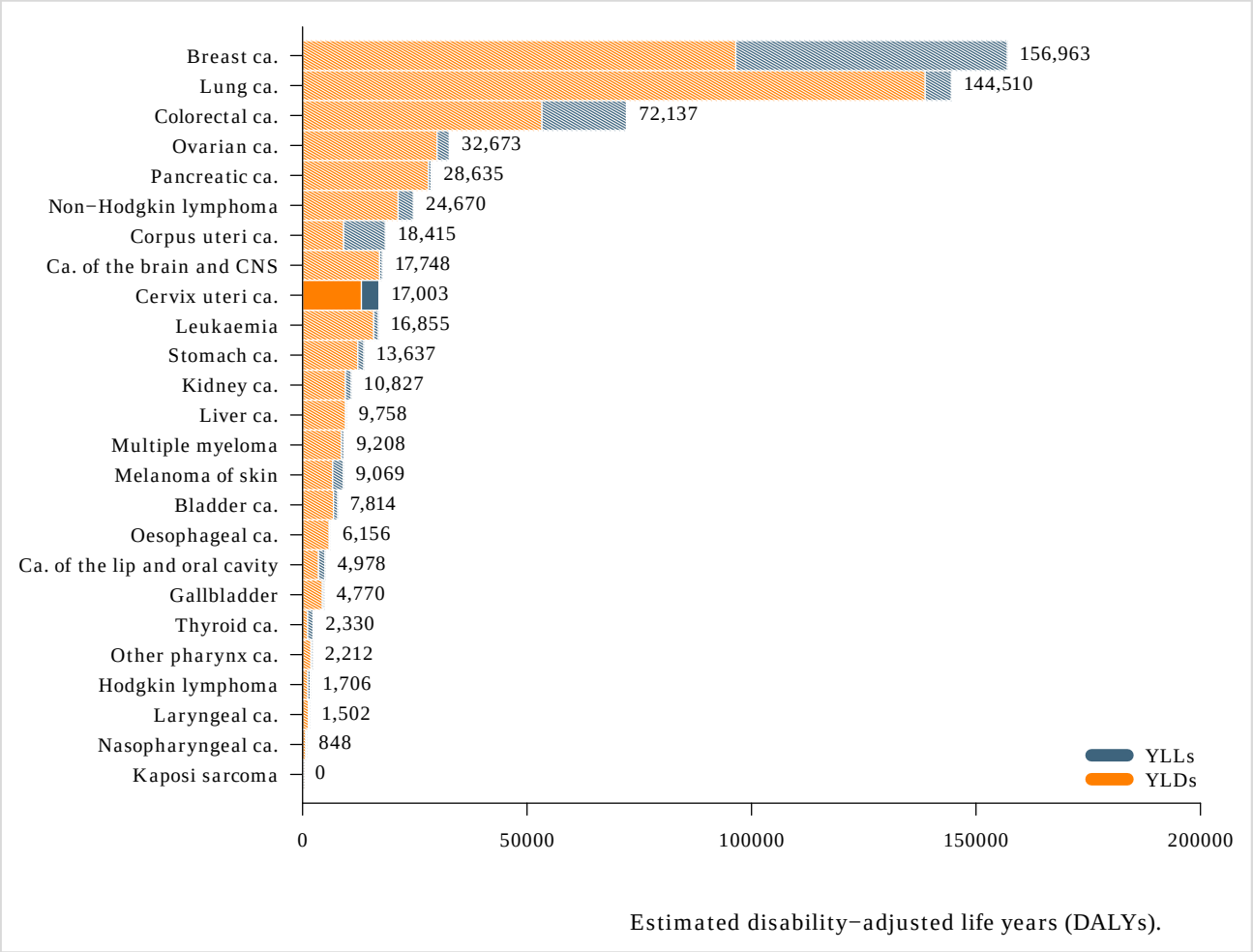
Data accessed on 05 Oct 2018.
Rates per 100,000 women per year.
Data sources:
Ferlay J, Ervik M, Lam F, Colombet M, Mery L, Piñeros M, Znaor A, Soerjomataram I, Bray F (2018). Global Cancer Observatory: Cancer Today. Lyon, France: International Agency for Research on Cancer. Available from: https://gco.iarc.fr/today, accessed [05 October 2018].

Table 7: Premature deaths and disability from cervical cancer in Canada, Northern America and the rest of the world (estimates for 2008)

	Canada		Northern America		World	
Indicator	**Number**	**ASR (W)**	**Number**	**ASR (W)**	**Number**	**ASR (W)**
Estimated disability-adjusted life years (DALYs)	17,003	80	153,658	74	8,738,004	293
Years of life lost (YLLs)	13,106	57	120,320	55	7,788,282	264
Years lived with disability (YLDs)	3,897	22	33,338	19	949,722	28

Data accessed on 04 Nov 2013.
Data sources:
Soerjomataram I, Lortet-Tieulent J, Parkin DM, Ferlay J, Mathers C, Forman D, Bray F. Global burden of cancer in 2008: a systematic analysis of disability-adjusted life-years in 12 world regions. Lancet. 2012 Nov 24;380(9856):1840-50.

Figure 17: Comparison of annual premature deaths and disability from cervical cancer in Canada to other cancers among women (estimates for 2008)



Data accessed on 04 Nov 2013.

CNS: Central Nervous System; YLDs: years lived with disability; YLLs: Years of life lost;

Data sources:

Soerjomataram I, Lortet-Tieulent J, Parkin DM, Ferlay J, Mathers C, Forman D, Bray F. Global burden of cancer in 2008: a systematic analysis of disability-adjusted life-years in 12 world regions. Lancet. 2012 Nov 24;380(9856):1840-50.

3.2 Anogenital cancers other than the cervix

Data on HPV role in anogenital cancers other than cervix are limited, but there is an increasing body of evidence strongly linking HPV DNA with cancers of anus, vulva, vagina, and penis. Although these cancers are much less frequent compared to cervical cancer, their association with HPV make them potentially preventable and subject to similar preventative strategies as those for cervical cancer. *(Vaccine 2006, Vol. 24, Suppl 3; Vaccine 2008, Vol. 26, Suppl 10; Vaccine 2012, Vol. 30, Suppl 5; IARC Monographs 2007, Vol. 90)*.

3.2.1 Anal cancer

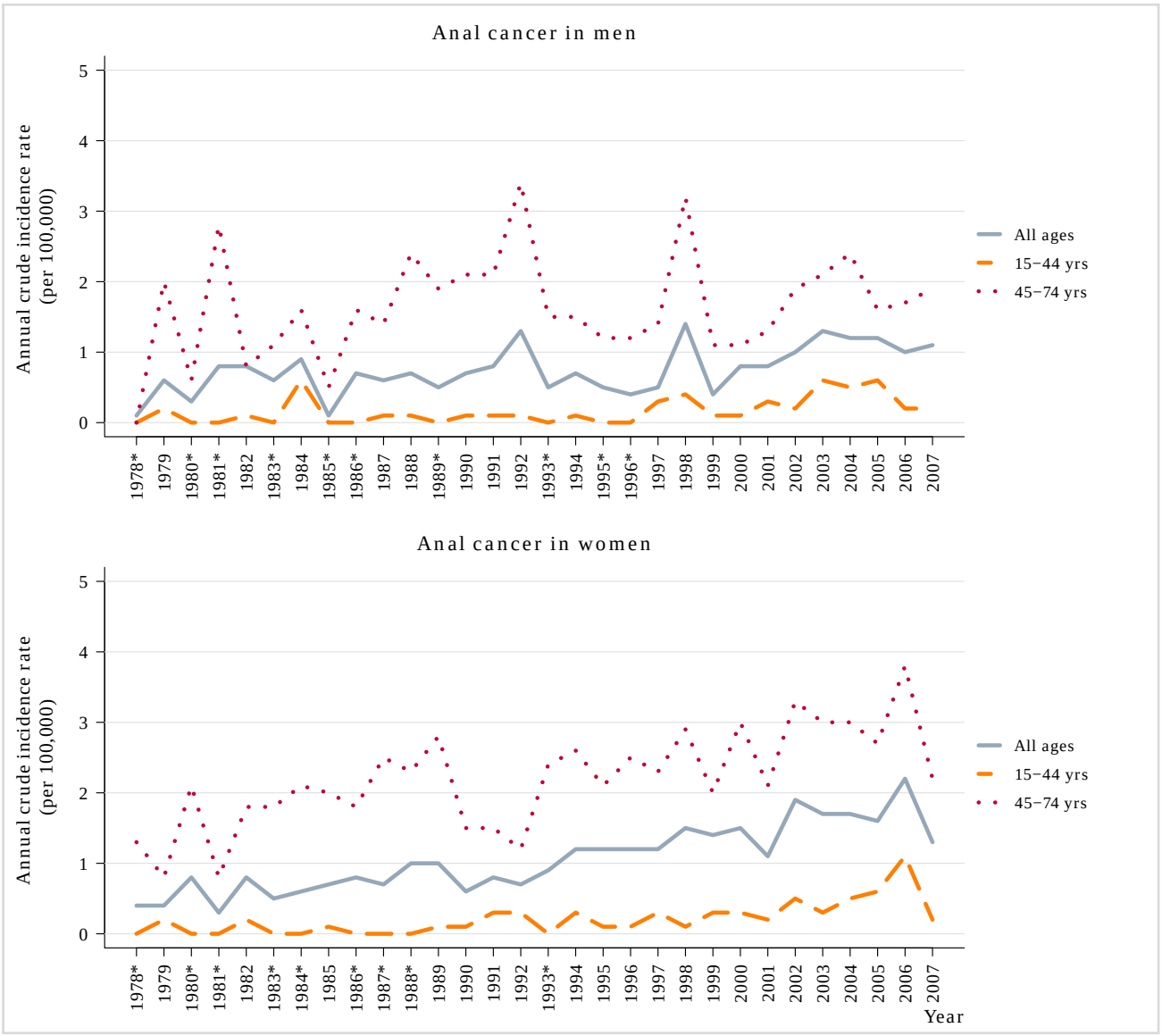
Anal cancer is rare in the general population with an average worldwide incidence of 1 per 100,000, but is reported to be increasing in more developed regions. Globally, there are an estimated 27,000 new cases every year *(de Martel C et al. Lancet Oncol 2012;13(6):607-15)*. Women have higher incidences of anal cancer than men. Incidence is particularly high among populations of men who have sex with men (MSM), women with history of cervical or vulvar cancer, and immunosuppressed populations, including those who are HIV-infected and patients with a history of organ transplantation. These cancers are predominantly squamous cell carcinoma, adenocarcinomas, or basaloid and cloacogenic carcinomas.

Table 8: Anal cancer incidence in Canada by cancer registry and sex

		MALE			FEMALE		
Cancer registry[1]	**Period**	**N cases**[a]	**Crude rate**[b]	**ASR**[b]	**N cases**[a]	**Crude rate**[c]	**ASR**[c]
Alberta	2008-2012	84	0.9	0.6	157	1.7	1.2
British Columbia	2008-2012	165	1.5	0.9	294	2.6	1.5
Manitoba	2008-2012	26	0.8	0.5	59	1.9	1.2
New Brunswick	2008-2012	15	0.8	0.5	40	2.1	1.2
Newfoundland and Labrador	2008-2012	11	0.9	0.5	27	2.0	1.1
Northwest Territories	2008-2012	0	0.0	0.0	0	0.0	0.0
Nova Scotia	2008-2012	29	1.3	0.7	67	2.8	1.5
Nunavut	2008-2012	1	1.2	1.0	0	0.0	0.0
Ontario	2008-2012	513	1.6	1.0	743	2.2	1.3
Prince Edward Island	2008-2012	5	1.4	0.8	10	2.8	1.5
Saskatchewan	2008-2012	26	1.0	0.6	50	1.9	1.1
Yukon	2008-2012	2	2.3	1.7	0	0.0	0.0

Data accessed on 05 Oct 2018.
ASR: Age-standardized rate, Standardized rates have been estimated using the direct method and the World population as the reference;
Please refer to original source (available at http://ci5.iarc.fr/CI5-XI/Default.aspx)
[a] Accumulated number of cases during the period in the population covered by the corresponding registry.
[b] Rates per 100,000 men per year.
[c] Rates per 100,000 women per year.
Data sources:
[1] Bray F, Colombet M, Mery L, Piñeros M, Znaor A, Zanetti R and Ferlay J, editors (2017). Cancer Incidence in Five Continents, Vol. XI (electronic version). Lyon: International Agency for Research on Cancer. Available from: http://ci5.iarc.fr, accessed [05 October 2018].

Figure 18: Time trends in anal cancer incidence in Canada (cancer registry data)



*No cases were registered for this age group.

Data accessed on 27 Apr 2015.

The following regional cancer registries provided data and contributed to their national estimate: Manitoba, Nova Scotia, Saskatchewan.

Data sources:

Ferlay J, Bray F, Steliarova-Foucher E and Forman D. Cancer Incidence in Five Continents, CI5plus: IARC CancerBase No. 9 [Internet]. Lyon, France: International Agency for Research on Cancer; 2014. Available from: http://ci5.iarc.fr

3.2.2 Vulvar cancer

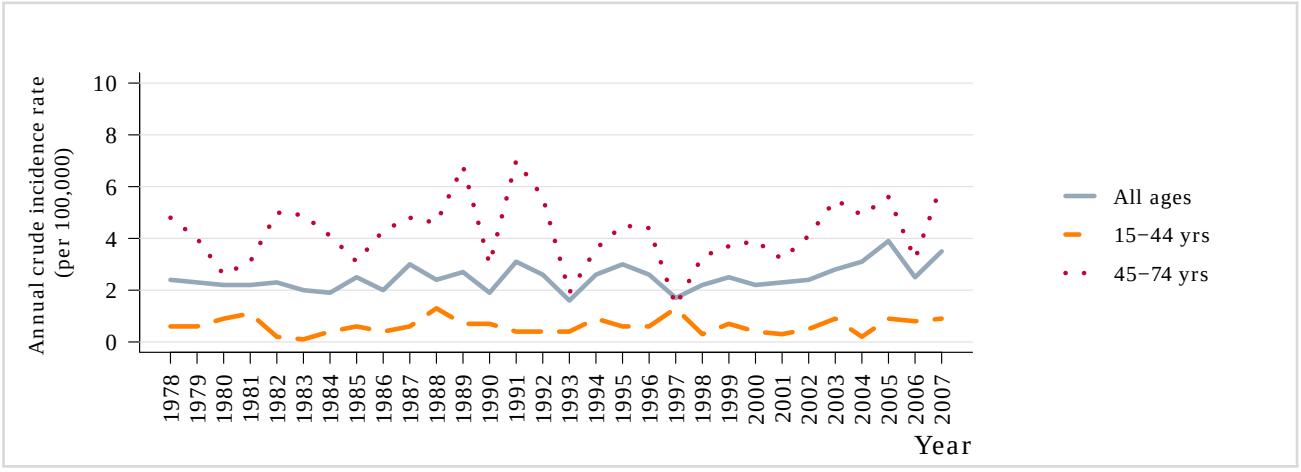
Cancer of the vulva is rare among women worldwide, with an estimated 27,000 new cases in 2008, representing 4% of all gynaecologic cancers *(de Martel C et al. Lancet Oncol 2012;13(6):607-15)*. Worldwide, about 60% of all vulvar cancer cases occur in more developed countries. Vulvar cancer has two distinct histological patterns with two different risk factor profiles: (1) basaloid/warty types (2) keratinising types. Basaloid/warty lesions are more common in young women, are very often associated with HPV DNA detection (75-100%), and have a similar risk factor profile as cervical cancer. Keratinising vulvar carcinomas represent the majority of the vulvar lesions (>60%), they occur more often in older women and are more rarely associated with HPV *(IARC Monograph Vol 100B)*.

Table 9: Vulvar cancer incidence in Canada by cancer registry

Cancer registry[1]	Period	N cases[a]	Crude rate[b]	ASR[b]
Alberta	2008-2012	223	2.4	1.5
British Columbia	2008-2012	368	3.3	1.6
Manitoba	2008-2012	127	4.1	2.4
New Brunswick	2008-2012	71	3.7	1.7
Newfoundland and Labrador	2008-2012	57	4.3	2.1
Northwest Territories	2008-2012	1	0.9	0.7
Nova Scotia	2008-2012	126	5.2	2.4
Nunavut	2008-2012	2	2.5	3.6
Ontario	2008-2012	1,021	3.1	1.6
Prince Edward Island	2008-2012	13	3.6	1.8
Saskatchewan	2008-2012	90	3.4	1.8
Yukon	2008-2012	0	0.0	0.0

Data accessed on 05 Oct 2018.
ASR: Age-standardized rate, Standardized rates have been estimated using the direct method and the World population as the reference;
Please refer to original source (available at http://ci5.iarc.fr/CI5-XI/Default.aspx)
[a] Accumulated number of cases during the period in the population covered by the corresponding registry.
[b] Rates per 100,000 women per year.
Data sources:
[1] Bray F, Colombet M, Mery L, Piñeros M, Znaor A, Zanetti R and Ferlay J, editors (2017). Cancer Incidence in Five Continents, Vol. XI (electronic version). Lyon: International Agency for Research on Cancer. Available from: http://ci5.iarc.fr, accessed [05 October 2018].

Figure 19: Time trends in vulvar cancer incidence in Canada (cancer registry data)



Data accessed on 27 Apr 2015.
The following regional cancer registries provided data and contributed to their national estimate: Manitoba, Nova Scotia, Saskatchewan.
Data sources:
Ferlay J, Bray F, Steliarova-Foucher E and Forman D. Cancer Incidence in Five Continents, CI5plus: IARC CancerBase No. 9 [Internet]. Lyon, France: International Agency for Research on Cancer; 2014. Available from: http://ci5.iarc.fr

3.2.3 Vaginal cancer

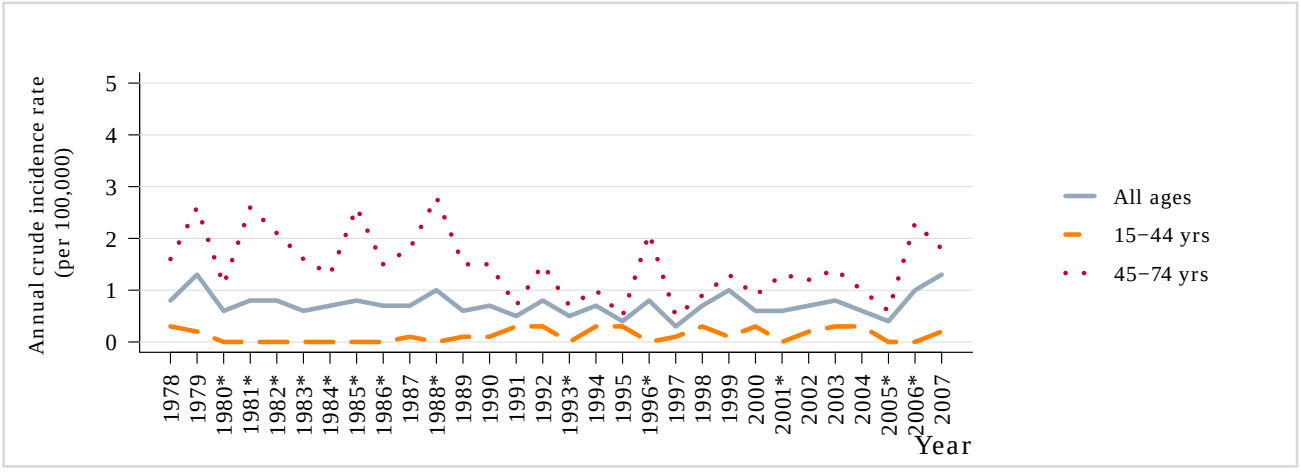
Cancer of the vagina is a rare cancer, with an estimated 13,000 new cases in 2008, representing 2% of all gynaecologic cancers *(de Martel C et al. Lancet Oncol 2012;13(6):607-15)*. Similar to cervical cancer, the majority of vaginal cancer cases (68%) occur in less developed countries. Most vaginal cancers are squamous cell carcinoma (90%) generally attributable to HPV, followed by clear cell adenocarcinomas and melanoma. Vaginal cancers are primarily reported in developed countries. Metastatic cervical cancer can be misclassified as cancer of the vagina. Invasive vaginal cancer is diagnosed primarily in old women (≥ 65 years) and the diagnosis is rare in women under 45 years whereas the peak incidence of carcinoma in situ is observed between ages 55 and 70 *(Vaccine 2008, Vol. 26, Suppl 10)*.

Table 10: Vaginal cancer incidence in Canada by cancer registry

Cancer registry[1]	Period	N cases[a]	Crude rate[b]	ASR[b]
Alberta	2008-2012	60	0.7	0.4
British Columbia	2008-2012	93	0.8	0.4
Manitoba	2008-2012	16	0.5	0.2
New Brunswick	2008-2012	18	0.9	0.4
Newfoundland and Labrador	2008-2012	10	0.8	0.4
Northwest Territories	2008-2012	0	0.0	0.0
Nova Scotia	2008-2012	18	0.7	0.3
Nunavut	2008-2012	0	0.0	0.0
Ontario	2008-2012	279	0.8	0.5
Prince Edward Island	2008-2012	5	1.4	0.9
Saskatchewan	2008-2012	30	1.1	0.4
Yukon	2008-2012	3	3.5	2.7

Data accessed on 05 Oct 2018.
ASR: Age-standardized rate, Standardized rates have been estimated using the direct method and the World population as the reference;
Please refer to original source (available at http://ci5.iarc.fr/CI5-XI/Default.aspx)
[a] Accumulated number of cases during the period in the population covered by the corresponding registry.
[b] Rates per 100,000 women per year.
Data sources:
[1] Bray F, Colombet M, Mery L, Piñeros M, Znaor A, Zanetti R and Ferlay J, editors (2017). Cancer Incidence in Five Continents, Vol. XI (electronic version). Lyon: International Agency for Research on Cancer. Available from: http://ci5.iarc.fr, accessed [05 October 2018].

Figure 20: Time trends in vaginal cancer incidence in Canada (cancer registry data)



*No cases were registered for this age group.
Data accessed on 27 Apr 2015.
The following regional cancer registries provided data and contributed to their national estimate: Manitoba, Nova Scotia, Saskatchewan.
Data sources:
Ferlay J, Bray F, Steliarova-Foucher E and Forman D. Cancer Incidence in Five Continents, CI5plus: IARC CancerBase No. 9 [Internet]. Lyon, France: International Agency for Research on Cancer; 2014. Available from: http://ci5.iarc.fr

3.2.4 Penile cancer

The annual burden of penile cancer has been estimated to be 22,000 cases worldwide with incidence rates strongly correlating with those of cervical cancer *(de Martel C et al. Lancet Oncol 2012;13(6):607-15)*. Penile cancer is rare and most commonly affects men aged 50-70 years. Incidence rates are higher in less developed countries than in more developed countries, accounting for up to 10% of male cancers in some parts of Africa, South America and Asia. Precursor cancerous penile lesions (PeIN) are rare.

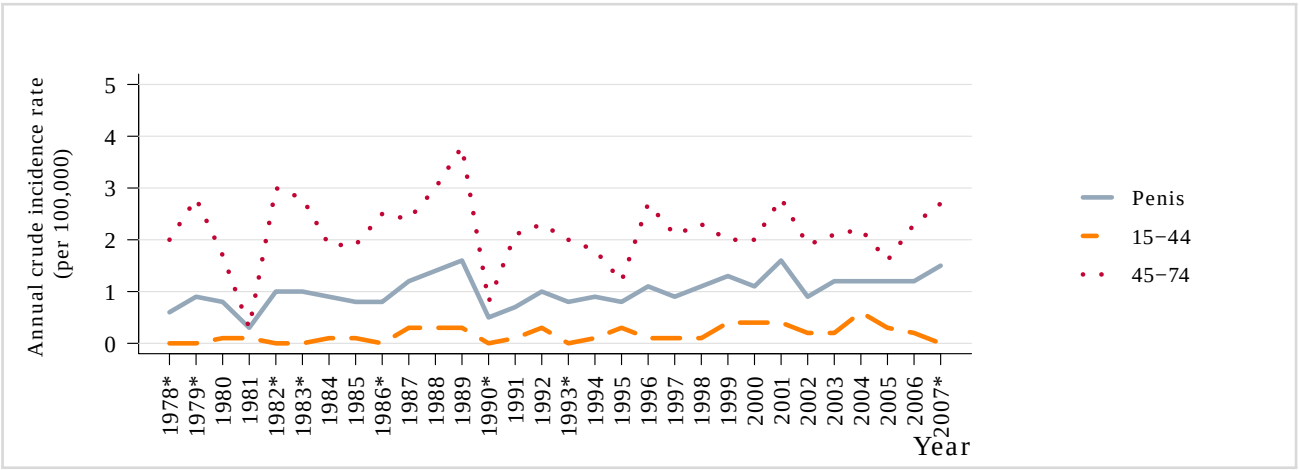
Cancers of the penis are primarily of squamous cell carcinomas (SCC) (95%) and the most common penile SCC histologic sub-types are keratinising (49%), mixed warty-basaloid (17%), verrucous (8%) warty (6%), and basaloid (4%). HPV is most commonly detected in basaloid and warty tumours but is less common in keratinising and verrucous tumours. Approximately 60-100% of PeIN lesions are HPV DNA positive.

Table 11: Penile cancer incidence in Canada by cancer registry

Cancer registry	Period	N cases[a]	Crude rate[b]	ASR[b]
Alberta	2008-2012	78	0.8	0.6
British Columbia	2008-2012	102	0.9	0.5
Manitoba	2008-2012	31	1.0	0.6
New Brunswick	2008-2012	26	1.4	0.8
Newfoundland and Labrador	2008-2012	29	2.3	1.2
Northwest Territories	2008-2012	0	0.0	0.0
Nova Scotia	2008-2012	37	1.6	0.9
Nunavut	2008-2012	1	1.2	3.4
Ontario	2008-2012	275	0.9	0.5
Prince Edward Island	2008-2012	5	1.4	0.7
Saskatchewan	2008-2012	37	1.4	0.8
Yukon	2008-2012	1	1.1	0.7

Data accessed on 05 Oct 2018.
ASR: Age-standardized rate, Standardized rates have been estimated using the direct method and the World population as the reference;
Please refer to original source (available at http://ci5.iarc.fr/CI5-XI/Default.aspx)
[a] Accumulated number of cases during the period in the population covered by the corresponding registry.
[b] Rates per 100,000 men per year.
Data sources:
[1] Bray F, Colombet M, Mery L, Piñeros M, Znaor A, Zanetti R and Ferlay J, editors (2017). Cancer Incidence in Five Continents, Vol. XI (electronic version). Lyon: International Agency for Research on Cancer. Available from: http://ci5.iarc.fr, accessed [05 October 2018].

Figure 21: Time trends in penile cancer incidence in Canada (cancer registry data)



*No cases were registered for this age group.
Data accessed on 27 Apr 2015.
The following regional cancer registries provided data and contributed to their national estimate: Manitoba, Nova Scotia, Saskatchewan.
Data sources:
Ferlay J, Bray F, Steliarova-Foucher E and Forman D. Cancer Incidence in Five Continents, CI5plus: IARC CancerBase No. 9 [Internet]. Lyon, France: International Agency for Research on Cancer; 2014. Available from: http://ci5.iarc.fr

3.3 Head and neck cancers

The majority of head and neck cancers are associated with high tobacco and alcohol consumption. However, increasing trends in the incidence at specific sites suggest that other aetiological factors are involved, and infection by certain high-risk types of HPV (i.e. HPV16) have been reported to be associated with head and neck cancers, in particular with oropharyngeal cancer. Current evidence suggests that HPV16 is associated with tonsil cancer (including Waldeyer ring cancer), base of tongue cancer and other oropharyngeal cancer sites. Associations with other head and neck cancer sites such as oral cancer are neither strong nor consistent when compared to molecular-epidemiological data on HPV and oropharyngeal cancer. Association with laryngeal cancer is still unclear *(IARC Monograph Vol 100B)*.

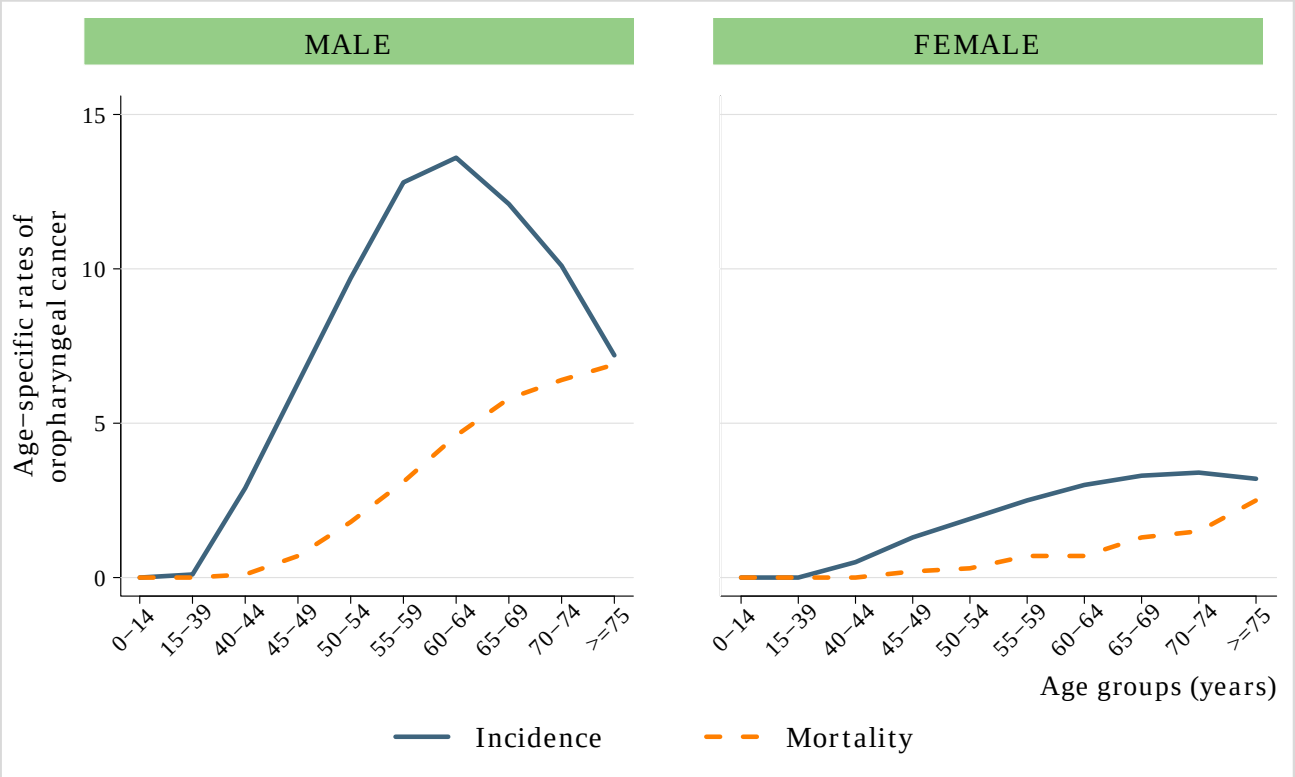
3.3.1 Oropharyngeal cancer

Table 12: Incidence and mortality of cancer of the oropharynx in Canada, Northern America and the rest of the world by sex (estimates for 2018). Includes ICD-10 codes: C09-10

Indicator	MALE			FEMALE		
	Canada	Northern America	World	Canada	Northern America	World
INCIDENCE						
Annual number of new cancer cases	868	10,923	74,472	234	2,397	18,415
Crude incidence rate[a]	4.7	6.1	1.9	1.3	1.3	0.5
Age-standardized incidence rate[a]	2.8	3.9	1.8	0.7	0.8	0.4
Cumulative risk (%) at 75 years old[b]	0.3	0.5	0.2	0.1	0.1	0
MORTALITY						
Annual number of deaths	320	2,963	42,116	91	883	8,889
Crude mortality rate[a]	1.7	1.6	1.1	0.5	0.5	0.2
Age-standardized mortality rate[a]	0.9	0.9	1.0	0.2	0.2	0.2
Cumulative risk (%) at 75 years old[c]	0.1	0.1	0.1	0	0	0

Data accessed on 05 Oct 2018.
For more detailed methods of estimation please refer to http://gco.iarc.fr/today/data-sources-methods
[a] Male: Rates per 100,000 men per year. Female: Rates per 100,000 women per year.
[b] Cumulative risk (incidence) is the probability or risk of individuals getting from the disease during ages 0-74 years. For cancer, it is expressed as the % of new born children who would be expected to develop from a particular cancer before the age of 75 if they had the rates of cancer observed in the period in the absence of competing causes.
[c] Cumulative risk (mortality) is the probability or risk of individuals dying from the disease during ages 0-74 years. For cancer, it is expressed as the % of new born children who would be expected to die from a particular cancer before the age of 75 if they had the rates of cancer observed in the period in the absence of competing causes.
Data sources:
Ferlay J, Ervik M, Lam F, Colombet M, Mery L, Piñeros M, Znaor A, Soerjomataram I, Bray F (2018). Global Cancer Observatory: Cancer Today. Lyon, France: International Agency for Research on Cancer. Available from: https://gco.iarc.fr/today, accessed [05 October 2018].

Figure 22: Comparison of incidence and mortality rates of the oropharynx by age group and sex in Canada (estimates for 2018). Includes ICD-10 codes: C09-10



Data accessed on 05 Oct 2018.
Male: Rates per 100,000 men per year. Female: Rates per 100,000 women per year.
Data sources:
Ferlay J, Ervik M, Lam F, Colombet M, Mery L, Piñeros M, Znaor A, Soerjomataram I, Bray F (2018). Global Cancer Observatory: Cancer Today. Lyon, France: International Agency for Research on Cancer. Available from: https://gco.iarc.fr/today, accessed [05 October 2018].

Table 13: Incidence of oropharyngeal cancer in Canada by cancer registry and sex

Cancer registry[1,α]	Period[α]	MALE			FEMALE		
		N cases[a]	Crude rate[b]	ASR[α]	N cases[a]	Crude rate[b]	ASR[b]
Tongue (ICD-10 code: C01-02)							
Alberta	2008-2012	366	3.9	2.9	158	1.7	1.1
British Columbia	2008-2012	569	5.1	3.1	233	2.1	1.1
Manitoba	2008-2012	124	4.0	2.8	47	1.5	1.0
New Brunswick	2008-2012	81	4.4	2.5	44	2.3	1.2
Newfoundland and Labrador	2008-2012	55	4.3	2.5	19	1.4	0.9
Northwest Territories	2008-2012	4	3.6	3.0	1	0.9	1.1
Nova Scotia	2008-2012	139	6.0	3.5	60	2.5	1.3
Nunavut	2008-2012	1	1.2	1.8	0	0.0	0.0
Ontario	2008-2012	1,320	4.1	2.7	637	1.9	1.1
Prince Edward Island	2008-2012	27	7.8	4.3	8	2.2	1.0
Saskatchewan	2008-2012	100	3.8	2.6	45	1.7	1.0
Yukon	2008-2012	7	7.9	4.8	1	1.2	1.2
Tonsillar cancer (ICD-10 code: C09)							
Alberta	2008-2012	229	2.4	1.8	46	0.5	0.4
British Columbia	2008-2012	364	3.3	2.0	96	0.9	0.5
Manitoba	2008-2012	82	2.7	1.9	16	0.5	0.3
New Brunswick	2008-2012	87	4.7	2.8	28	1.5	0.8
Newfoundland and Labrador	2008-2012	49	3.8	2.2	15	1.1	0.6
Northwest Territories	2008-2012	0	0.0	0.0	0	0.0	0.0
Nova Scotia	2008-2012	93	4.0	2.3	25	1.0	0.6
Nunavut	2008-2012	2	2.3	2.9	1	1.2	2.7
Ontario	2008-2012	832	2.6	1.7	219	0.7	0.4
Prince Edward Island	2008-2012	11	3.2	1.9	2	0.6	0.2
Saskatchewan	2008-2012	73	2.8	1.9	18	0.7	0.4
Yukon	2008-2012	2	2.3	1.7	0	0.0	0.0
Cancer of the oropharynx (excludes tonsil) (ICD-10 code: C10)							
Alberta	2008-2012	56	0.6	0.4	19	0.2	0.1
British Columbia	2008-2012	72	0.7	0.4	26	0.2	0.1
Manitoba	2008-2012	14	0.5	0.3	8	0.3	0.1
New Brunswick	2008-2012	13	0.7	0.4	0	0.0	0.0
Newfoundland and Labrador	2008-2012	6	0.5	0.2	0	0.0	0.0
Northwest Territories	2008-2012	1	0.9	0.6	0	0.0	0.0
Nova Scotia	2008-2012	24	1.0	0.6	5	0.2	0.1
Nunavut	2008-2012	0	0.0	0.0	0	0.0	0.0
Ontario	2008-2012	287	0.9	0.6	92	0.3	0.2
Prince Edward Island	2008-2012	3	0.9	0.4	2	0.6	0.4
Saskatchewan	2008-2012	4	0.2	0.1	5	0.2	0.1
Yukon	2008-2012	0	0.0	0.0	0	0.0	0.0

Data accessed on 15 Oct 2018.

ASR: Age-standardised rate. Standardised rates have been estimated using the direct method and the World population as the reference.

[a] Accumulated number of cases during the period in the population covered by the corresponding registry.

[b] Male: Rates per 100,000 men per year. Female: Rates per 100,000 women per year.

[α] Please refer to original source (available at http://ci5.iarc.fr/CI5-XI/Default.aspx)

Data sources:

[1] Bray F, Colombet M, Mery L, Piñeros M, Znaor A, Zanetti R and Ferlay J, editors (2017). Cancer Incidence in Five Continents, Vol. XI (electronic version). Lyon: International Agency for Research on Cancer. Available from: http://ci5.iarc.fr, accessed [05 October 2018].

4 HPV related statistics

HPV infection is commonly found in the anogenital tract of men and women with and without clinical lesions. The aetiological role of HPV infection among women with cervical cancer is well-established, and there is growing evidence of its central role in other anogenital sites. HPV is also responsible for other diseases such as recurrent juvenile respiratory papillomatosis and genital warts, both mainly caused by HPV types 6 and 11 *(Lacey CJ, Vaccine 2006; 24(S3):35)*. For this section, the methodologies used to compile the information on HPV burden are derived from systematic reviews and meta-analyses of the literature. Due to the limitations of HPV DNA detection methods and study designs used, these data should be interpreted with caution and used only as a guide to assess the burden of HPV infection within the population. *(Vaccine 2006, Vol. 24, Suppl 3; Vaccine 2008, Vol. 26, Suppl 10; Vaccine 2012,Vol. 30, Suppl 5; IARC Monographs 2007, Vol. 90)*.

4.1 HPV burden in women with normal cervical cytology, cervical precancerous lesions or invasive cervical cancer

The statistics shown in this section focus on HPV infection in the cervix uteri. HPV cervical infection results in cervical morphological lesions ranging from normalcy (cytologically normal women) to different stages of precancerous lesions (CIN-1, CIN-2, CIN-3/CIS) and invasive cervical cancer. HPV infection is measured by HPV DNA detection in cervical cells (fresh tissue, paraffin embedded or exfoliated cells).

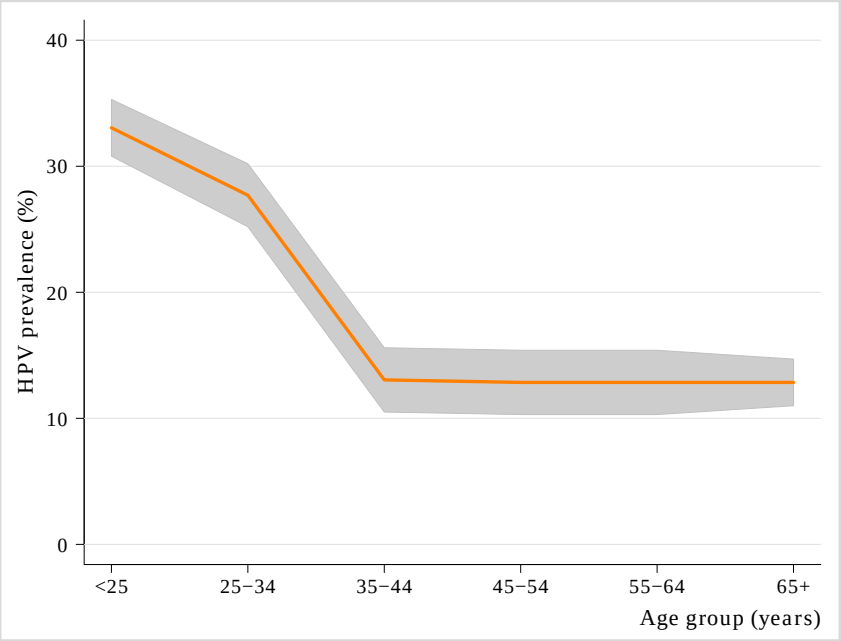
The prevalence of HPV increases with lesion severity. HPV causes virtually 100% of cervical cancer cases, and an underestimation of HPV prevalence in cervical cancer is most likely due to the limitations of study methodologies. Worldwide, HPV16 and 18 (the two vaccine-preventable types) contribute to over 70% of all cervical cancer cases, between 41% and 67% of high-grade cervical lesions and 16-32% of low-grade cervical lesions. After HPV16/18, the six most common HPV types are the same in all world regions, namely 31, 33, 35, 45, 52 and 58; these account for an additional 20% of cervical cancers worldwide (*Clifford G, Vaccine 2006;24(S3):26*).

Methods: Prevalence and type distribution of human papillomavirus in cervical carcinoma, low-grade cervical lesions, high-grade cervical lesions and normal cytology: systematic review and meta-analysis

A systematic review of the literature was conducted regarding the worldwide HPV-prevalence and type distribution for cervical carcinoma, low-grade cervical lesions, high-grade cervical lesions and normal cytology from 1990 to 'data as of' indicated in each section. The search terms for the review were 'HPV' AND cerv* using Pubmed. There were no limits in publication language. References cited in selected articles were also investigated. Inclusion criteria were: HPV DNA detection by means of PCR or HC2, a minimum of 20 cases for cervical carcinoma, 20 cases for low-grade cervical lesions, 20 cases for high-grade cervical lesions and 100 cases for normal cytology and a detailed description of HPV DNA detection and genotyping techniques used. The number of cases tested and HPV positive extracted for each study were pooled to estimate the prevalence of HPV DNA and the HPV type distribution globally and by geographical region. Binomial 95% confidence intervals were calculated for each HPV prevalence. For more details refer to the methods document.

4.1.1 HPV prevalence in women with normal cervical cytology

Figure 23: Crude age-specific HPV prevalence (%) and 95% confidence interval in women with normal cervical cytology in Canada

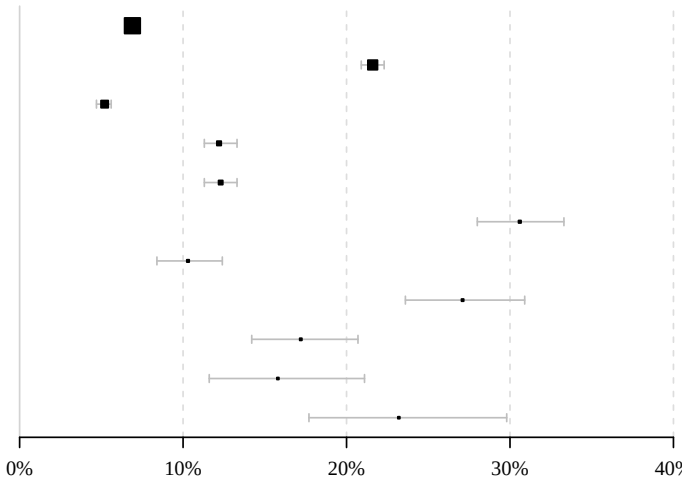


Data updated on 11 Jun 2019 (data as of 30 Jun 2015).

Data sources:

Based on systematic reviews and meta-analysis performed by ICO. The ICO HPV Information Centre has updated data until June 2014. Reference publications: 1) Bruni L, J Infect Dis 2010; 202: 1789. 2) De Sanjosé S, Lancet Infect Dis 2007; 7: 453
Jiang Y, J Infect Public Health 2011; 4: 219 | Kapala J, J Virol Methods 2007; 142: 223 | Richardson H, Cancer Epidemiol Biomarkers Prev 2003; 12: 485

Figure 24: HPV prevalence among women with normal cervical cytology in Canada, by study



Study	Age	N	% (95% CI)
Louvanto 2014 (Montreal)[a]	30−65	23,739	6.9 (6.6−7.3)
Jiang 2013[b]	14−69	13,379	21.6 (20.9−22.3)
Mayrand 2006[c]	30−69	9,245	5.2 (4.7−5.6)
Ogilvie 2013 (British Columbia)[a]	−	4,330	12.2 (11.3−13.3)
Moore 2009 (British Columbia)	>=15	4,003	12.3 (11.3−13.3)
Young 1997 (Winnipeg)	−	1,132	30.6 (28.0−33.3)
Sellors 2000 (Ontario)	15−49	878	10.3 (8.4−12.4)
Richardson 2003 (Montreal)	17−42	568	27.1 (23.6−30.9)
Demers 2012 (Manitoba)	>=18	517	17.2 (14.2−20.7)
Kapala 2007 (Ontario)	−	222	15.8 (11.6−21.1)
Roteli−Martins 2011[a]	15−25	185	23.2 (17.7−29.8)

Data updated on 11 Jun 2019 (data as of 30 Jun 2015).

95% CI: 95% Confidence Interval; N: number of women tested;
The samples for HPV testing come from cervical specimens (fresh/fixed biopsies or exfoliated cells).
[a] Women from the general population, including some with cytological cervical abnormalities
[b] Northwest Territories, Nunavut, Labrador, Yukon.
[c] Montreal and Newfoundland

Data sources:

Based on systematic reviews and meta-analysis performed by ICO. The ICO HPV Information Centre has updated data until June 2014. Reference publications: 1) Bruni L, J Infect Dis 2010; 202: 1789. 2) De Sanjosé S, Lancet Infect Dis 2007; 7: 453
Demers AA, Chronic Dis Inj Can 2012; 32: 177 | Jiang Y, Infect Agents Cancer 2013; 8: 25 | Kapala J, J Virol Methods 2007; 142: 223 | Louvanto K, Am J Obstet Gynecol 2014; 210: 474.e1 | Mayrand MH, Int J Cancer 2006; 119: 615 | Moore RA, Cancer Causes Control 2009; 20: 1387 | Ogilvie GS, Vaccine 2013; 31: 1129 | Richardson H, Cancer Epidemiol Biomarkers Prev 2003; 12: 485 | Roteli-Martins CM, Int J Gynecol Pathol 2011; 30: 173 | Sellors JW, CMAJ 2000; 163: 503 | Young TK, Sex Transm Dis 1997; 24: 293

4.1.2 HPV type distribution among women with normal cervical cytology, precancerous cervical lesions and cervical cancer

Table 14: Prevalence of HPV16 and HPV18 by cytology in Canada

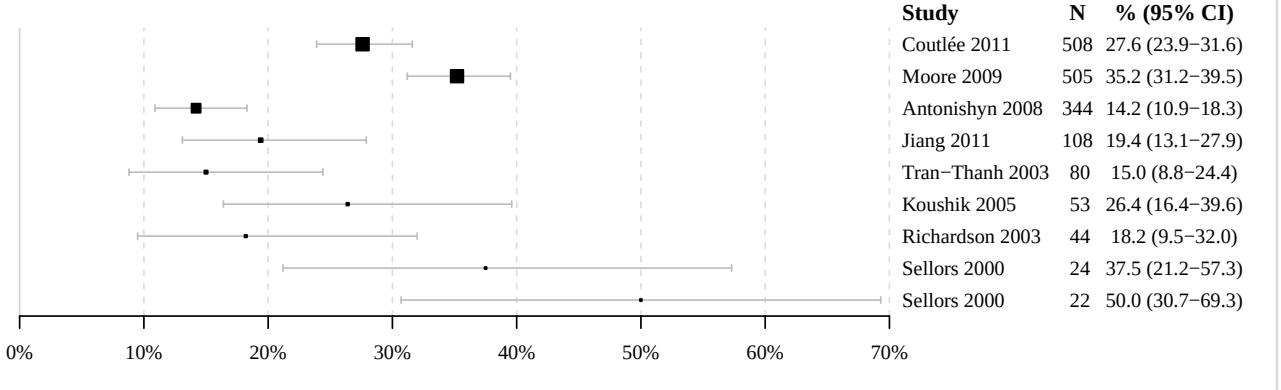
	No. tested	HPV 16/18 Prevalence % (95% CI)
Normal cytology[1,2]	17,899	6.2 (5.9-6.6)
Low-grade lesions[3,4]	1,688	33.5 (31.3-35.8)
High-grade lesions[5,6]	754	67.0 (63.5-70.2)
Cervical cancer[7,8]	169	74.0 (66.9-80.0)

Data updated on 11 Jun 2019 (data as of 30 Jun 2015 / 30 Jun 2015).
95% CI: 95% Confidence Interval; High-grade lesions: CIN-2, CIN-3, CIS or HSIL; Low-grade lesions: LSIL or CIN-1;
The samples for HPV testing come from cervical specimens (fresh / fixed biopsies or exfoliated cells)
Data sources:
[1]Based on systematic reviews and meta-analysis performed by ICO. The ICO HPV Information Centre has updated data until June 2014. Reference publications: 1) Bruni L, J Infect Dis 2010; 202: 1789. 2) De Sanjosé S, Lancet Infect Dis 2007; 7: 453
[2]Demers AA, Chronic Dis Inj Can 2012; 32: 177 | Jiang Y, Infect Agents Cancer 2013; 8: 25 | Moore RA, Cancer Causes Control 2009; 20: 1387
[3]Based on meta-analysis performed by IARC's Infections and Cancer Epidemiology Group up to November 2011, the ICO HPV Information Centre has updated data until June 2015. Reference publications: 1) Guan P, Int J Cancer 2012;131:2349 2) Clifford GM, Cancer Epidemiol Biomarkers Prev 2005;14:1157
[4]Contributing studies: Antonishyn NA, Arch Pathol Lab Med 2008; 132: 54 | Coutlée F, J Med Virol 2011; 83: 1034 | Jiang Y, J Infect Public Health 2011; 4: 219 | Koushik A, Cancer Detect Prev 2005; 29: 307 | Moore RA, Cancer Causes Control 2009; 20: 1387 | Richardson H, Cancer Epidemiol Biomarkers Prev 2003; 12: 485 | Sellors JW, CMAJ 2000; 163: 503 | Sellors JW, CMAJ 2000; 163: 513 | Tran-Thanh D, Am J Obstet Gynecol 2003; 188: 129
[5]Based on meta-analysis performed by IARC's Infections and Cancer Epidemiology Group up to November 2011, the ICO HPV Information Centre has updated data until June 2015. Reference publications: 1) Guan P, Int J Cancer 2012;131:2349 2) Smith JS, Int J Cancer 2007;121:621 3) Clifford GM, Br J Cancer 2003;89:101.
[6]Contributing studies: Antonishyn NA, Arch Pathol Lab Med 2008; 132: 54 | Coutlée F, J Med Virol 2011; 83: 1034 | Jiang Y, J Infect Public Health 2011; 4: 219 | Moore RA, Cancer Causes Control 2009; 20: 1387
[7]Based on meta-analysis performed by IARC's Infections and Cancer Epidemiology Group up to November 2011, the ICO HPV Information Centre has updated data until June 2014. Reference publications: 1) Guan P, Int J Cancer 2012;131:2349 2) Li N, Int J Cancer 2011;128:927 3) Smith JS, Int J Cancer 2007;121:621 4) Clifford GM, Br J Cancer 2003;88:63 5) Clifford GM, Br J Cancer 2003;89:101.
[8]Contributing studies: Bosch FX, J Natl Cancer Inst 1995; 87: 796 | Duggan MA, Hum Pathol 1995; 26: 319 | Tran-Thanh D, Am J Obstet Gynecol 2003; 188: 129

Figure 25: HPV 16 prevalence among women with normal cervical cytology in Canada, by study

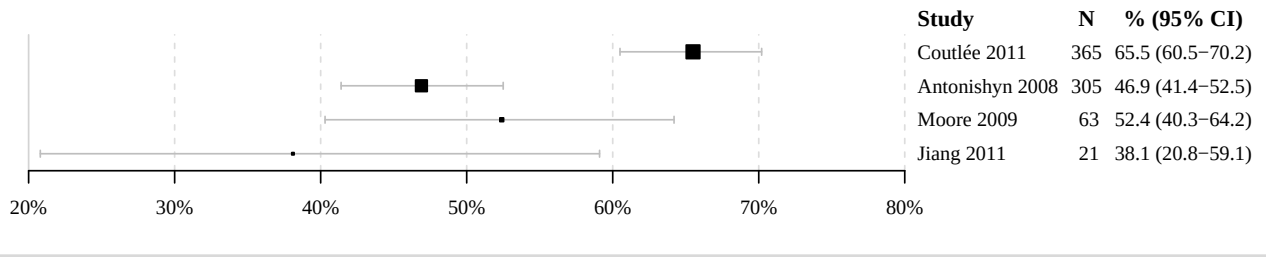
Data updated on 11 Jun 2019 (data as of 30 Jun 2015).
95% CI: 95% Confidence Interval; N: number of women tested;
The samples for HPV testing come from cervical specimens (fresh/fixed biopsies or exfoliated cells).
Data sources:
Based on systematic reviews and meta-analysis performed by ICO. The ICO HPV Information Centre has updated data until June 2014. Reference publications: 1) Bruni L, J Infect Dis 2010; 202: 1789. 2) De Sanjosé S, Lancet Infect Dis 2007; 7: 453
Demers AA, Chronic Dis Inj Can 2012; 32: 177 | Jiang Y, Infect Agents Cancer 2013; 8: 25 | Moore RA, Cancer Causes Control 2009; 20: 1387

Figure 26: HPV 16 prevalence among women with low-grade cervical lesions in Canada, by study



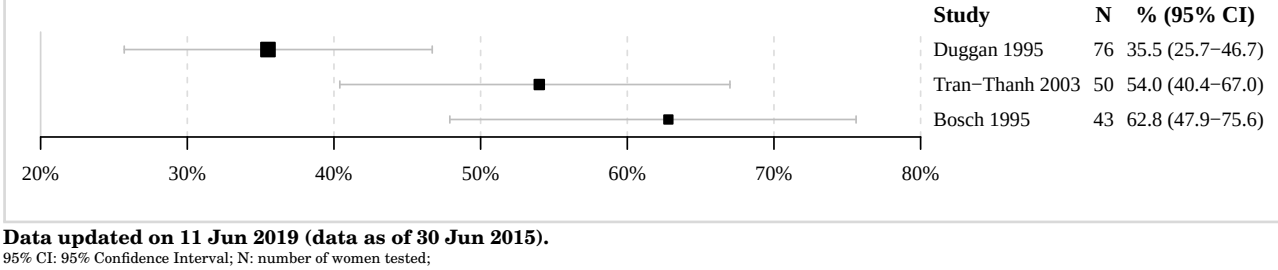
Data updated on 11 Jun 2019 (data as of 30 Jun 2015).
95% CI: 95% Confidence Interval; Low-grade lesions: LSIL or CIN-1; N: number of women tested;
The samples for HPV testing come from cervical specimens (fresh/fixed biopsies or exfoliated cells).
Data sources:
Based on meta-analysis performed by IARC's Infections and Cancer Epidemiology Group up to November 2011, the ICO HPV Information Centre has updated data until June 2015. Reference publications: 1) Guan P, Int J Cancer 2012;131:2349 2) Clifford GM, Cancer Epidemiol Biomarkers Prev 2005;14:1157
Antonishyn NA, Arch Pathol Lab Med 2008; 132: 54 | Coutlée F, J Med Virol 2011; 83: 1034 | Jiang Y, J Infect Public Health 2011; 4: 219 | Koushik A, Cancer Detect Prev 2005; 29: 307 | Moore RA, Cancer Causes Control 2009; 20: 1387 | Richardson H, Cancer Epidemiol Biomarkers Prev 2003; 12: 485 | Sellors JW, CMAJ 2000; 163: 503 | Sellors JW, CMAJ 2000; 163: 513 | Tran-Thanh D, Am J Obstet Gynecol 2003; 188: 129

Figure 27: HPV 16 prevalence among women with high-grade cervical lesions in Canada, by study



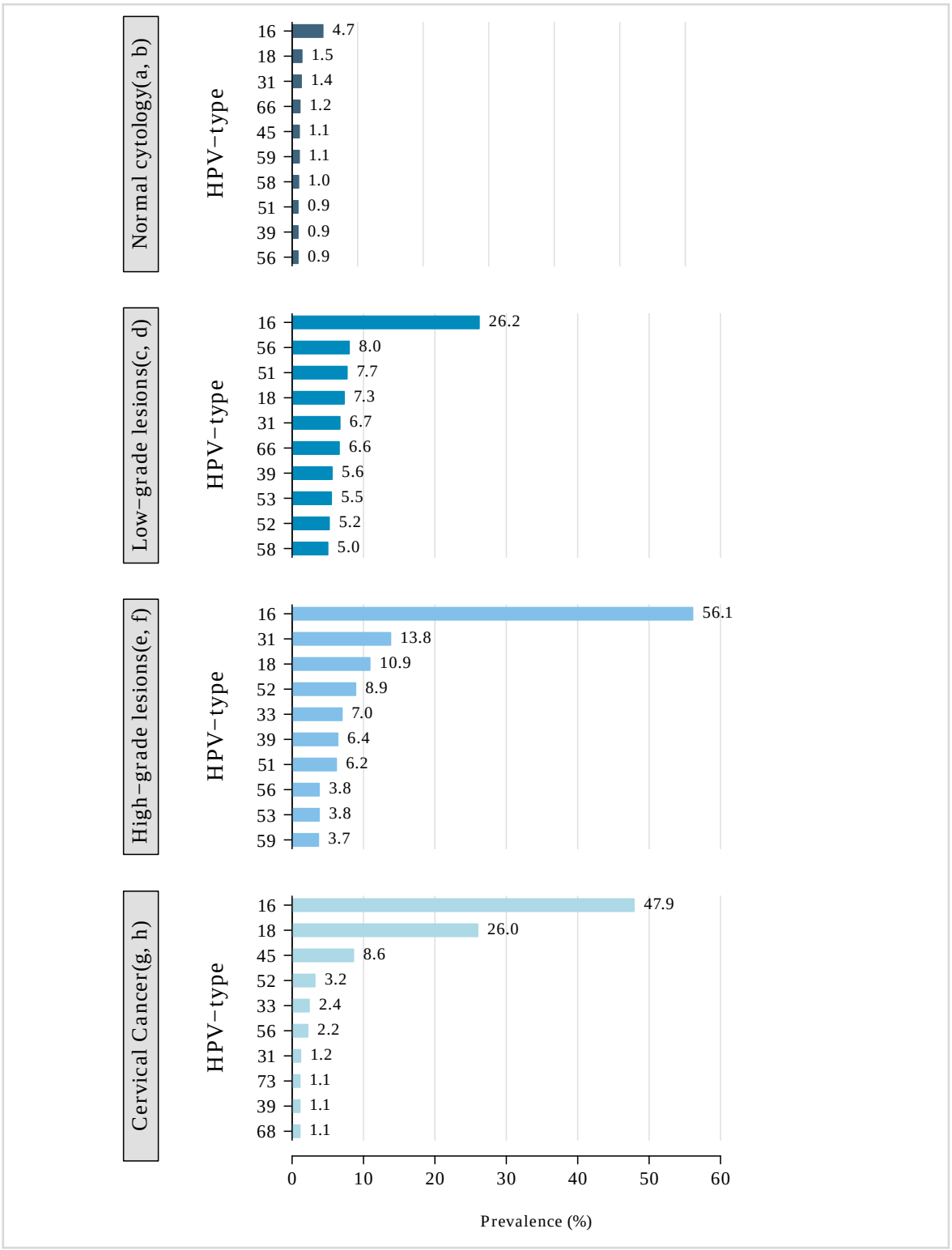
Data updated on 11 Jun 2019 (data as of 30 Jun 2015).
95% CI: 95% Confidence Interval; High-grade lesions: CIN-2, CIN-3, CIS or HSIL; N: number of women tested;
The samples for HPV testing come from cervical specimens (fresh/fixed biopsies or exfoliated cells).
Data sources:
Based on meta-analysis performed by IARC's Infections and Cancer Epidemiology Group up to November 2011, the ICO HPV Information Centre has updated data until June 2015. Reference publications: 1) Guan P, Int J Cancer 2012;131:2349 2) Smith JS, Int J Cancer 2007;121:621 3) Clifford GM, Br J Cancer 2003;89:101.
Antonishyn NA, Arch Pathol Lab Med 2008; 132: 54 | Coutlée F, J Med Virol 2011; 83: 1034 | Jiang Y, J Infect Public Health 2011; 4: 219 | Moore RA, Cancer Causes Control 2009; 20: 1387

Figure 28: HPV 16 prevalence among women with invasive cervical cancer in Canada, by study



Data updated on 11 Jun 2019 (data as of 30 Jun 2015).
95% CI: 95% Confidence Interval; N: number of women tested;
The samples for HPV testing come from cervical specimens (fresh/fixed biopsies or exfoliated cells).
Data sources:
Based on meta-analysis performed by IARC's Infections and Cancer Epidemiology Group up to November 2011, the ICO HPV Information Centre has updated data until June 2014. Reference publications: 1) Guan P, Int J Cancer 2012;131:2349 2) Li N, Int J Cancer 2011;128:927 3) Smith JS, Int J Cancer 2007;121:621 4) Clifford GM, Br J Cancer 2003;88:63 5) Clifford GM, Br J Cancer 2003;89:101.
Bosch FX, J Natl Cancer Inst 1995; 87: 796 | Duggan MA, Hum Pathol 1995; 26: 319 | Tran-Thanh D, Am J Obstet Gynecol 2003; 188: 129

Figure 29: Comparison of the ten most frequent HPV oncogenic types in Canada among women with and without cervical lesions



Data updated on 11 Jun 2019 (data as of 30 Jun 2015 / 30 Jun 2015).

High-grade lesions: CIN-2, CIN-3, CIS or HSIL; Low-grade lesions: LSIL or CIN-1;

The samples for HPV testing come from cervical specimens (fresh / fixed biopsies or exfoliated cells).

Data sources:

[a] Based on systematic reviews and meta-analysis performed by ICO. The ICO HPV Information Centre has updated data until June 2014. Reference publications: 1) Bruni L, J Infect Dis 2010; 202: 1789. 2) De Sanjosé S, Lancet Infect Dis 2007; 7: 453

[b] Demers AA, Chronic Dis Inj Can 2012; 32: 177 | Jiang Y, Infect Agents Cancer 2013; 8: 25 | Moore RA, Cancer Causes Control 2009; 20: 1387

[c] Based on meta-analysis performed by IARC's Infections and Cancer Epidemiology Group up to November 2011, the ICO HPV Information Centre has updated data until June 2015. Reference publications: 1) Guan P, Int J Cancer 2012;131:2349 2) Clifford GM, Cancer Epidemiol Biomarkers Prev 2005;14:1157

[d] Contributing studies: Antonishyn NA, Arch Pathol Lab Med 2008; 132: 54 | Coutlée F, J Med Virol 2011; 83: 1034 | Jiang Y, J Infect Public Health 2011; 4: 219 | Koushik A, Cancer Detect Prev 2005; 29: 307 | Moore RA, Cancer Causes Control 2009; 20: 1387 | Richardson H, Cancer Epidemiol Biomarkers Prev 2003; 12: 485 | Sellors JW, CMAJ 2000; 163: 503 | Sellors JW, CMAJ 2000; 163: 513 | Tran-Thanh D, Am J Obstet Gynecol 2003; 188: 129

[e] Based on meta-analysis performed by IARC's Infections and Cancer Epidemiology Group up to November 2011, the ICO HPV Information Centre has updated data until June 2015. Reference publications: 1) Guan P, Int J Cancer 2012;131:2349 2) Smith JS, Int J Cancer 2007;121:621 3) Clifford GM, Br J Cancer 2003;89:101.

(Continued on next page)

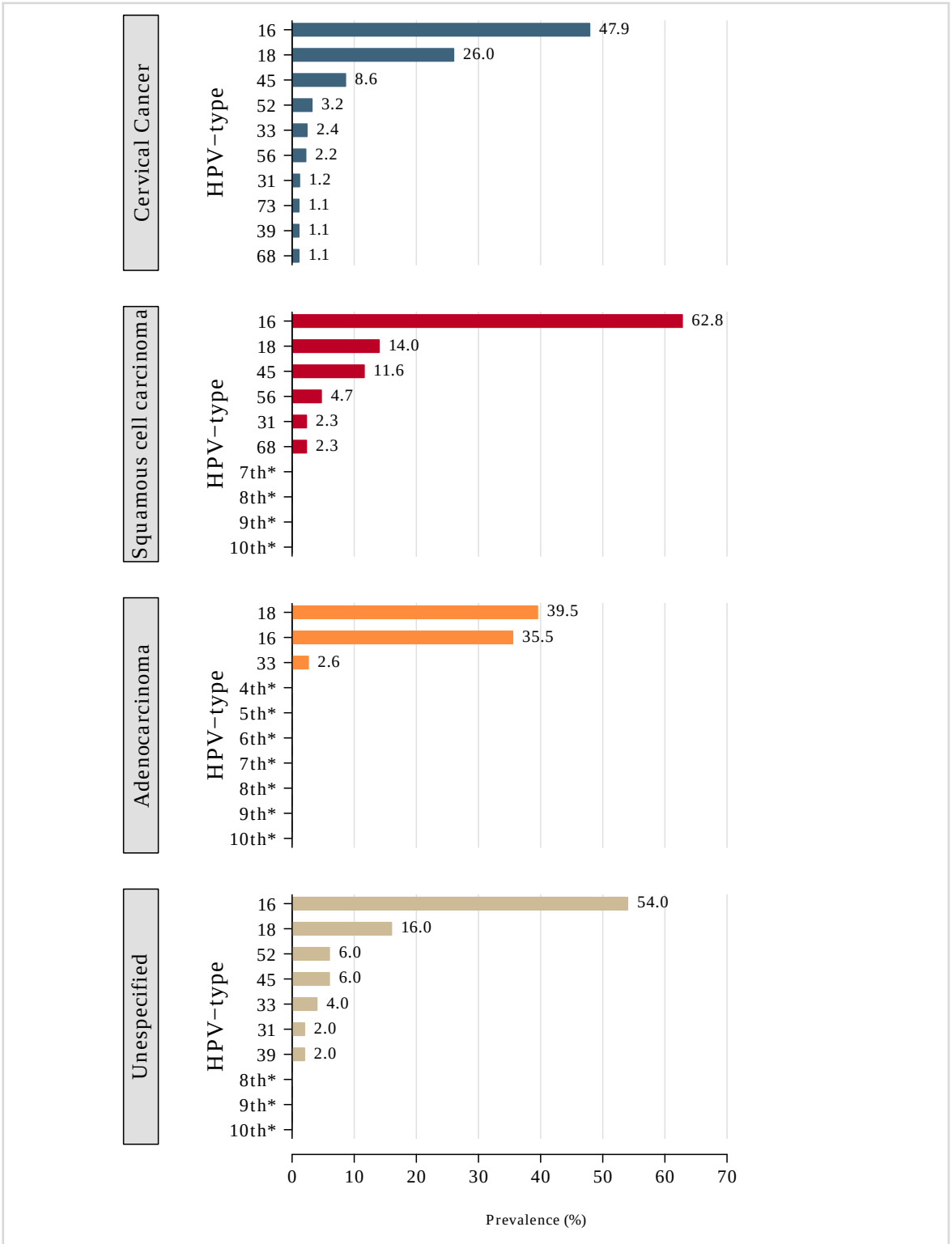
(Figure 29 – continued from previous page)

[f] Contributing studies: Antonishyn NA, Arch Pathol Lab Med 2008; 132: 54 | Coutlée F, J Med Virol 2011; 83: 1034 | Jiang Y, J Infect Public Health 2011; 4: 219 | Moore RA, Cancer Causes Control 2009; 20: 1387

[g] Based on meta-analysis performed by IARC's Infections and Cancer Epidemiology Group up to November 2011, the ICO HPV Information Centre has updated data until June 2014. Reference publications: 1) Guan P, Int J Cancer 2012;131:2349 2) Li N, Int J Cancer 2011;128:927 3) Smith JS, Int J Cancer 2007;121:621 4) Clifford GM, Br J Cancer 2003;88:63 5) Clifford GM, Br J Cancer 2003;89:101.

[h] Contributing studies: Bosch FX, J Natl Cancer Inst 1995; 87: 796 | Duggan MA, Hum Pathol 1995; 26: 319 | Tran-Thanh D, Am J Obstet Gynecol 2003; 188: 129

Figure 30: Comparison of the ten most frequent HPV oncogenic types in Canada among women with invasive cervical cancer by histology



*No data available. No more types than shown were tested or were positive.

Data updated on 19 May 2017 (data as of 30 Jun 2015).

(Continued on next page)

(Figure 30 – continued from previous page)

The samples for HPV testing come from cervical specimens (fresh / fixed biopsies or exfoliated cells). The ranking of the ten most frequent HPV types may present less than ten types beause only a limited number of types were tested or were HPV-positive.

Data sources:

Based on meta-analysis performed by IARC's Infections and Cancer Epidemiology Group up to November 2011, the ICO HPV Information Centre has updated data until June 2014. Reference publications: 1) Guan P, Int J Cancer 2012;131:2349 2) Li N, Int J Cancer 2011;128:927 3) Smith JS, Int J Cancer 2007;121:621 4) Clifford GM, Br J Cancer 2003;88:63 5) Clifford GM, Br J Cancer 2003;89:101.

Contributing studies: Bosch FX, J Natl Cancer Inst 1995; 87: 796 | Duggan MA, Hum Pathol 1995; 26: 319 | Tran-Thanh D, Am J Obstet Gynecol 2003; 188: 129

Table 15: Type-specific HPV prevalence in women with normal cervical cytology, precancerous cervical lesions and invasive cervical cancer in Canada

HPV Type	Normal cytology[1,2] No. tested	Normal cytology[1,2] HPV Prev % (95% CI)	Low-grade lesions[3,4] No. tested	Low-grade lesions[3,4] HPV Prev % (95% CI)	High-grade lesions[5,6] No. tested	High-grade lesions[5,6] HPV Prev % (95% CI)	Cervical cancer[7,8] No. tested	Cervical cancer[7,8] HPV Prev % (95% CI)
ONCOGENIC HPV TYPES								
High-risk HPV types								
16	17,899	4.7 (4.4-5.0)	1,688	26.2 (24.1-28.3)	754	56.1 (52.5-59.6)	169	47.9 (40.5-55.4)
18	17,899	1.5 (1.3-1.7)	1,688	7.3 (6.1-8.6)	754	10.9 (8.8-13.3)	169	26.0 (20.0-33.1)
31	17,899	1.4 (1.2-1.6)	1,688	6.7 (5.6-8.0)	754	13.8 (11.5-16.4)	169	1.2 (0.3-4.2)
33	17,899	0.7 (0.6-0.9)	1,688	4.1 (3.2-5.1)	754	7.0 (5.4-9.1)	169	2.4 (0.9-5.9)
35	17,899	0.6 (0.5-0.7)	1,688	3.8 (3.0-4.8)	754	3.3 (2.3-4.8)	169	0.0 (0.0-2.2)
39	17,899	0.9 (0.8-1.0)	1,688	5.6 (4.6-6.8)	754	6.4 (4.8-8.3)	93	1.1 (0.2-5.8)
45	17,899	1.1 (1.0-1.3)	1,688	2.7 (2.0-3.6)	754	3.3 (2.3-4.8)	93	8.6 (4.4-16.1)
51	17,899	0.9 (0.7-1.0)	1,688	7.7 (6.5-9.1)	754	6.2 (4.7-8.2)	93	0.0 (0.0-4.0)
52	17,899	0.8 (0.7-0.9)	1,688	5.2 (4.3-6.4)	754	8.9 (7.1-11.1)	93	3.2 (1.1-9.1)
56	17,899	0.9 (0.8-1.1)	1,688	8.0 (6.8-9.4)	733	3.8 (2.7-5.5)	93	2.2 (0.6-7.5)
58	17,899	1.0 (0.8-1.1)	1,688	5.0 (4.0-6.1)	754	3.2 (2.1-4.7)	93	0.0 (0.0-4.0)
59	17,899	1.1 (1.0-1.3)	1,688	3.3 (2.6-4.3)	754	3.7 (2.6-5.3)	93	0.0 (0.0-4.0)
Probable/possible carcinogen								
26	17,899	0.0 (0.0-0.0)	1,298	0.0 (0.0-0.3)	428	0.2 (0.0-1.3)	93	0.0 (0.0-4.0)
30	13,896	0.2 (0.1-0.2)	957	0.4 (0.2-1.1)	368	0.0 (0.0-1.0)	-	-
34	-	-	852	0.1 (0.0-0.7)	670	0.0 (0.0-0.6)	-	-
53	17,899	0.3 (0.2-0.4)	1,688	5.5 (4.5-6.6)	733	3.8 (2.7-5.5)	93	0.0 (0.0-4.0)
66	17,899	1.2 (1.0-1.3)	1,642	6.6 (5.5-7.9)	754	3.1 (2.0-4.5)	93	0.0 (0.0-4.0)
67	17,899	0.9 (0.8-1.1)	1,598	2.4 (1.8-3.3)	754	1.3 (0.7-2.4)	50	0.0 (0.0-7.1)
68	17,899	0.2 (0.1-0.3)	1,688	1.2 (0.8-1.8)	733	0.8 (0.4-1.8)	93	1.1 (0.2-5.8)
69	17,899	0.1 (0.1-0.2)	1,254	0.2 (0.1-0.7)	428	0.0 (0.0-0.9)	50	0.0 (0.0-7.1)
70	17,899	0.8 (0.7-0.9)	1,598	1.9 (1.4-2.7)	754	1.5 (0.8-2.6)	93	0.0 (0.0-4.0)
73	17,899	0.4 (0.3-0.5)	1,642	2.7 (2.1-3.6)	733	2.6 (1.7-4.0)	93	1.1 (0.2-5.8)
82	17,899	0.1 (0.0-0.1)	1,642	1.9 (1.4-2.7)	733	2.0 (1.2-3.3)	93	0.0 (0.0-4.0)
85	13,896	0.2 (0.1-0.3)	108	0.9 (0.2-5.1)	-	-	-	-
97	-	-	-	-	-	-	-	-
NON-ONCOGENIC HPV TYPES								
6	17,899	1.4 (1.2-1.5)	1,688	8.4 (7.1-9.8)	733	3.0 (2.0-4.5)	169	0.6 (0.1-3.3)
11	17,899	0.2 (0.1-0.3)	1,644	1.3 (0.9-2.0)	733	0.5 (0.2-1.4)	169	0.0 (0.0-2.2)
32	13,896	0.2 (0.1-0.2)	108	0.0 (0.0-3.4)	-	-	-	-
40	17,899	0.3 (0.2-0.4)	108	1.9 (0.5-6.5)	-	-	50	0.0 (0.0-7.1)
42	17,899	0.9 (0.8-1.1)	108	2.8 (0.9-7.9)	-	-	50	0.0 (0.0-7.1)
43	17,899	0.2 (0.1-0.2)	108	1.9 (0.5-6.5)	-	-	-	-
44	17,899	0.3 (0.2-0.4)	108	0.0 (0.0-3.4)	-	-	-	-
54	17,899	0.7 (0.6-0.8)	108	2.8 (0.9-7.9)	-	-	50	0.0 (0.0-7.1)
55	-	-	-	-	-	-	-	-
57	4,003	0.0 (0.0-0.1)	-	-	-	-	-	-
61	17,899	0.1 (0.0-0.1)	108	0.0 (0.0-3.4)	-	-	50	0.0 (0.0-7.1)
62	17,899	0.9 (0.8-1.1)	108	2.8 (0.9-7.9)	-	-	50	0.0 (0.0-7.1)
64	-	-	-	-	-	-	-	-
71	17,899	0.0 (0.0-0.0)	108	0.0 (0.0-3.4)	-	-	50	0.0 (0.0-7.1)
72	17,899	0.6 (0.5-0.7)	108	0.9 (0.2-5.1)	-	-	50	0.0 (0.0-7.1)
74	17,899	0.4 (0.3-0.5)	108	0.0 (0.0-3.4)	-	-	-	-
81	17,899	0.8 (0.7-0.9)	108	3.7 (1.4-9.1)	-	-	-	-
83	17,899	0.4 (0.3-0.5)	108	1.9 (0.5-6.5)	-	-	50	0.0 (0.0-7.1)
84	17,899	0.4 (0.3-0.5)	108	0.0 (0.0-3.4)	-	-	50	0.0 (0.0-7.1)
86	13,896	0.3 (0.2-0.4)	-	-	-	-	-	-
87	13,896	0.1 (0.1-0.2)	108	0.9 (0.2-5.1)	-	-	-	-
89	17,899	0.6 (0.5-0.8)	108	2.8 (0.9-7.9)	-	-	50	0.0 (0.0-7.1)
90	13,896	0.4 (0.3-0.5)	108	3.7 (1.4-9.1)	-	-	-	-
91	13,896	0.0 (0.0-0.1)	108	3.7 (1.4-9.1)	-	-	-	-

Data updated on 11 Jun 2019 (data as of 30 Jun 2015 / 30 Jun 2015).

95% CI: 95% Confidence Interval; High-grade lesions: CIN-2, CIN-3, CIS or HSIL; Low-grade lesions: LSIL or CIN-1;
The samples for HPV testing come from cervical specimens (fresh / fixed biopsies or exfoliated cells).

Data sources:

[1]Based on systematic reviews and meta-analysis performed by ICO. The ICO HPV Information Centre has updated data until June 2014. Reference publications: 1) Bruni L, J Infect Dis 2010; 202: 1789. 2) De Sanjosé S, Lancet Infect Dis 2007; 7: 453

[2]Demers AA, Chronic Dis Inj Can 2012; 32: 177 | Jiang Y, Infect Agents Cancer 2013; 8: 25 | Moore RA, Cancer Causes Control 2009; 20: 1387

[3]Based on meta-analysis performed by IARC's Infections and Cancer Epidemiology Group up to November 2011, the ICO HPV Information Centre has updated data until June 2015. Reference publications: 1) Guan P, Int J Cancer 2012;131:2349 2) Clifford GM, Cancer Epidemiol Biomarkers Prev 2005;14:1157

[4]Contributing studies: Antonishyn NA, Arch Pathol Lab Med 2008; 132: 54 | Coutlée F, J Med Virol 2011; 83: 1034 | Jiang Y, J Infect Public Health 2011; 4: 219 | Koushik A, Cancer Detect Prev 2005; 29: 307 | Moore RA, Cancer Causes Control 2009; 20: 1387 | Richardson H, Cancer Epidemiol Biomarkers Prev 2003; 12: 485 | Sellors JW, CMAJ 2000; 163: 503 | Sellors JW, CMAJ 2000; 163: 513 | Tran-Thanh D, Am J Obstet Gynecol 2003; 188: 129

(Continued on next page)

(Table 15 – continued from previous page)

[5]Based on meta-analysis performed by IARC's Infections and Cancer Epidemiology Group up to November 2011, the ICO HPV Information Centre has updated data until June 2015. Reference publications: 1) Guan P, Int J Cancer 2012;131:2349 2) Smith JS, Int J Cancer 2007;121:621 3) Clifford GM, Br J Cancer 2003;89:101.

[6]Contributing studies: Antonishyn NA, Arch Pathol Lab Med 2008; 132: 54 | Coutlée F, J Med Virol 2011; 83: 1034 | Jiang Y, J Infect Public Health 2011; 4: 219 | Moore RA, Cancer Causes Control 2009; 20: 1387

[7]Based on meta-analysis performed by IARC's Infections and Cancer Epidemiology Group up to November 2011, the ICO HPV Information Centre has updated data until June 2014. Reference publications: 1) Guan P, Int J Cancer 2012;131:2349 2) Li N, Int J Cancer 2011;128:927 3) Smith JS, Int J Cancer 2007;121:621 4) Clifford GM, Br J Cancer 2003;88:63 5) Clifford GM, Br J Cancer 2003;89:101.

[8]Contributing studies: Bosch FX, J Natl Cancer Inst 1995; 87: 796 | Duggan MA, Hum Pathol 1995; 26: 319 | Tran-Thanh D, Am J Obstet Gynecol 2003; 188: 129

Table 16: Type-specific HPV prevalence among invasive cervical cancer cases in Canada by histology

HPV Type	Any Histology No. tested	Any Histology HPV Prev % (95% CI)	Squamous cell carcinoma No. tested	Squamous cell carcinoma HPV Prev % (95% CI)	Adenocarcinoma No. tested	Adenocarcinoma HPV Prev % (95% CI)	Unespecified No. tested	Unespecified HPV Prev % (95% CI)
ONCOGENIC HPV TYPES								
High-risk HPV types								
16	169	47.9 (40.5-55.4)	43	62.8 (47.9-75.6)	76	35.5 (25.7-46.7)	50	54.0 (40.4-67.0)
18	169	26.0 (20.0-33.1)	43	14.0 (6.6-27.3)	76	39.5 (29.2-50.7)	50	16.0 (8.3-28.5)
31	169	1.2 (0.3-4.2)	43	2.3 (0.4-12.1)	76	0.0 (0.0-4.8)	50	2.0 (0.4-10.5)
33	169	2.4 (0.9-5.9)	43	0.0 (0.0-8.2)	76	2.6 (0.7-9.1)	50	4.0 (1.1-13.5)
35	169	0.0 (0.0-2.2)	43	0.0 (0.0-8.2)	76	0.0 (0.0-4.8)	50	0.0 (0.0-7.1)
39	93	1.1 (0.2-5.8)	43	0.0 (0.0-8.2)	-	-	50	2.0 (0.4-10.5)
45	93	8.6 (4.4-16.1)	43	11.6 (5.1-24.5)	-	-	50	6.0 (2.1-16.2)
51	93	0.0 (0.0-4.0)	43	0.0 (0.0-8.2)	-	-	50	0.0 (0.0-7.1)
52	93	3.2 (1.1-9.1)	43	0.0 (0.0-8.2)	-	-	50	6.0 (2.1-16.2)
56	93	2.2 (0.6-7.5)	43	4.7 (1.3-15.5)	-	-	50	0.0 (0.0-7.1)
58	93	0.0 (0.0-4.0)	43	0.0 (0.0-8.2)	-	-	50	0.0 (0.0-7.1)
59	93	0.0 (0.0-4.0)	43	0.0 (0.0-8.2)	-	-	50	0.0 (0.0-7.1)
Probable/possible carcinogen								
26	93	0.0 (0.0-4.0)	-	-	-	-	-	-
30	-	-	-	-	-	-	-	-
34	-	-	-	-	-	-	-	-
53	93	0.0 (0.0-4.0)	-	-	-	-	-	-
66	93	0.0 (0.0-4.0)	43	0.0 (0.0-8.2)	-	-	50	0.0 (0.0-7.1)
67	50	0.0 (0.0-7.1)	-	-	-	-	50	0.0 (0.0-7.1)
68	93	1.1 (0.2-5.8)	43	2.3 (0.4-12.1)	-	-	50	0.0 (0.0-7.1)
69	50	0.0 (0.0-7.1)	-	-	-	-	-	-
70	93	0.0 (0.0-4.0)	-	-	-	-	-	-
73	93	1.1 (0.2-5.8)	-	-	-	-	-	-
82	93	0.0 (0.0-4.0)	43	0.0 (0.0-8.2)	-	-	50	0.0 (0.0-7.1)
85	-	-	-	-	-	-	-	-
97	-	-	-	-	-	-	-	-
NON-ONCOGENIC HPV TYPES								
6	169	0.6 (0.1-3.3)	-	-	-	-	-	-
11	169	0.0 (0.0-2.2)	-	-	-	-	-	-
27	-	-	-	-	-	-	-	-
32	-	-	-	-	-	-	-	-
40	50	0.0 (0.0-7.1)	-	-	-	-	-	-
42	50	0.0 (0.0-7.1)	-	-	-	-	50	0.0 (0.0-7.1)
43	-	-	-	-	-	-	-	-
44	-	-	-	-	-	-	-	-
54	50	0.0 (0.0-7.1)	-	-	-	-	-	-
55	-	-	-	-	-	-	-	-
57	-	-	-	-	-	-	-	-
60	-	-	-	-	-	-	-	-
61	50	0.0 (0.0-7.1)	-	-	-	-	-	-
62	50	0.0 (0.0-7.1)	-	-	-	-	-	-
64	-	-	-	-	-	-	-	-
71	50	0.0 (0.0-7.1)	-	-	-	-	-	-
72	50	0.0 (0.0-7.1)	-	-	-	-	-	-
74	-	-	-	-	-	-	-	-
76	-	-	-	-	-	-	-	-
81	-	-	-	-	-	-	-	-
83	50	0.0 (0.0-7.1)	-	-	-	-	-	-
84	50	0.0 (0.0-7.1)	-	-	-	-	-	-
86	-	-	-	-	-	-	-	-
87	-	-	-	-	-	-	-	-
89	50	0.0 (0.0-7.1)	-	-	-	-	-	-
90	-	-	-	-	-	-	-	-
91	-	-	-	-	-	-	-	-
No Data Available	-	- -	-	- -	-	- -	-	- -

Data updated on 19 May 2017 (data as of 30 Jun 2015).

95% CI: 95% Confidence Interval;

The samples for HPV testing come from cervical specimens (fresh / fixed biopsies or exfoliated cells).

Data sources:

Based on meta-analysis performed by IARC's Infections and Cancer Epidemiology Group up to November 2011, the ICO HPV Information Centre has updated data until June 2014. Reference publications: 1) Guan P, Int J Cancer 2012;131:2349 2) Li N, Int J Cancer 2011;128:927 3) Smith JS, Int J Cancer 2007;121:621 4) Clifford GM, Br J Cancer 2003;88:63 5) Clifford GM, Br J Cancer 2003;89:101.

Contributing studies: Bosch FX, J Natl Cancer Inst 1995; 87: 796 | Duggan MA, Hum Pathol 1995; 26: 319 | Tran-Thanh D, Am J Obstet Gynecol 2003; 188: 129

4.1.3 HPV type distribution among HIV+ women with normal cervical cytology

Table 17: Studies on HPV prevalence among HIV women with normal cytology in Canada

Study	HPV detection method and targeted HPV types	No. Tested	HPV prevalence %	HPV prevalence (95% CI)	Prevalence of 5 most frequent HPVs HPV type (%)
No Data Available	-	-	-	-	-

Data updated on 31 Jul 2013 (data as of 31 Dec 2011). Only for European countries.
95% CI: 95% Confidence Interval;
Data sources:
Systematic review and meta-analysis were performed by the ICO HPV Information Centre up to December 2011. Selected studies had to include at least 20 HIV positive women who had both normal cervical cytology and HPV test results (PCR or HC2).

4.1.4 Terminology

Cytologically normal women

No abnormal cells are observed on the surface of their cervix upon cytology.

Cervical Intraepithelial Neoplasia (CIN) / Squamous Intraepithelial Lesions (SIL)

SIL and CIN are two commonly used terms to describe precancerous lesions or the abnormal growth of squamous cells observed in the cervix. SIL is an abnormal result derived from cervical cytological screening or Pap smear testing. CIN is a histological diagnosis made upon analysis of cervical tissue obtained by biopsy or surgical excision. The condition is graded as CIN 1, 2 or 3, according to the thickness of the abnormal epithelium (1/3, 2/3 or the entire thickness).

Low-grade cervical lesions (LSIL/CIN-1)

Low-grade cervical lesions are defined by early changes in size, shape, and number of abnormal cells formed on the surface of the cervix and may be referred to as mild dysplasia, LSIL, or CIN-1.

High-grade cervical lesions (HSIL/ CIN-2 / CIN-3 / CIS)

High-grade cervical lesions are defined by a large number of precancerous cells on the surface of the cervix that are distinctly different from normal cells. They have the potential to become cancerous cells and invade deeper tissues of the cervix. These lesions may be referred to as moderate or severe dysplasia, HSIL, CIN-2, CIN-3 or cervical carcinoma in situ (CIS).

Carcinoma in situ (CIS)

Preinvasive malignancy limited to the epithelium without invasion of the basement membrane. CIN 3 encompasses the squamous carcinoma in situ.

Invasive cervical cancer (ICC) / Cervical cancer

If the high-grade precancerous cells invade the basement membrane is called ICC. ICC stages range from stage I (cancer is in the cervix or uterus only) to stage IV (the cancer has spread to distant organs, such as the liver).

Invasive squamous cell carcinoma

Invasive carcinoma composed of cells resembling those of squamous epithelium.

Adenocarcinoma

Invasive tumour with glandular and squamous elements intermingled.

4.2 HPV burden in anogenital cancers other than cervix

Methods: Prevalence and type distribution of human papillomavirus in carcinoma of the vulva, vagina, anus and penis: systematic review and meta-analysis

A systematic review of the literature was conducted on the worldwide HPV-prevalence and type distribution for anogenital carcinomas other than cervix from January 1986 to 'data as of' indicated in each section. The search terms for the review were 'HPV' AND (anus OR anal) OR (penile) OR vagin* OR vulv* using Pubmed. There were no limits in publication language. References cited in selected articles were also investigated. Inclusion criteria were: HPV DNA detection by means of PCR, a minimum of 10 cases by lesion and a detailed description of HPV DNA detection and genotyping techniques used. The number of cases tested and HPV positive cases were extracted for each study to estimate the prevalence of HPV DNA and the HPV type distribution. Binomial 95% confidence intervals were calculated for each HPV prevalence.

4.2.1 Anal cancer and precancerous anal lesions

Anal cancer is similar to cervical cancer with respect to overall HPV DNA positivity, with approximately 88% of cases associated with HPV infection worldwide *(de Martel C et al. Lancet Oncol 2012;13(6):607-15)*. HPV16 is the most common type detected, representing 73% of all HPV-positive tumours. HPV18 is the second most common type detected and is found in approximately 5% of cases. HPV DNA is also detected in the majority of precancerous anal lesions (AIN) (91.5% in AIN1 and 93.9% in AIN2/3) *(De Vuyst H et al. Int J Cancer 2009; 124: 1626-36)*. In this section, the burden of HPV among cases of anal cancers and precancerous anal lesions in Canada are presented.

Table 18: Studies on HPV prevalence among anal cancer cases in Canada (male and female)

Study	HPV detection method and targeted HPV types	No. Tested	HPV prevalence %	HPV prevalence (95% CI)	Prevalence of 5 most frequent HPVs HPV type (%)
Ouhoummane 2013	PCR L1-Consensus primer, LBA (HPV 6, 11, 16, 18, 26, 31, 33, 34, 35, 39, 40, 42, 45, 51, 52, 53, 54, 56, 58, 59, 61, 62, 66, 67, 68, 69, 70, 71, 72, 73, 81, 82, 83, 84, 89)	96	91.7	(84.4-95.7)	HPV 16 (82.3%) HPV 6 (3.1%) HPV 33 (3.1%) HPV 18 (2.1%) HPV 58 (2.1%)

Data updated on 11 Jun 2019 (data as of 30 Jun 2015).
95% CI: 95% Confidence Interval;
LBA: Line-Blot Assay; PCR: Polymerase Chain Reaction;
Data sources:
Based on systematic reviews (up to 2008) performed by ICO for the IARC Monograph on the Evaluation of Carcinogenic Risks to Humans volume 100B and IARC's Infections and Cancer Epidemiology Group. The ICO HPV Information Centre has updated data until June 2015. Reference publications: 1) Bouvard V, Lancet Oncol 2009;10:321 2) De Vuyst H, Int J Cancer 2009;124:1626
Ouhoummane N, Cancer Epidemiol 2013; 37: 807

Table 19: Studies on HPV prevalence among cases of AIN2/3 in Canada

Study[a]	HPV detection method and targeted HPV types	No. Tested	HPV prevalence %	HPV prevalence (95% CI)	Prevalence of 5 most frequent HPVs HPV type (%)
Gohy 2008	PCR-MY09/11, (HPV 6, 11, 16, 18, 26, 31, 33, 34, 35, 39, 40, 42, 44, 45, 51, 52, 53, 54, 56, 58, 59, 61, 62, 66, 67, 68, 69, 70, 71, 72, 73, 81, 82, 83, 84, 89)	62	93.5	(84.6-97.5)	HPV 16 (35.5%) HPV 18 (16.1%) HPV 58 (16.1%) HPV 42 (9.7%) HPV 45 (9.7%)
Salit 2009	PCR-PGMY09/11, PCR L1-Consensus primer, LBA (HPV 6, 11, 16, 18, 26, 31, 33, 35, 39, 40, 42, 44, 45, 51, 52, 53, 54, 56, 57, 58, 59, 66, 68)	74	100.0	(95.1-100.0)	HPV 16 (52.7%) HPV 18 (32.4%) HPV 31 (31.1%) HPV 6 (28.4%) HPV 52 (27.0%)

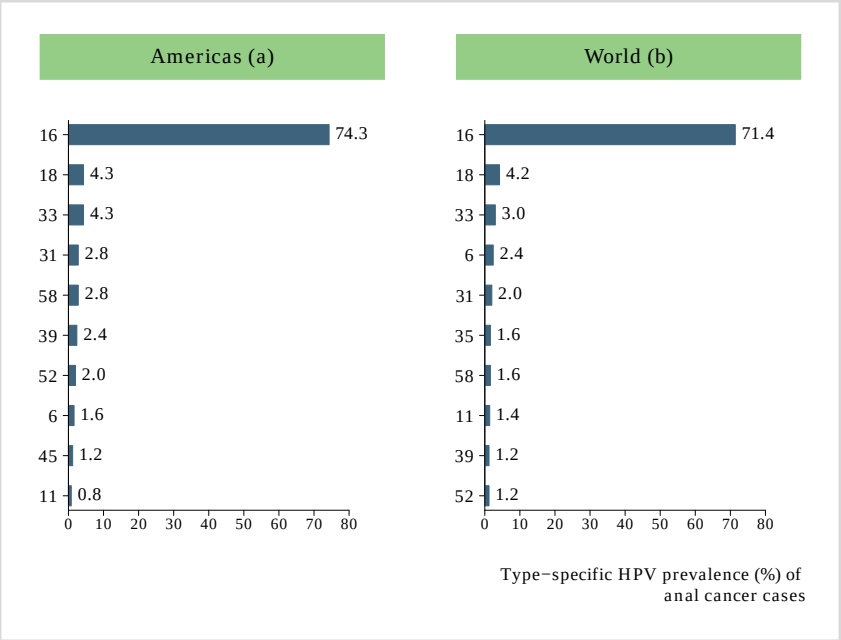
Data updated on 11 Jun 2019 (data as of 30 Jun 2015).

(Continued on next page)

(Table 19 – continued from previous page)

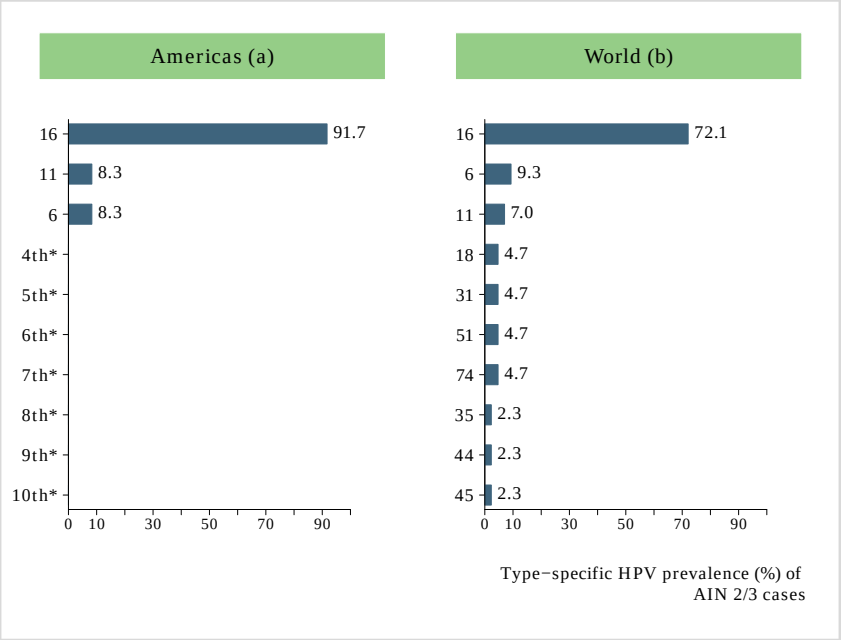
95% CI: 95% Confidence Interval; AIN 2/3: Anal intraepithelial neoplasia of grade 2/3;
LBA: Line-Blot Assay; PCR: Polymerase Chain Reaction;
[a] HIV positive cases
Data sources:
Based on systematic reviews (up to 2008) performed by ICO for the IARC Monograph on the Evaluation of Carcinogenic Risks to Humans volume 100B and IARC's Infections and Cancer Epidemiology Group. The ICO HPV Information Centre has updated data until June 2015. Reference publications: 1) Bouvard V, Lancet Oncol 2009;10:321 2) De Vuyst H, Int J Cancer 2009;124:1626
Gohy L, J Acquir Immune Defic Syndr 2008; 49: 32 | Salit IE, Cancer Epidemiol Biomarkers Prev 2009; 18: 1986

Figure 31: Comparison of the ten most frequent HPV types in anal cancer cases in the Americas and the World



Data updated on 09 Feb 2017 (data as of 30 Jun 2014).
[a] Includes cases from Chile, Colombia, Ecuador, Guatemala, Honduras, Mexico, Paraguay and United States
[b] Includes cases from Europe (Bosnia-Herzegovina, Czech Republic, France, Germany, Poland, Portugal, Slovenia, Spain and United Kingdom); America (Chile, Colombia, Ecuador, Guatemala, Honduras, Mexico, Paraguay and United States); Africa (Mali, Nigeria and Senegal); Asia (Bangladesh,India and South Korea)
Data sources:
Data from Alemany L, Int J Cancer 2015; 136: 98. This study has gathered the largest international series of anal cancer cases and precancerous lesions worldwide using a standard protocol with a highly sensitive HPV DNA detection assay.

Figure 32: Comparison of the ten most frequent HPV types in AIN 2/3 cases in the Americas and the World



*No data available. No more types than shown were tested or were positive.

Data updated on 09 Feb 2017 (data as of 30 Jun 2014).

AIN 2/3: Anal intraepithelial neoplasia of grade 2/3;

[a] Includes cases from Chile, Colombia, Ecuador, Guatemala, Honduras, Mexico, Paraguay

[b] Includes cases from Europe (Bosnia-Herzegovina, Czech Republic, France, Germany, Poland, Portugal, Slovenia, Spain and United Kingdom); America (Chile, Colombia, Ecuador, Guatemala, Honduras, Mexico, Paraguay)

Data sources:

Data from Alemany L, Int J Cancer 2015; 136: 98. This study has gathered the largest international series of anal cancer cases and precancerous lesions worldwide using a standard protocol with a highly sensitive HPV DNA detection assay.

4.2.2 Vulvar cancer and precancerous vulvar lesions

HPV attribution for vulvar cancer is 43% worldwide *(de Martel C et al. Lancet Oncol 2012;13(6):607-15)*. Vulvar cancer has two distinct histological patterns with two different risk factor profiles: (1) basaloid/warty types (2) keratinising types. Basaloid/warty lesions are more common in young women, are frequently found adjacent to VIN, are very often associated with HPV DNA detection (86%), and have a similar risk factor profile as cervical cancer. Keratinising vulvar carcinomas represent the majority of the vulvar lesions (>60%). These lesions develop from non HPV-related chronic vulvar dermatoses, especially lichen sclerosus and/or squamous hyperplasia, their immediate cancer precursor lesion is differentiated VIN, they occur more often in older women, and are rarely associated with HPV (6%) or with any of the other risk factors typical of cervical cancer. HPV prevalence is frequently detected among cases of high-grade VIN (VIN2/3) (85.3%). HPV 16 is the most common type detected followed by HPV 33 *(De Vuyst H et al. Int J Cancer 2009; 124: 1626-36)*.In this section, the HPV burden among cases of vulvar cancer cases and precancerous vulvar lesions in Canada are presented.

Table 20: Studies on HPV prevalence among vulvar cancer cases in Canada

Study	HPV detection method and targeted HPV types	No. Tested	HPV prevalence		Prevalence of 5 most frequent HPVs
			%	(95% CI)	HPV type (%)
No Data Available	-	-	-	-	-

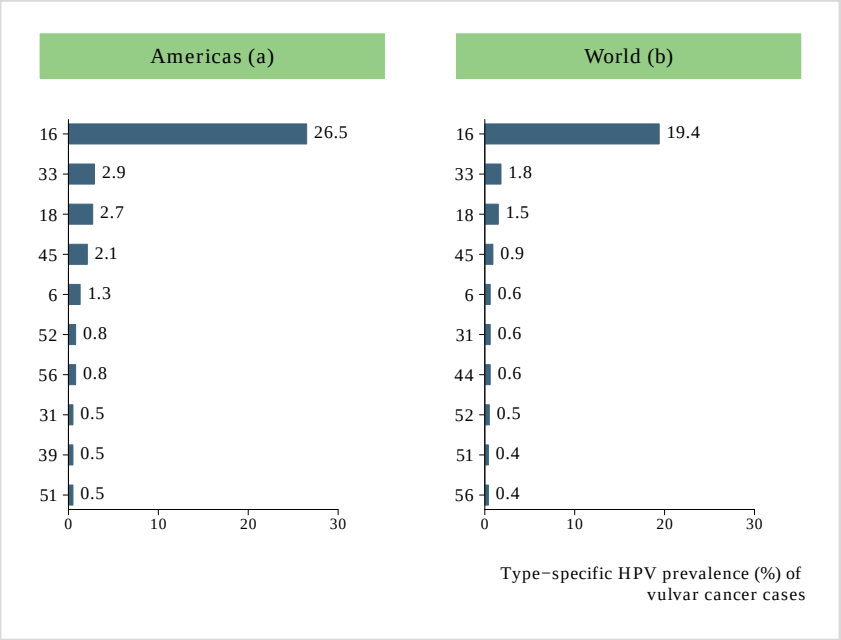
Data updated on 11 Jun 2019 (data as of 30 Jun 2015).
95% CI: 95% Confidence Interval;
Data sources:
Based on systematic reviews (up to 2008) performed by ICO for the IARC Monograph on the Evaluation of Carcinogenic Risks to Humans volume 100B and IARC's Infections and Cancer Epidemiology Group. The ICO HPV Information Centre has updated data until June 2015. Reference publications: 1) Bouvard V, Lancet Oncol 2009;10:321 2) De Vuyst H, Int J Cancer 2009;124:1626

Table 21: Studies on HPV prevalence among VIN 2/3 cases in Canada

Study	HPV detection method and targeted HPV types	No. Tested	HPV prevalence		Prevalence of 5 most frequent HPVs
			%	(95% CI)	HPV type (%)
No Data Available	-	-	-	-	-

Data updated on 11 Jun 2019 (data as of 30 Jun 2015).
95% CI: 95% Confidence Interval; VIN 2/3: Vulvar intraepithelial neoplasia of grade 2/3;
Data sources:
Based on systematic reviews (up to 2008) performed by ICO for the IARC Monograph on the Evaluation of Carcinogenic Risks to Humans volume 100B and IARC's Infections and Cancer Epidemiology Group. The ICO HPV Information Centre has updated data until June 2015. Reference publications: 1) Bouvard V, Lancet Oncol 2009;10:321 2) De Vuyst H, Int J Cancer 2009;124:1626

Figure 33: Comparison of the ten most frequent HPV types in cases of vulvar cancer in the Americas and the World



Data updated on 09 Feb 2017 (data as of 30 Jun 2014).

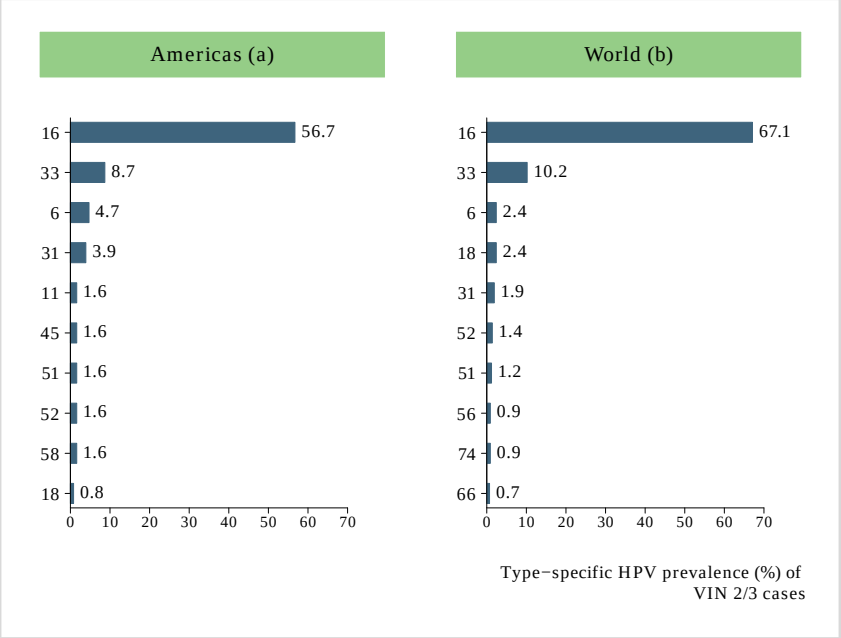
[a] Includes cases from Argentina, Brazil, Chile, Colombia, Ecuador, Guatemala, Honduras, Mexico, Paraguay, Uruguay, United States of America and Venezuela

[b] Includes cases from America (Argentina, Brazil, Chile, Colombia, Ecuador, Guatemala, Honduras, Mexico, Paraguay, Uruguay, United States of America and Venezuela); Africa (Mali, Mozambique, Nigeria, and Senegal); Oceania (Australia and New Zealand); Europe (Austria, Belarus, Bosnia-Herzegovina, Czech Republic, France, Germany, Greece, Italy, Poland, Portugal, Spain and United Kingdom); and in Asia (Bangladesh, India, Israel, South Korea, Kuwait, Lebanon, Philippines, Taiwan and Turkey)

Data sources:

Data from de Sanjosé S, Eur J Cancer 2013; 49: 3450. This study has gathered the largest international series of vulva cancer cases and precancerous lesions worldwide using a standard protocol with a highly sensitive HPV DNA detection assay.

Figure 34: Comparison of the ten most frequent HPV types in VIN 2/3 cases in the Americas and the World



Data updated on 09 Feb 2017 (data as of 30 Jun 2014).

[a] Includes cases from Argentina, Brazil, Chile, Colombia, Ecuador, Guatemala, Honduras, Mexico, Paraguay, Uruguay, and Venezuela.

[b] Includes cases from America (Argentina, Brazil, Chile, Colombia, Ecuador, Guatemala, Honduras, Mexico, Paraguay, Uruguay and Venezuela); Oceania (Australia and New Zealand); Europe (Austria, Belarus, Bosnia-Herzegovina, Czech Republic, France, Germany, Greece, Italy, Poland, Portugal, Spain and United Kingdom); and in Asia (Bangladesh, India, Israel, South Korea, Kuwait, Lebanon, Philippines, Taiwan and Turkey)

Data sources:

Data from de Sanjosé S, Eur J Cancer 2013; 49: 3450. This study has gathered the largest international series of vulva cancer cases and precancerous lesions worldwide using a standard protocol with a highly sensitive HPV DNA detection assay.

4.2.3 Vaginal cancer and precancerous vaginal lesions

Vaginal and cervical cancers share similar risk factors and it is generally accepted that both carcinomas share the same aetiology of HPV infection although there is limited evidence available. Women with vaginal cancer are more likely to have a history of other ano-genital cancers, particularly of the cervix, and these two carcinomas are frequently diagnosed simultaneously. HPV DNA is detected among 70% of invasive vaginal carcinomas and 91% of high-grade vaginal neoplasias (VaIN2/3). HPV16 is the most common type in high-grade vaginal neoplasias and it is detected in at least 70% of HPV-positive carcinomas *(de Martel C et al. Lancet Oncol 2012;13(6):607-15; De Vuyst H et al. Int J Cancer 2009; 124:1626-36)*. In this section, the HPV burden among cases of vaginal cancer cases and precancerous vaginal lesions in Canada are presented.

Table 22: Studies on HPV prevalence among vaginal cancer cases in Canada

Study	HPV detection method and targeted HPV types	No. Tested	HPV prevalence %	HPV prevalence (95% CI)	Prevalence of 5 most frequent HPVs HPV type (%)
No Data Available	-	-	-	-	-

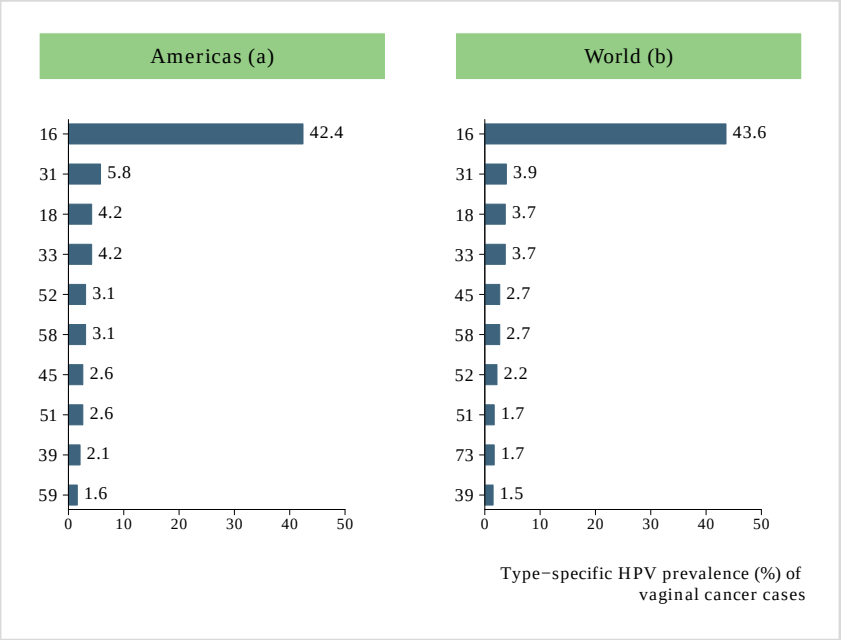
Data updated on 11 Jun 2019 (data as of 30 Jun 2015).
95% CI: 95% Confidence Interval;
Data sources:
Based on systematic reviews (up to 2008) performed by ICO for the IARC Monograph on the Evaluation of Carcinogenic Risks to Humans volume 100B and IARC's Infections and Cancer Epidemiology Group. The ICO HPV Information Centre has updated data until June 2015. Reference publications: 1) Bouvard V, Lancet Oncol 2009;10:321 2) De Vuyst H, Int J Cancer 2009;124:1626

Table 23: Studies on HPV prevalence among VaIN 2/3 cases in Canada

Study	HPV detection method and targeted HPV types	No. Tested	HPV prevalence %	HPV prevalence (95% CI)	Prevalence of 5 most frequent HPVs HPV type (%)
No Data Available	-	-	-	-	-

Data updated on 11 Jun 2019 (data as of 30 Jun 2015).
95% CI: 95% Confidence Interval; VAIN 2/3: Vaginal intraepithelial neoplasia of grade 2/3;
Based on systematic reviews (up to 2008) performed by ICO for the IARC Monograph on the Evaluation of Carcinogenic Risks to Humans volume 100B and IARC's Infections and Cancer Epidemiology Group. The ICO HPV Information Centre has updated data until June 2015. Reference publications: 1) Bouvard V, Lancet Oncol 2009;10:321 2) De Vuyst H, Int J Cancer 2009;124:1626
Data sources:
Based on systematic reviews (up to 2008) performed by ICO for the IARC Monograph on the Evaluation of Carcinogenic Risks to Humans volume 100B and IARC's Infections and Cancer Epidemiology Group. The ICO HPV Information Centre has updated data until June 2015. Reference publications: 1) Bouvard V, Lancet Oncol 2009;10:321 2) De Vuyst H, Int J Cancer 2009;124:1626

Figure 35: Comparison of the ten most frequent HPV types in cases of vaginal cancer in the Americas and the World



Data updated on 09 Feb 2017 (data as of 30 Jun 2014).

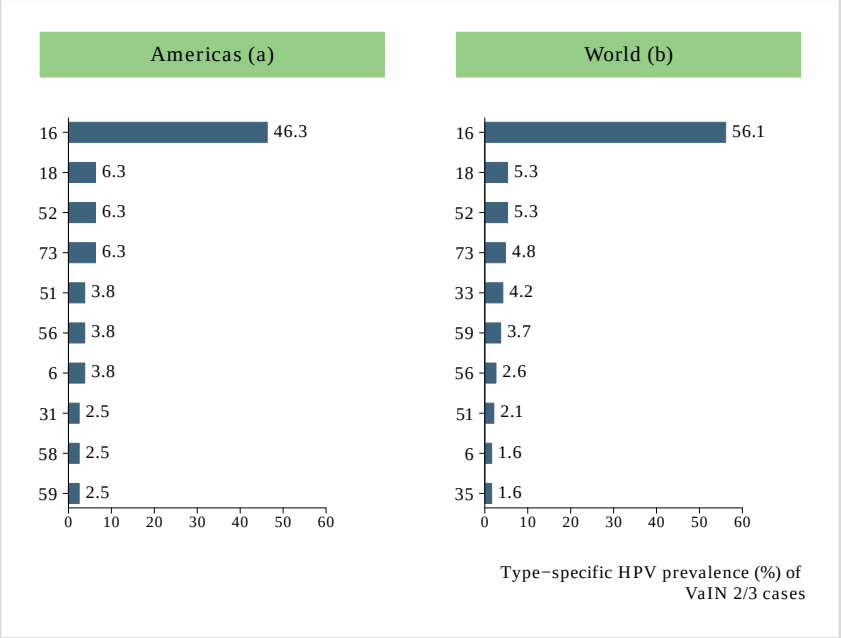
[a] Includes cases from Argentina, Brazil, Chile, Colombia, Ecuador, Guatemala, Mexico, Paraguay, Uruguay, United States of America and Venezuela.

[b] Includes cases from Europe (Austria, Belarus, Czech Republic, France, Germany, Greece, Poland, Spain and United Kingdom); America (Argentina, Brazil, Chile, Colombia, Ecuador, Guatemala, Mexico, Paraguay, Uruguay, United states of America and Venezuela); Africa (Mozambique, Nigeria); Asia (Bangladesh, India, Israel, South Korea, Kuwait, Philippines, Taiwan and Turkey); and Oceania (Australia)

Data sources:

Data from Alemany L, Eur J Cancer 2014; 50: 2846. This study has gathered the largest international series of vaginal cancer cases and precancerous lesions worldwide using a standard protocol with a highly sensitive HPV DNA detection assay.

Figure 36: Comparison of the ten most frequent HPV types in VaIN 2/3 cases in the Americas and the World



Data updated on 09 Feb 2017 (data as of 30 Jun 2014).

VAIN 2/3: Vaginal intraepithelial neoplasia of grade 2/3;

[a] Includes cases from Argentina, Brazil, Chile, Colombia, Ecuador, Guatemala, Mexico, Paraguay, Uruguay, United States of America and Venezuela.

[b] Includes cases from Europe (Austria, Belarus, Czech Republic, France, Germany, Greece, Poland, Spain and United Kingdom); America (Argentina, Brazil, Chile, Colombia, Ecuador, Guatemala, Mexico, Paraguay, Uruguay, United states of America and Venezuela); Asia (Bangladesh, India, Israel, South Korea, Kuwait, Philippines, Taiwan and Turkey); and Oceania (Australia)

Data sources:

Data from Alemany L, Eur J Cancer 2014; 50: 2846. This study has gathered the largest international series of vaginal cancer cases and precancerous lesions worldwide using a standard protocol with a highly sensitive HPV DNA detection assay.

4.2.4 Penile cancer and precancerous penile lesions

HPV DNA is detectable in approximately 50% of all penile cancers *(de Martel C et al. Lancet Oncol 2012;13(6):607-15)*. Among HPV-related penile tumours, HPV16 is the most common type detected, followed by HPV18 and HPV types 6/11 *(Miralles C et al. J Clin Pathol 2009;62:870-8)*. Over 95% of invasive penile cancers are SCC and the most common penile SCC histologic sub-types are keratinising (49%), mixed warty-basaloid (17%), verrucous (8%), warty (6%), and basaloid (4%). HPV is commonly detected in basaloid and warty tumours but is less common in keratinising and verrucous tumours. In this section, the HPV burden among cases of penile cancer cases and precancerous penile lesions in Canada are presented.

Table 24: Studies on HPV prevalence among penile cancer cases in Canada

Study	HPV detection method and targeted HPV types	No. Tested	HPV prevalence %	HPV prevalence (95% CI)	Prevalence of 5 most frequent HPVs HPV type (%)
Maden 1993	PCR L1-Consensus primer, PCR-E6, PCR-E7, TS (HPV 16)	67	49.3	(37.7-60.9)	HPV 16 (34.3%)

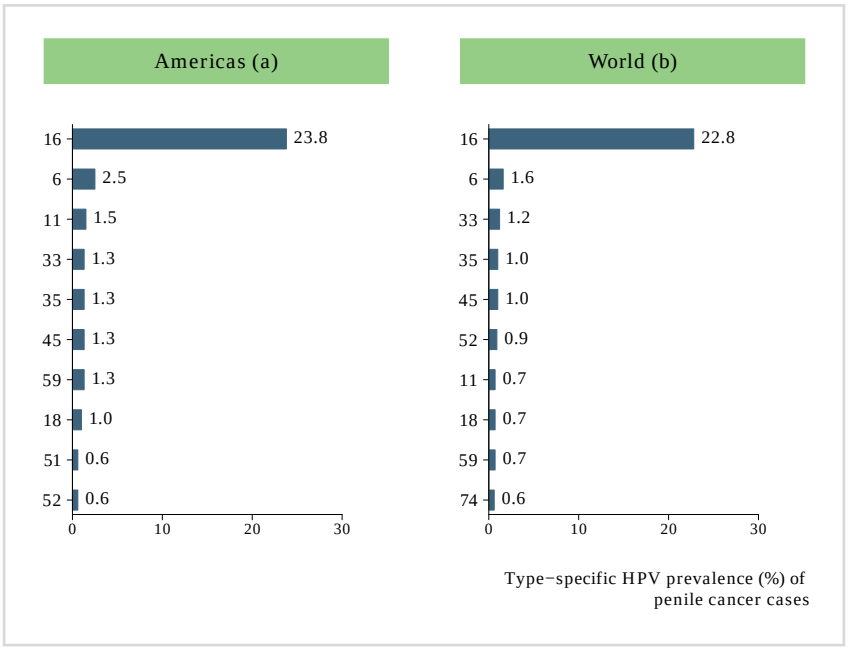
Data updated on 11 Jun 2019 (data as of 30 Jun 2015).
95% CI: 95% Confidence Interval;
PCR: Polymerase Chain Reaction; TS: Type Specific;
Data sources:
The ICO HPV Information Centre has updated data until June 2015. Reference publications (up to 2008): 1) Bouvard V, Lancet Oncol 2009;10:321 2) Miralles-Guri C,J Clin Pathol 2009;62:870
Maden C, J Natl Cancer Inst 1993; 85: 19

Table 25: Studies on HPV prevalence among PeIN 2/3 cases in Canada

Study	HPV detection method and targeted Method	No. Tested	HPV prevalence %	HPV prevalence (95% CI)	Prevalence of 5 most frequent HPVs HPV type (%)
No Data Available	-	-	-	-	-

Data updated on 11 Jun 2019 (data as of 30 Jun 2015).
95% CI: 95% Confidence Interval; PeIN 2/3: Penile intraepithelial neoplasia of grade 2/3;
Data sources:
The ICO HPV Information Centre has updated data until June 2014. Reference publication (up to 2008): Bouvard V, Lancet Oncol 2009;10:321

Figure 37: Comparison of the ten most frequent HPV types in cases of penile cancer in the Americas and the World



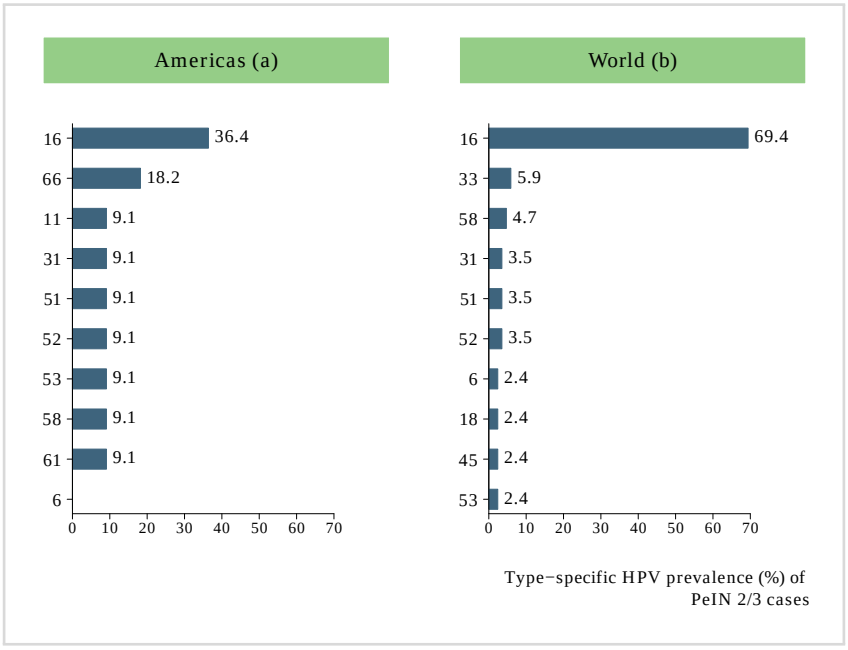
Data updated on 09 Feb 2017 (data as of 30 Jun 2015).

[a] Includes cases from Chile, Colombia, Ecuador, Guatemala, Honduras, Mexico, Paraguay, Venezuela and United States

[b] Includes cases from Australia, Bangladesh, India, South Korea, Lebanon, Philippines, Chile, Colombia, Ecuador, Guatemala, Honduras, Mexico, Paraguay, Venezuela and United States, Mozambique, Nigeria, Senegal, Czech Republic, France, Greece, Poland, Portugal, Spain and United Kingdom.

Data sources:
Alemany L, Eur Urol 2016; 69: 953

Figure 38: Comparison of the ten most frequent HPV types in PeIN 2/3 cases in the Americas and the World



Data updated on 09 Feb 2017 (data as of 30 Jun 2015).

[a] Includes cases from Chile, Colombia, Ecuador, Guatemala, Honduras, Mexico, Paraguay, Venezuela.

[b] Includes cases from Australia, Bangladesh, India, South Korea, Lebanon, Philippines, Chile, Colombia, Ecuador, Guatemala, Honduras, Mexico, Paraguay, Venezuela, Mozambique, Nigeria, Senegal, Czech Republic, France, Greece, Poland, Portugal, Spain and United Kingdom.

Data sources:
Alemany L, Eur Urol 2016; 69: 953

4.3 HPV burden in men

The information to date regarding anogenital HPV infection is primarily derived from cross-sectional studies of selected populations such as general population, university students, military recruits, and studies that examined husbands of control women, as well as from prospective studies. Special subgroups include mainly studies that examined STD (sexually transmitted diseases) clinic attendees, MSM (men who have sex with men), HIV positive men, and partners of women with HPV lesions, CIN (cervical intraepithelial neoplasia), cervical cancer or cervical carcinoma in situ. Globally, prevalence of external genital HPV infection in men is higher than cervical HPV infection in women, but persistence is less likely. As with genital HPV prevalence, high numbers of sexual partners increase the acquisition of oncogenic HPV infections (Vaccine 2012, Vol. 30, Suppl 5). In this section, the HPV burden among men in Canada is presented.

Methods

HPV burden in men was based on published systematic reviews and meta-analyses (Dunne EF, J Infect Dis 2006; 194: 1044, Smith JS, J Adolesc Health 2011; 48: 540, Olesen TB, Sex Transm Infect 2014; 90: 455, and Hebnes JB, J Sex Med 2014; 11: 2630) up to October 31, 2015. The search terms for the review were human papillomavirus, men, polymerase chain reaction (PCR), hybrid capture (HC), and viral DNA. References cited in selected articles were also investigated. Inclusion criteria were: HPV DNA detection by means of PCR or HC (ISH if data are not available for the country), and a detailed description of HPV DNA detection and genotyping techniques used. The number of cases tested and HPV positive cases were extracted for each study to estimate the anogenital prevalence of HPV DNA. Binomial 95% confidence intervals were calculated for each anogenital HPV prevalence.

Table 26: Studies on HPV prevalence among men in Canada

Study[a]	Anatomic sites samples	HPV detection method	Population	Age (years)	HPV prevalence		
					No	%	(95% CI)
Vardas 2011	Penis	RT-PCR-Multiplex or Biplex	Heterosexual men enrolled in a HPV vaccine trial	Median 20 (15-24)	3132	21.2	(19.8-22.7)

Data updated on 11 Jun 2019 (data as of 31 Oct 2015).
95% CI: 95% Confidence Interval;
PCR: Polymerase Chain Reaction; RT-PCR: Real Time Polymerase Chain Reaction;
[a] Includes cases from Australia, Brazil, Canada, Croatia, Germany, Mexico, Spain, and USA.
Data sources:
Based on published systematic reviews, the ICO HPV Information Centre has updated data until October 2015. Reference publications: 1) Dunne EF, J Infect Dis 2006; 194: 1044 2) Smith JS, J Adolesc Health 2011; 48: 540 3) Olesen TB, Sex Transm Infect 2014; 90: 455 4) Hebnes JB, J Sex Med 2014; 11: 2630.
Vardas E, J Infect Dis 2011; 203: 58

Table 27: Studies on HPV prevalence among men from special subgroups in Canada

Study	Anatomic sites samples	HPV detection method	Population	Age (years)	HPV prevalence		
					No	%	(95% CI)
de Pokomandy 2009	Anal canal	PCR-PGMY09/11	HIV+ MSM	Median 43 (21-66)	241	97.9	(95.2-99.3)
Goldstone 2011	Penis	RT-PCR-Multiplex or Biplex	HIV- MSM	Median 22 (16-27)	602	18.4	(15.4-21.8)

(Table 27 – continued from previous page)

(Table 27 – continued from previous page)

Study	Anatomic sites samples	HPV detection method	Population	Age (years)	HPV prevalence		
					No	%	(95% CI)
Goldstone 2011	Anus	RT-PCR-Multiplex or Biplex	HIV- MSM	Median 22 (16-27)	602	42.4	(38.4-46.4)
Ogilvie 2009	Shaft, scrotum	PCR-Roche Amplicor HPV test	Heterosexual men attending provincial STD clinic	16-69	262	69.8	(63.9-75.3)
Salit 2009	Anus	PCR-PGMY09/11	HIV+ MSM participants in TRACE study	38-50	224	93.3	(89.2-96.2)
Salit 2010	Anal canal	HC2	HIV+ MSM	Median 44.4 (IQR=39.4-50.6)	400	93	(90.0-95.3)

Data updated on 11 Jun 2019 (data as of 31 Oct 2015).

95% CI: 95% Confidence Interval;

HC2: Hybrid Capture 2; PCR: Polymerase Chain Reaction; RT-PCR: Real Time Polymerase Chain Reaction;

Data sources:

Based on published systematic reviews, the ICO HPV Information Centre has updated data until October 2015. Reference publications: 1) Dunne EF, J Infect Dis 2006; 194: 1044 2) Smith JS, J Adolesc Health 2011; 48: 540 3) Olesen TB, Sex Transm Infect 2014; 90: 455 4) Hebnes JB, J Sex Med 2014; 11: 2630.
de Pokomandy A, J Infect Dis 2009; 199: 965 | Goldstone S, J Infect Dis 2011; 203: 66 | Ogilvie GS, Sex Transm Infect 2009; 85: 221 | Salit IE, Cancer Epidemiol Biomarkers Prev 2009; 18: 1986 | Salit IE, AIDS 2010; 24: 1307

4.4 HPV burden in the head and neck

The last evaluation of the International Agency for Research in Cancer (IARC) on the carcinogenicity of HPV in humans concluded that (a) there is enough evidence for the carcinogenicity of HPV type 16 in the oral cavity, oropharynx (including tonsil cancer, base of tongue cancer and other oropharyngeal cancer sites), and (b) limited evidence for laryngeal cancer *(IARC Monograph Vol 100B)*. There is increasing evidence that HPV-related oropharyngeal cancers constitute an epidemiological, molecular and clinical distinct form as compared to non HPV-related ones. Some studies indicate that the most likely explanation for the origin of this distinct form of head and neck cancers associated with HPV is a sexually acquired oral HPV infection that is not cleared, persists and evolves into a neoplastic lesion. The most recent figures estimate that 25.6% of all oropharyngeal cancers are attributable to HPV infection with HPV16 being the most frequent type *(de Martel C. Lancet Oncol. 2012;13(6):607). In this section, the HPV burden in the head and neck in Canada is presented.*.

4.4.1 Burden of oral HPV infection in healthy population

Table 28: Studies on oral HPV prevalence among healthy in Canada

Study	Method specimen collection and anatomic site	HPV detection method and targeted HPV types	Population	Age (years)	No. Tested	HPV prevalence %	HPV prevalence (95% CI)	Prev. of 5 most frequent HPVs HPV type (%)
MEN								
No Data Available	-	-	-	-	-	-	-	-
WOMEN								
No Data Available	-	-	-	-	-	-	-	-
BOTH OR UNSPECIFIED								
No Data Available	-	-	-	-	-	-	-	-

Data as of 29 Feb 2012. Only for European countries.
95% CI: 95% Confidence Interval;
Data sources:
Systematic review and meta-analysis was performed by ICO HPV Information Centre until July 2012. Pubmed was searched using the keywords oral and papillomavirus. Inclusion criteria: studies reporting oral HPV prevalence in healthy population in Europe; n > 50. Exclusion criteria: focused only in children or immunosuppressed population; not written in English; case-control studies; commentaries and systematic reviews and studies that did not use HPV DNA detection methods.

4.4.2 HPV burden in head and neck cancers

Table 29: Studies on HPV prevalence among cases of oral cavity cancer in Canada

Study	HPV detection method and targeted HPV types	No. Tested	HPV prevalence %	HPV prevalence (95% CI)	Prevalence of 5 most frequent HPVs HPV type (%)
MEN					
Herrero 2003	GP5+/GP6+ (L1) Hybridization with EIA oligonucleotide probes (2. 6. 11. 16. 18. 31. 33. 35. 39. 40. 42. 43. 44. 45. 51. 52. 56. 58. 59. 66. 68)	17	11.8	(3.3-34.3)	HPV 16 (11.8%)
Noble-Topham 1993	TS-PCR E6/E7 for 6b/11/16/18 Amplification with TS primers (6b/11. 16. 18)	7	57.1	(25.0-84.2)	HPV 18 (57.1%) HPV 16 (14.3%)
WOMEN					
Herrero 2003	GP5+/GP6+ (L1) Hybridization with EIA oligonucleotide probes (2. 6. 11. 16. 18. 31. 33. 35. 39. 40. 42. 43. 44. 45. 51. 52. 56. 58. 59. 66. 68)	11	9.1	(1.6-37.7)	HPV 16 (9.1%)

(Continued on next page)

(Table 29 – continued from previous page)

Study	HPV detection method and targeted HPV types	No. Tested	HPV prevalence %	HPV prevalence (95% CI)	Prevalence of 5 most frequent HPVs HPV type (%)
Noble-Topham 1993	TS-PCR E6/E7 for 6b/11/16/18 Amplification with TS primers (6b/11. 16. 18)	13	46.2	(23.2-70.9)	HPV 18 (30.8%) HPV 16 (7.7%)
BOTH OR UNSPECIFIED					
Herrero 2003	GP5+/GP6+ (L1) Hybridization with EIA oligonucleotide probes (2. 6. 11. 16. 18. 31. 33. 35. 39. 40. 42. 43. 44. 45. 51. 52. 56. 58. 59. 66. 68)	28	10.7	(3.7-27.2)	HPV 16 (10.7%)
Lingen 2013	PCR L1-Consensus primer, PCR-SPF10, LiPA (HPV 6, 11, 16, 18, 26, 31, 33, 35, 39, 40, 43, 44, 45, 51, 52, 53, 54, 56, 58, 59, 66, 68, 69, 70, 71, 73, 74, 81)	409	5.9	(4.0-8.6)	-
Noble-Topham 1993	TS-PCR E6/E7 for 6b/11/16/18 Amplification with TS primers (6b/11. 16. 18)	23	43.5	(25.6-63.2)	HPV 18 (34.8%) HPV 16 (8.7%)

Data as of 31 Dec 2015. Only for European countries.
95% CI: 95% Confidence Interval;
EIA: Enzyme ImmunoAssay; LiPA: Line Probe Assay; PCR: Polymerase Chain Reaction; SPF: Short Primer Fragment; TS: Type Specific;
[a] Includes cases from Canada and USA
Data sources:
Based on systematic reviews and meta-analysis performed by ICO. Reference publications: 1) Ndiaye C, Lancet Oncol 2014; 15: 1319 2) Kreimer AR, Cancer Epidemiol Biomarkers Prev 2005; 14: 467
Herrero R, J Natl Cancer Inst 2003; 95: 1772 | Lingen MW, Oral Oncol 2013; 49: 1 | Noble-Topham SE, Arch Otolaryngol Head Neck Surg 1993; 119: 1299

Table 30: Studies on HPV prevalence among cases of oropharyngeal cancer in Canada

Study	HPV detection method and targeted HPV types	No. Tested	HPV prevalence %	HPV prevalence (95% CI)	Prevalence of 5 most frequent HPVs HPV type (%)
MEN					
No Data Available	-	-	-	-	-
WOMEN					
No Data Available	-	-	-	-	-
BOTH OR UNSPECIFIED					
Nichols 2013	PCR-E6, PCR-E7, PCR-MULTIPLEX (HPV 16, 18, 31, 33, 35, 39, 45, 51, 52, 56, 58, 59, 67, 68)	95	52.6	(42.7-62.4)	HPV 16 (47.4%) HPV 18 (2.1%) HPV 67 (2.1%) HPV 33 (1.1%)

Data as of 31 Dec 2015. Only for European countries.
95% CI: 95% Confidence Interval;
PCR: Polymerase Chain Reaction;
Data sources:
Based on systematic reviews and meta-analysis performed by ICO. Reference publications: 1) Ndiaye C, Lancet Oncol 2014; 15: 1319 2) Kreimer AR, Cancer Epidemiol Biomarkers Prev 2005; 14: 467
Nichols AC, J Otolaryngol Head Neck Surg 2013; 42: 9

Table 31: Studies on HPV prevalence among cases of hypopharyngeal or laryngeal cancer in Canada

Study	HPV detection method and targeted HPV types	No. Tested	HPV prevalence %	HPV prevalence (95% CI)	Prevalence of 5 most frequent HPVs HPV type (%)
MEN					
Fliss 1994	TS-PCR E6/E7 for 6b/11/16/18 Amplification with TS primers (6b/11. 16. 18)	28	46.4	(29.5-64.2)	HPV 16 (32.1%) HPV 18 (32.1%)

(Continued on next page)

(Table 31 – continued from previous page)

Study	HPV detection method and targeted HPV types	No. Tested	HPV prevalence %	HPV prevalence (95% CI)	Prevalence of 5 most frequent HPVs HPV type (%)
WOMEN					
Fliss 1994	TS-PCR E6/E7 for 6b/11/16/18 Amplification with TS primers (6b/11. 16. 18)	1	0.0	-	-
BOTH OR UNSPECIFIED					
Fliss 1994	TS-PCR E6/E7 for 6b/11/16/18 Amplification with TS primers (6b/11. 16. 18)	29	44.8	(28.4-62.5)	HPV 16 (31.0%) HPV 18 (31.0%)

Data as of 31 Dec 2015. Only for European countries.
95% CI: 95% Confidence Interval;
PCR: Polymerase Chain Reaction; TS: Type Specific;
Data sources:
Based on systematic reviews and meta-analysis performed by ICO. Reference publications: 1) Ndiaye C, Lancet Oncol 2014; 15: 1319 2) Kreimer AR, Cancer Epidemiol Biomarkers Prev 2005; 14: 467
Fliss DM, Laryngoscope 1994; 104: 146

5 Factors contributing to cervical cancer

HPV is a necessary cause of cervical cancer, but it is not a sufficient cause. Other cofactors are necessary for progression from cervical HPV infection to cancer. Tobacco smoking, high parity, long-term hormonal contraceptive use, and co-infection with HIV have been identified as established cofactors. Co-infection with Chlamydia trachomatis and herpes simplex virus type-2, immunosuppression, and certain dietary deficiencies are other probable cofactors. Genetic and immunological host factors and viral factors other than type, such as variants of type, viral load and viral integration, are likely to be important but have not been clearly identified. *(Muñoz N, Vaccine 2006; 24(S3): 1-10)*. In this section, the prevalence of smoking, parity (fertility), oral contraceptive use, and HIV in Canada are presented.

Table 32: Factors contributing to cervical carcinogenesis (cofactors) in Canada

INDICATOR[a]		MALE	FEMALE	TOTAL
Smoking				
Smoking of any tobacco adjusted prevalence (%) [95% CI]	Current[1,b,c,±]	18.9 [15.7-22.4]	13.6 [11.2-15.8]	16.2 [13.4-19.0]
	Daily[1,b,d,±]	13.9 [11.5-16.4]	9.9 [8.2-11.6]	11.9 [9.8-14.0]
Cigarette smoking adjusted prevalence (%) [95% CI]	Current[1,b,c,±]	18.3 [15.3-21.6]	13.0 [10.7-15.3]	15.6 [13.0-18.4]
	Daily[1,b,d,±]	13.7 [11.6-16.2]	9.7 [8.1-11.5]	11.7 [9.8-13.8]
Parity				
Total fertility rate per woman[2,∓]		-	1.6	-
Age-specific fertility rate (per 1000 women)	15-19 years[2,∓]	-	12.6	-
	20-24 years[2,∓]	-	45.7	-
	25-29 years[2,∓]	-	95.2	-
	30-34 years[2,∓]	-	105.9	-
	35-39 years[2,∓]	-	52.3	-
	40-44 years[2,∓]	-	10.3	-
	45-49 years[2,∓]	-	0.5	-
Hormonal contraception				
Oral contraceptive use (%) among women15-49yrs who are married or in union[3,e,*]		-	43.7	-
Hormonal contraception use (%) (pill, injectable or implant), among women15-49yrs who are married or in union[3,e,f,*]		-	46.2	-
HIV				
Estimated percent of adults aged 15-49 who are living with HIV [low estimate - high estimate][4,g]		-	-	-
Estimated percent of young adults aged 15-24 who are living with HIV [low estimate - high estimate][4,g]		-	-	-
HIV prevalence (%) among female sex workers in the capital city[4,h]		-	-	-
HIV prevalence (%) among men who have sex with men in the capital city[4,⋆]		14.9	-	-
Estimated number of adults (15+ years) living with HIV [low estimate - high estimate][4,i]		-	-	-
Estimated number of adults and children living with HIV [low estimate - high estimate][4,i]		-	-	-
Estimated number of AIDS deaths in adults and children [low estimate - high estimate][4,j]		-	-	-

Data accessed on 22 Mar 2017.

[a] Please refer to original source for methods of estimation of the following indicators.

[b] Adjusted and age-standardized prevalence estimates of tobacco use by country, for the year 2013. These rates are constructed solely for the purpose of comparing tobacco use prevalence estimates across countries, and should not be used to estimate the number of smokers in the population.

[c] "Current" means smoking at the time of the survey, including daily and non-daily smoking. "Tobacco smoking" means smoking any form of tobacco, including cigarettes, cigars, pipes, hookah, shisha, water-pipe, etc. and excluding smokeless tobacco.

[d] "Daily" means smoking every day at the time of the survey. "Tobacco smoking" means smoking any form of tobacco, including cigarettes, cigars, pipes, hookah, shisha, water-pipe, etc. and excluding smokeless tobacco.

[e] Data pertain to women who have ever had sex. Data pertain to all women of reproductive age, irrespective of marital status. Data pertain to sexually active, non-pregnant women.

[f] Proportion (%) of women using hormonal contraception (pill, injectable or implant), among those of reproductive age who are married or in union.

[g] Estimates include all people with HIV infection, regardless of whether they have developed symptoms of AIDS.

[h] Data on key populations at higher risk from country progress reports typically derive from surveys in capital cities and are not representative of the entire country. In particular, surveys in capital cities are likely to overestimate national HIV prevalence and service coverage.

[i] The number of people with HIV infection, whether or not they have developed symptoms of AIDS, estimated to be alive at the end of a specific year.

[j] The estimated number of adults and children that have died due to HIV/AIDS in a specific year.

Year of estimate: [±] 2013; [∓] 2011; [*] 2006; [⋆] 2015;

Data sources:

[1] WHO report on the global tobacco epidemic, 2015: The MPOWER package. Geneva, World Health Organization, 2015. Available at http://www.who.int/tobacco/global_report/2015/en/index.html

(Continued on next page)

(Table 32 – continued from previous page)

[2]United Nations, Department of Economic and Social Affairs, Population Division (2015). World Fertility Data 2015 (POP/DB/Fert/Rev2015). Available at: http://www.un.org/en/development/desa/population/publications/dataset/fertility/wfd2015.shtml. [Accessed on March 22, 2017].

[3]United Nations, Department of Economic and Social Affairs, Population Division (2016). World Contraceptive Use 2016 (POP/DB/CP/Rev2016). http://www.un.org/en/development/desa/population/publications/dataset/contraception/wcu2016.shtml. Available at: [Accessed on March 22, 2017].

[4]UNAIDS database [internet]. Available at: http://aidsinfo.unaids.org/ [Accessed on March 22, 2017]

6 Sexual and reproductive health behaviour indicators

Sexual intercourse is the primary route of transmission of genital HPV infection. Information about sexual and reproductive health behaviours is essential to the design of effective preventive strategies against anogenital cancers. In this section, we describe sexual and reproductive health indicators that may be used as proxy measures of risk for HPV infection and anogenital cancers. Several studies have reported that earlier sexual debut is a risk factor for HPV infection, although the reason for this relationship is still unclear. In this section, information on sexual and reproductive health behaviour in Canada are presented.

Table 33: Percentage of 15-year-olds who have had sexual intercourse in Canada

Indicator	Male	Female
Percentage of 15-year-old subjects who report sexual intercourse	22	21

Data accessed on 16 Mar 2017.
Fifteen-year-olds teenagers only were asked whether they had ever had sexual intercourse.
Year of estimation: 2013-2014
Please refer to original source for methods of estimation
Data sources:
Growing up unequal: gender and socioeconomic differences in young people's health and well-being. Health Behaviour in School-aged Children (HBSC) study: international report from the 2013/2014 survey. Inchley J, Currie D, Young T, et al. Copenhagen, WHO Regional Office for Europe, 2016 (Health Policy for Children and Adolescents, No. 7). Available at: http://www.euro.who.int/__data/assets/pdf_file/0003/303438/HSBC-No.7-Growing-up-unequal-Full-Report.pdf?ua=1

Table 34: Median age at first sex in Canada

			MALE		FEMALE		TOTAL	
Study[1,a]	Year/period	Birth cohort	N	Median age at first sex	N	Median age at first sex	N	Median age at first sex
Kiely 2011	2009	1984-1985	-	-	1,301	16.0	-	-

Data accessed on 16 Mar 2017.
N: number of subjects;
[a] Residents in Quebec, beneficiaires from binificiaires de la Rigie de l'assurance maladie du Quebec.
Data sources:
[1] Kiely M, Sauvageau C, Dubé E, Deceuninck G, De Wals P. Virus du papillome humain : connaissances, croyances et comportements des femmes québécoises. Rev can santé publique 2011;102(4):303-7.

Table 35: Marriage patterns in Canada

Indicator		Male	Female
Average age at first marriage[1]		28.6	26.9
Age-specific % of ever married[2]	15-19 years	0.84	2.29
	20-24 years	12.2	22.2
	25-29 years	41.9	55.7
	30-34 years	66.4	74.9
	35-39 years	78.0	82.7
	40-44 years	81.5	86.0
	45-49 years	83.4	88.0

Data accessed on 16 Mar 2017.
Year of estimate: 2011;
Please refer to original source for methods of estimation.
Data sources:
[1] The world bank: health nutrition and population statistics. Updated 16-Dec-2016. Accessed on March 16 2017. Available at http://data.worldbank.org/data-catalog/health-nutrition-and-population-statistics
[2] United Nations, Department of Economic and Social Affairs, Population Division (2015). World Marriage Data 2015 (POP/DB/Marr/Rev2015). Available at: http://www.un.org/en/development/desa/population/theme/marriage-unions/WMD2015.shtml Accessed on April 3, 2017.

7 HPV preventive strategies

It is established that well-organised cervical screening programmes or widespread good quality cytology can reduce cervical cancer incidence and mortality. The introduction of HPV vaccination could also effectively reduce the burden of cervical cancer in the coming decades. This section presents indicators on basic characteristics and performance of cervical cancer screening, status of HPV vaccine licensure and introduction in Canada.

7.1 Cervical cancer screening practices

Screening strategies differ between countries. Some countries have population-based programmes, where in each round of screening women in the target population are individually identified and invited to attend screening. This type of programme can be implemented nationwide or only in specific regions of the country. In opportunistic screening, invitations depend on the individual's decision or on encounters with health-care providers. The most frequent method for cervical cancer screening is cytology, and there are alternative methods such as HPV DNA tests and visual inspection with acetic acid (VIA). VIA is an alternative to cytology-based screening in low-resource settings (the 'see and treat' approach). HPV DNA testing is being introduced into some countries as an adjunct to cytology screening ('co-testing') or as the primary screening test to be followed by a secondary, more specific test, such as cytology.

Table 36: Main characteristics of cervical cancer screening in Canada

Availability of a cervical cancer screening programme[α]	Yes
Quality assurance structure and mandate to supervise and to monitor the screening process[β]	Yes, varies among regions
Active invitation to screening[γ]	No, varies among regions
Main screening test used for primary screening	Cytology
Undergoing demonstration projects	HPV test
Screening ages (years)	21-65/69/70 varies by region
Screening interval or frequency of screenings	Varies among regions: Manitoba, Ontario, Québec, Nova Scotia: every 3 years (ages 21- 65/69). Prince Edward island: every 2 years (ages 21-65). Other regions every 2-3 years (ages 21-70) after 3 consecutive annual negative tests

Data accessed on 31 Dec 2016.

[α] Public national cervical cancer screening program in place (Cytology/VIA/HPV testing). Countries may have clinical guidelines or protocols, and cervical cancer screening services in a private sector but without a public national program. Publicly mandat

[β] Self-reported quality assurance: Organised programmes provide for a national or regional team responsible for implementation and require providers to follow guidelines, rules, or standard operating procedures. They also define a quality assurance structur

[γ] Self-reported active invitation or recruitment, as organised population-based programmes, identify and personally invite each eligible person in the target population to attend a given round of screening.

Data sources:

Cervical Cancer Screening Guidelines Across Canada: Environmental Scan. Toronto: Canadian Partnership Against Cancer; Cancerview.ca [August 28, 2015]. Available from: [http://westernhealth.nl.ca/uploads/PDFs/CSI/Cervical%20Cancer%20Screening%20Guidelines%20Across%20Canada%20-%20Environmental%20Scan%202014.pdf]

Provincial/Territorial Screening and Vaccine Programs. Cancerview.ca [August 28, 2015]. Available at: http://www.cancerview.ca/cv/portal/Home/PreventionAndScreening/PSProfessionals/PSScreeningAndEarlyDiagnosis/CervicalCancerControlInCanada/ProvinciaTerritorialScreeningAndVaccinePrograms?_afrLoop=1543391567404000&lang=en&_afrWindowMode=0&_adf.ctrl-state=tpxoyx0a0_192

Cervical Cancer Screening in Canada: Monitoring Program Performance 2006 –2008. Published at December, 2011. Available at: http://www.cancerview.ca/idc/groups/public/documents/webcontent/cccic_cervical_cs_report.pdf

Table 37: Estimated coverage of cervical cancer screening in Canada

Reference	Year	Population	Urban vs rural or both (all)	N Women	Age range	Within the last year(s)	Coverage (%)[a]
CANSIM 2009a[1,α]	2005	General female population	All	-	18-69	3y	72 .8
CANSIM 2009b[2,β]	2003	General female population	All	10,745,009	18-69	3y	74 .1
Cervical Cancer Screening 1998 Canada[3,b]	1998	National screening programme	All	-	20-69	3y	79
Cervical Cancer Screening 2013 Canada[4,c]	2010-2013	National screening programme	All	1,234,425	21-69	3y	73.5

Data accessed on 31 Dec 2016.

[a] Proportion of women in the total sample of the mentioned age range in the country or region that reported having a Pap smear during a given time period (e.g., last year, last 2, 3, 5 years or ever).

[b] Data from the National Population Health Survey, 1998/99.

[c] Hysterectomy-corrected includes Manitoba and British Columbia. Non-hysterectomy- corrected includes Alberta, Saskatchewan, New Brunswick, Nova Scotia, Prince Edward Island, Newfoundland and Labrador and Northwest Territories.

[α] Age-standardised rates with direct method and 1991 Canadian Census population structure. Data from Statistics Canada, Canadian Community Health Survey (CCHS), 2000/2001, 2003 and 2005; National Population Health Survey (NPHS), 1994/1995, 1996/1997 and 19

[β] Data source from Statistics Canada, Canadian Community Health Survey, 2003. Table 105-0242 - Pap smear, by age group, females aged 18 to 69 years, Canada, provinces, territories, health regions (June 2003 boundaries) and peer groups, every 2 years. CANSI

Data sources:

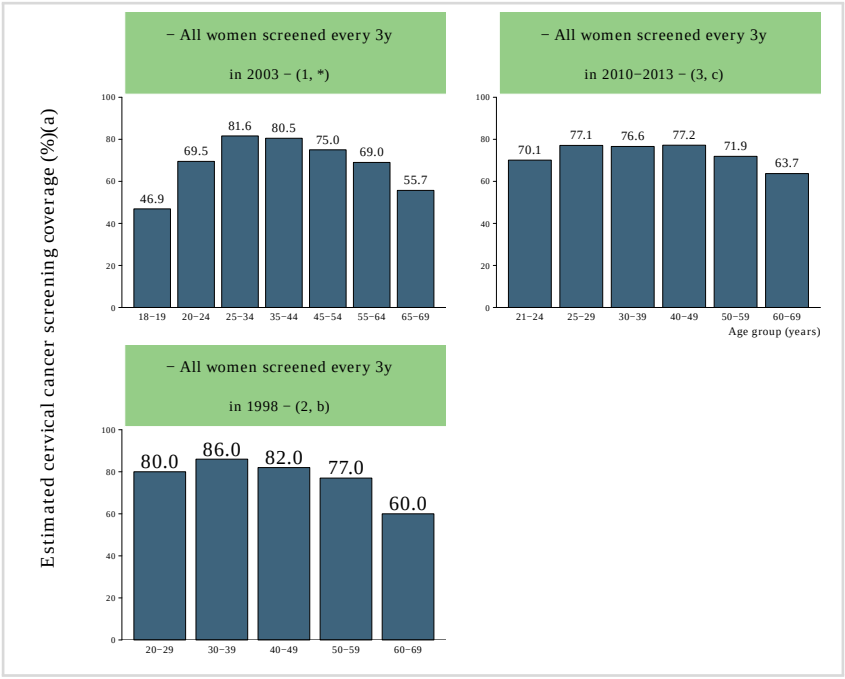
[1] Table 105-0242 - Pap smear, by age group, females aged 18 to 69 years, Canada, provinces, territories, health regions (June 2003 boundaries) and peer groups, every 2 years. CANSIM database 2009 [cited 2009 Mar 30]

[2] Table 105-4042 - Pap smear, females aged 18 to 69 years, Canada, provinces, territories, occasional, CANSIM (database). CANSIM database 2009 [cited 2009 Mar 30]

[3] Health Canada (2002). Cervical cancer screening in Canada: 1998 Surveillance Report. Cat No H39-616/1998E. Ministry of public works and goberment services, Canada.

[4] Canadian Partnership Against Cancer. Cervical Cancer Screening in Canada. Toronto (ON): Canadian Partnership Against Cancer; updated 2016 July.

Figure 39: Estimated coverage of cervical cancer screening in Canada, by age and study



Data accessed on 31 Dec 2016.

[a] Proportion of women in the total sample of the mentioned age range in the country or region that reported having a Pap smear during a given time period (e.g., last year, last 2, 3, 5 years or ever).

[b] Data from the National Population Health Survey, 1998/99.

[c] Hysterectomy corrected

[*] Data source from Statistics Canada, Canadian Community Health Survey, 2003. Table 105-0242 - Pap smear, by age group, females aged 18 to 69 years, Canada, provinces, territories, health regions (June 2003 boundaries) and peer groups, every 2 years. CANSI

Data sources:

ICO Information Centre on HPV and Cancer. Country-specific references identified in each country-specific report as general recommendation from relevant scientific organizations and/or publications.

[1] Table 105-4042 - Pap smear, females aged 18 to 69 years, Canada, provinces, territories, occasional, CANSIM (database). CANSIM database 2009 [cited 2009 Mar 30]

[2] Health Canada (2002). Cervical cancer screening in Canada: 1998 Surveillance Report. Cat No H39-616/1998E. Ministry of public works and goberment services, Canada.

[3] Canadian Partnership Against Cancer. Cervical Cancer Screening in Canada. Toronto (ON): Canadian Partnership Against Cancer; updated 2016 July.

Table 38: Estimated coverage of cervical cancer screening in Canada , by region

Region	N Women	Age range	LY[a]	Population	Coverage (%)[b]	Year(s) studied	Reference
Alberta	1,052,389	18-69	3y	General female population	79.1	2003	CANSIM 2009b[1,α]
	-	20-69	3y	National screening programme	81.0	1998	Cervical Cancer Screening 1998 Canada[2]
	507,215	20-69	3y	National screening programme	70.2	2009-2011	Cervical Cancer Screening 2009-2011 Canada[3]
	842,909	21-69	3y	National screening programme	67.7	2010-2013	Cervical Cancer Screening 2010-2013 Canada[4]
Alberta + Saskatchewan + Nova Scotia + Prince Edward Island + Newfoundland and Labrador	1,389,360	20-69	3y	National screening programme	67.1	2009-2011	Cervical Cancer Screening 2009-2011 Canada[3]
British Columbia	-	20-69	3y	National screening programme	77.0	1998	Cervical Cancer Screening 1998 Canada[2]
	1,356,113	20-69	3y	National screening programme	69.3	2009-2011	Cervical Cancer Screening 2009-2011 Canada[3]
	972,867	21-69	3y	National screening programme	73.8	2010-2013	Cervical Cancer Screening 2010-2013 Canada[4]
British Columbia + Manitoba	1,721,023	20-69	3y	National screening programme	69.4	2009-2011	Cervical Cancer Screening 2009-2011 Canada[3]
Manitoba	358,146	18-69	3y	General female population	77.3	2003	CANSIM 2009b[1,α]
	-	20-69	3y	National screening programme	85.0	1998	Cervical Cancer Screening 1998 Canada[2]
	36,491	20-69	3y	National screening programme	69.7	2009-2011	Cervical Cancer Screening 2009-2011 Canada[3]
	261,558	21-69	3y	National screening programme	70.8	2010-2013	Cervical Cancer Screening 2010-2013 Canada[4]
New Brunswick	258,548	18-69	3y	General female population	78.3	2003	CANSIM 2009b[1,α]
	-	20-69	3y	National screening programme	80.0	1998	Cervical Cancer Screening 1998 Canada[2]
	159,189	21-69	3y	National screening programme	64.5	2010-2013	Cervical Cancer Screening 2010-2013 Canada[4]
Newfoundland	-	20-69	3y	National screening programme	80.0	1998	Cervical Cancer Screening 1998 Canada[2]
	126,187	21-69	3y	National screening programme	71.3	2010-2013	Cervical Cancer Screening 2010-2013 Canada[4]
Newfoundland and Labrador	186,562	18-69	3y	General female population	78.6	2003	CANSIM 2009b[1,α]
	17,981	20-69	3y	National screening programme	70.2	2009-2011	Cervical Cancer Screening 2009-2011 Canada[3]
Northwest territories	13,431	18-69	3y	General female population	80.9	2003	CANSIM 2009b[1,α]
	9,623	21-69	3y	National screening programme	67.2	2010-2013	Cervical Cancer Screening 2010-2013 Canada[4]
Nova Scotia	325,685	18-69	3y	General female population	79.7	2003	CANSIM 2009b[1,α]

(Continued on next page)

(Table 38 – continued from previous page)

Region	N Women	Age range	LY[a]	Population	Coverage (%)[b]	Year(s) studied	Reference
	-	20-69	3y	National screening programme	83.0	1998	Cervical Cancer Screening 1998 Canada[2]
	326,984	20-69	3y	National screening programme	65.4	2009-2011	Cervical Cancer Screening 2009-2011 Canada[3]
	210,147	21-69	3y	National screening programme	67.2	2010-2013	Cervical Cancer Screening 2010-2013 Canada[4]
Nunavut	5,382	18-69	3y	General female population	71.3	2003	CANSIM 2009b[1,α]
	4,188,668	18-69	3y	General female population	73.9	2003	CANSIM 2009b[1,α]
	-	20-69	3y	National screening programme	78.0	1998	Cervical Cancer Screening 1998 Canada[2]
Ontario	-	20-69	3y	National screening programme	64.9	2009-2011	Cervical Cancer Screening 2009-2011 Canada[3]
	-	21-69	3y	National screening programme	64.9	2010-2013	Cervical Cancer Screening 2010-2013 Canada[4]
	47,633	18-69	3y	General female population	81.3	2003	CANSIM 2009b[1,α]
	-	20-69	3y	National screening programme	82.0	1998	Cervical Cancer Screening 1998 Canada[2]
Prince Edward Island	47,914	20-69	3y	National screening programme	66.1	2009-2011	Cervical Cancer Screening 2009-2011 Canada[3]
	31,445	21-69	3y	National screening programme	67.4	2010-2013	Cervical Cancer Screening 2010-2013 Canada[4]
	2,579,205	18-69	3y	General female population	69.6	2003	CANSIM 2009b[1,α]
Quebec	-	20-69	3y	National screening programme	78.0	1998	Cervical Cancer Screening 1998 Canada[2]
	302,655	18-69	3y	General female population	76.2	2003	CANSIM 2009b[1,α]
	-	20-69	3y	National screening programme	80.0	1998	Cervical Cancer Screening 1998 Canada[2]
Saskatchewan	327,437	20-69	3y	National screening programme	62.5	2009-2011	Cervical Cancer Screening 2009-2011 Canada[3]
	206,645	21-69	3y	National screening programme	62.9	2010-2013	Cervical Cancer Screening 2010-2013 Canada[4]
Yukon Territory	10,619	18-69	3y	General female population	83.5	2003	CANSIM 2009b[1,α]

Data accessed on 31 Dec 2016.

[a] LY: Within the last year(s).

[b] Proportion of women in the total sample of the mentioned age range in the country or region that reported having a Pap smear during a given time period (e.g., last year, last 2, 3, 5 years or ever).

[α] Data source from Statistics Canada, Canadian Community Health Survey, 2003. Table 105-0242 - Pap smear, by age group, females aged 18 to 69 years, Canada, provinces, territories, health regions (June 2003 boundaries) and peer groups, every 2 years. CANSI

Data sources:

[1] Table 105-4042 - Pap smear, females aged 18 to 69 years, Canada, provinces, territories, occasional, CANSIM (database). CANSIM database 2009 [cited 2009 Mar 30]

[2] Health Canada (2002). Cervical cancer screening in Canada: 1998 Surveillance Report. Cat No H39-616/1998E. Ministry of public works and goberment services, Canada.

[3] Canadian Partnership Against Cancer. Cervical Cancer Screening in Canada: Monitoring Program Performance 2009-2011. Toronto: Canadian Partnership Against Cancer, 2013.

[4] Canadian Partnership Against Cancer. Cervical Cancer Screening in Canada. Toronto (ON): Canadian Partnership Against Cancer; updated 2016 July.

7.2 HPV vaccination

Table 39: National HPV Immunization programme in Alberta (Canada)

	Female	Male
Year of introduction	2008	-
Primary target age (years)	10-11	-
Organized catch-up age (years)	-	-
Opportunistic catch-up age (years)	-	-
Strategy	Sch. (grade 5)	-
Schedule[a,b]	3-doses standard	-
Catch-up program for grade 9 during 2009-12 (girls 14-15)		

Data updated on 11 Jul 2017 (data as of 31 Dec 2016)

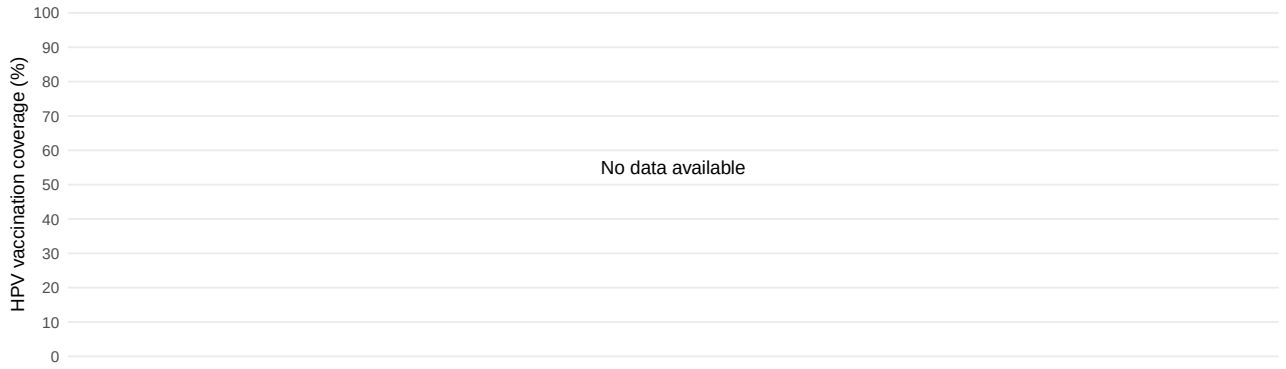
[a] 2 doses: 0-6m if not otherwise stated. Since 2014, based on clinical trials results several agencies responsible for the scientific evaluation of medicines, like the European Medicines Agency, aproved a two-dose schedule for girls aged less than 15 or 14 depending on the vaccine (Cervarix or Gardasil).

[b] 3-doses standard: administration of three doses following the standard vaccination schedule as 0-2-6 months for the quadrivalent vaccine or 0-1-6 months for the bivalent vaccine.

Data sources:

[1] Adapted from Bruni et al 2016 Lancet Global Health (data up to October 2014).

Figure 40: Reported HPV vaccination coverage in females by birth cohort in National HPV Immunization programme in Alberta (Canada)



Data updated on 11 Jul 2017 (data as of 31 Oct 2014)

Data sources:

[1] Adapted from Bruni et al 2016 Lancet Global Health (data up to October 2014).

[2] BC Centre for Disease Control. Immunization Programs & Vaccine Preventable Diseases Service. Immunization Uptake in Grade 6 Students. 2002-13

[3] BC Centre for Disease Control. Immunization Programs & Vaccine Preventable Diseases Service. Immunization Uptake in Grade 9 Students. 2002-13

[4] Canadian immunization commitee, Public Health Agency of Canada. Recommendations for human papillomavirus immunization programs. 2014.

[5] LaJeunesse C. HPV vaccine: Exploring less than favourable uptake. Western Canada Immunization Forum Mar 5 & 6 2014.

[6] Nova Scotia Department of Health and Wellness. Population Health Assessment and Surveillance.School-based immunization coverage in Nova Scotia: 2008-09 to 2011-12

[7] Ontario Agency for Health Protection and Promotion. Lim GH, McIntyre MA, Wilson S. Immunization coverage and exemptions among Ontario's school pupils for 2011–12: Findings and implications for future information systems. PHO Ground Rounds August 20, 2013

[8] Public Health Agency of Canada. Vaccine Coverage in Canadian Children: Results from the 2011 Childhood National Immunization Coverage Survey n.d. http://www.phac-aspc.gc.ca/im/nics-enva/vccc-cvec-eng.php

[9] Shearer BD, HPV Vaccination: Understanding the Impact on HPV Disease. National Collaborating Centre for Infectious Diseases. Purple Paper Dec 2011; Issue 34.

[10] Wilson SE, Harris T, Sethi P, Fediurek J, Macdonald L, Deeks SL. Coverage from Ontario, Canada's school-based HPV vaccine program: the first three years. Vaccine 2013;31:757–62.

Table 40: National HPV Immunization programme in British Columbia (Canada)

	Female	Male
Year of introduction	2008	-
Primary target age (years)	11-12	-
Organized catch-up age (years)	-	-
Opportunistic catch-up age (years)	? 26 years old and born before 1994	-
Strategy	Sch. (grade 6)	-
Schedule[a,b]	3-doses extended (0-6-36m, since 2010)	-

BC is currently providing the HPV2 vaccine at no cost to young women who are 26 years old and younger and born before 1994. This is a limited time program. Catch-up program for grade 9 during 2008-11 (girls 14-15). The HPV vaccine program started in Septe

Data updated on 11 Jul 2017 (data as of 31 Dec 2016)

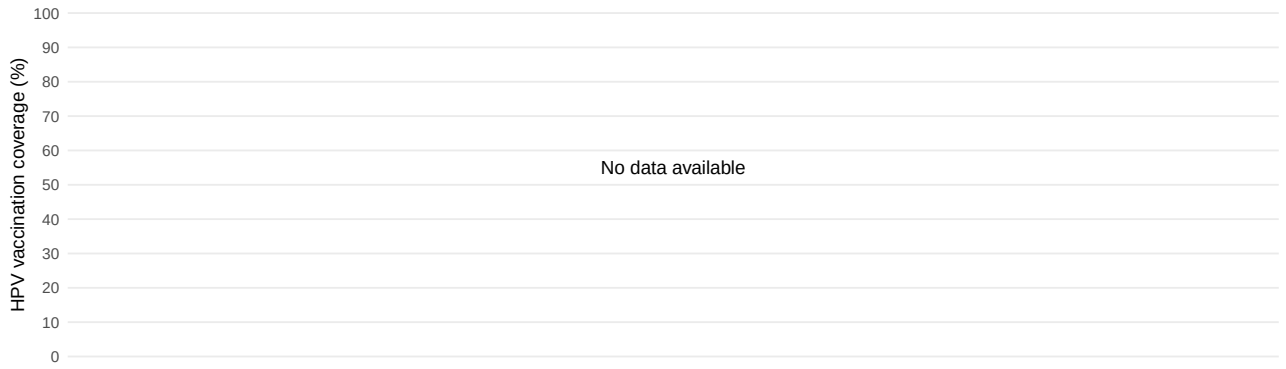
[a] 2 doses: 0-6m if not otherwise stated. Since 2014, based on clinical trials results several agencies responsible for the scientific evaluation of medicines, like the European Medicines Agency, aproved a two-dose schedule for girls aged less than 15 or 14 depending on the vaccine (Cervarix or Gardasil).

[b] 3-doses standard: administration of three doses following the standard vaccination schedule as 0-2-6 months for the quadrivalent vaccine or 0-1-6 months for the bivalent vaccine.

Data sources:

[1] Adapted from Bruni et al 2016 Lancet Global Health (data up to October 2014).

Figure 41: Reported HPV vaccination coverage in females by birth cohort in National HPV Immunization programme in British Columbia (Canada)



Data updated on 11 Jul 2017 (data as of 31 Oct 2014)

Data sources:

[1] Adapted from Bruni et al 2016 Lancet Global Health (data up to October 2014).

[2] BC Centre for Disease Control. Immunization Programs & Vaccine Preventable Diseases Service. Immunization Uptake in Grade 6 Students. 2002-13

[3] BC Centre for Disease Control. Immunization Programs & Vaccine Preventable Diseases Service. Immunization Uptake in Grade 9 Students. 2002-13

[4] Canadian immunization commitee, Public Health Agency of Canada. Recommendations for human papillomavirus immunization programs. 2014.

[5] LaJeunesse C. HPV vaccine: Exploring less than favourable uptake. Western Canada Immunization Forum Mar 5 & 6 2014.

[6] Nova Scotia Department of Health and Wellness. Population Health Assessment and Surveillance.School-based immunization coverage in Nova Scotia: 2008-09 to 2011-12

[7] Ontario Agency for Health Protection and Promotion. Lim GH, McIntyre MA, Wilson S. Immunization coverage and exemptions among Ontario's school pupils for 2011–12: Findings and implications for future information systems. PHO Ground Rounds August 20, 2013

[8] Public Health Agency of Canada. Vaccine Coverage in Canadian Children: Results from the 2011 Childhood National Immunization Coverage Survey n.d. http://www.phac-aspc.gc.ca/im/nics-enva/vccc-cvec-eng.php

[9] Shearer BD, HPV Vaccination: Understanding the Impact on HPV Disease. National Collaborating Centre for Infectious Diseases. Purple Paper Dec 2011; Issue 34.

[10] Wilson SE, Harris T, Sethi P, Fediurek J, Macdonald L, Deeks SL. Coverage from Ontario, Canada's school-based HPV vaccine program: the first three years. Vaccine 2013;31:757–62.

Table 41: National HPV Immunization programme in Manitoba (Canada)

	Female	Male
Year of introduction	2008	-
Primary target age (years)	11-12	-
Organized catch-up age (years)	-	-
Opportunistic catch-up age (years)	9-26 at high risk HPV infection (2012-2014)	-
Strategy	Sch. (grade 6)	-
Schedule[a,b]	3-doses standard	-

Girls or women with increased risk of HPV infection who started the 3-dose series before March 31st 2014 will be eligible to finish the series free-of-charge

Data updated on 11 Jul 2017 (data as of 31 Dec 2016)

[a] 2 doses: 0-6m if not otherwise stated. Since 2014, based on clinical trials results several agencies responsible for the scientific evaluation of medicines, like the European Medicines Agency, aproved a two-dose schedule for girls aged less than 15 or 14 depending on the vaccine (Cervarix or Gardasil).

[b] 3-doses standard: administration of three doses following the standard vaccination schedule as 0-2-6 months for the quadrivalent vaccine or 0-1-6 months for the bivalent vaccine.

Data sources:

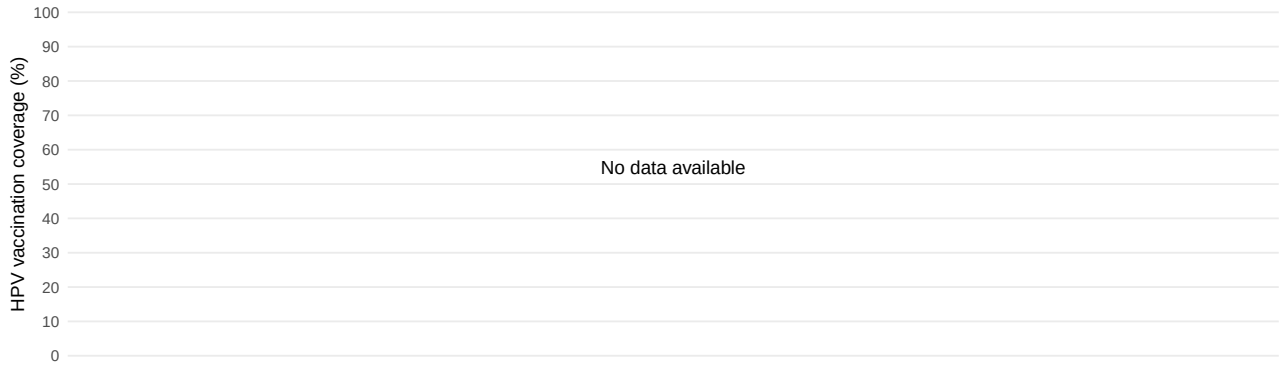
[1] Adapted from Bruni et al 2016 Lancet Global Health (data up to October 2014).

Specifically, data from Manitoba was extracted from:

[2] Government of Canada, Public Health Agency of Canada. Publicly funded Immunization Programs in Canada - Routine Schedule for Infants and Children including special programs and catch-up programs (as of March 2014) [Internet]. Available from: http://www.phac-aspc.gc.ca/im/ptimprog-progimpt/table-1-eng.php#fn_2

[3] Manitoba Communicable Disease Control. Public Health. Human Papillomavirus [Internet]. Available from: http://www.gov.mb.ca/health/publichealth/diseases/hpv.html

Figure 42: Reported HPV vaccination coverage in females by birth cohort in National HPV Immunization programme in Manitoba (Canada)



Data updated on 11 Jul 2017 (data as of 31 Oct 2014)

Data sources:

[1] Adapted from Bruni et al 2016 Lancet Global Health (data up to October 2014).

[2] BC Centre for Disease Control. Immunization Programs & Vaccine Preventable Diseases Service. Immunization Uptake in Grade 6 Students. 2002-13

[3] BC Centre for Disease Control. Immunization Programs & Vaccine Preventable Diseases Service. Immunization Uptake in Grade 9 Students. 2002-13

[4] Canadian immunization commitee, Public Health Agency of Canada. Recommendations for human papillomavirus immunization programs. 2014.

[5] LaJeunesse C. HPV vaccine: Exploring less than favourable uptake. Western Canada Immunization Forum Mar 5 & 6 2014.

[6] Nova Scotia Department of Health and Wellness. Population Health Assessment and Surveillance.School-based immunization coverage in Nova Scotia: 2008-09 to 2011-12

[7] Ontario Agency for Health Protection and Promotion. Lim GH, McIntyre MA, Wilson S. Immunization coverage and exemptions among Ontario's school pupils for 2011–12: Findings and implications for future information systems. PHO Ground Rounds August 20, 2013

[8] Public Health Agency of Canada. Vaccine Coverage in Canadian Children: Results from the 2011 Childhood National Immunization Coverage Survey n.d. http://www.phac-aspc.gc.ca/im/nics-enva/vccc-cvec-eng.php

[9] Shearer BD, HPV Vaccination: Understanding the Impact on HPV Disease. National Collaborating Centre for Infectious Diseases. Purple Paper Dec 2011; Issue 34.

[10] Wilson SE, Harris T, Sethi P, Fediurek J, Macdonald L, Deeks SL. Coverage from Ontario, Canada's school-based HPV vaccine program: the first three years. Vaccine 2013;31:757–62.

Table 42: National HPV Immunization programme in New Brunswick (Canada)

	Female	Male
Year of introduction	2008	-
Primary target age (years)	12-13	-
Organized catch-up age (years)	-	-
Opportunistic catch-up age (years)	-	-
Strategy	Sch. (Grade 7)	-
Schedule[a,b]	3-doses standard	-

Catch-up program for grade 8 during 2008-9 (girls 13-14)

Data updated on 11 Jul 2017 (data as of 31 Dec 2016)

[a] 2 doses: 0-6m if not otherwise stated. Since 2014, based on clinical trials results several agencies responsible for the scientific evaluation of medicines, like the European Medicines Agency, aproved a two-dose schedule for girls aged less than 15 or 14 depending on the vaccine (Cervarix or Gardasil).

[b] 3-doses standard: administration of three doses following the standard vaccination schedule as 0-2-6 months for the quadrivalent vaccine or 0-1-6 months for the bivalent vaccine.

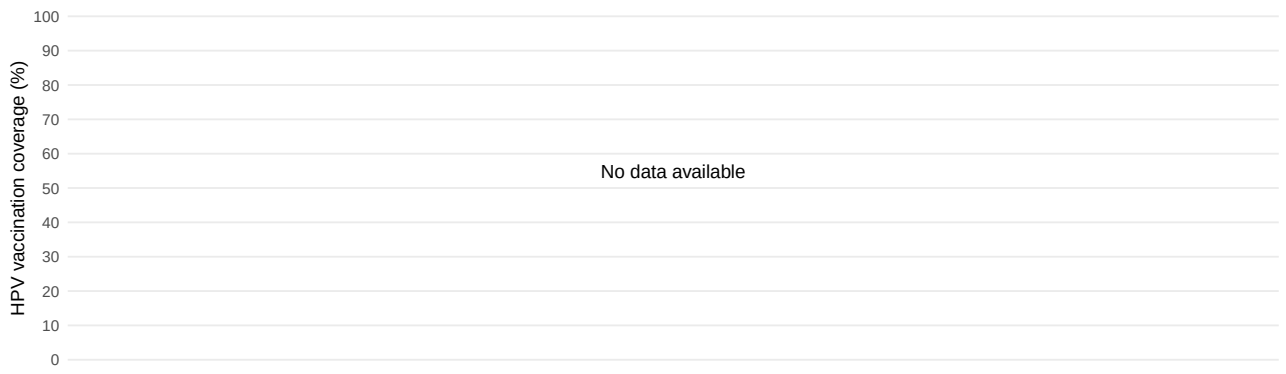
Data sources:

[1] Adapted from Bruni et al 2016 Lancet Global Health (data up to October 2014).

Specifically, data from New Brunswick was extracted from:

[2] Canadian immunization commitee, Public Health Agency of Canada. Recommendations for human papillomavirus immunization programs [Internet]. 2014. Available from: http://publications.gc.ca/collections/collection_2014/aspc-phac/HP40-107-2014-eng.pdf

Figure 43: Reported HPV vaccination coverage in females by birth cohort in National HPV Immunization programme in New Brunswick (Canada)



Data updated on 11 Jul 2017 (data as of 31 Oct 2014)

Data sources:

[1] Adapted from Bruni et al 2016 Lancet Global Health (data up to October 2014).

[2] BC Centre for Disease Control. Immunization Programs & Vaccine Preventable Diseases Service. Immunization Uptake in Grade 6 Students. 2002-13

[3] BC Centre for Disease Control. Immunization Programs & Vaccine Preventable Diseases Service. Immunization Uptake in Grade 9 Students. 2002-13

[4] Canadian immunization commitee, Public Health Agency of Canada. Recommendations for human papillomavirus immunization programs. 2014.

[5] LaJeunesse C. HPV vaccine: Exploring less than favourable uptake. Western Canada Immunization Forum Mar 5 & 6 2014.

[6] Nova Scotia Department of Health and Wellness. Population Health Assessment and Surveillance.School-based immunization coverage in Nova Scotia: 2008-09 to 2011-12

[7] Ontario Agency for Health Protection and Promotion. Lim GH, McIntyre MA, Wilson S. Immunization coverage and exemptions among Ontario's school pupils for 2011–12: Findings and implications for future information systems. PHO Ground Rounds August 20, 2013

[8] Public Health Agency of Canada. Vaccine Coverage in Canadian Children: Results from the 2011 Childhood National Immunization Coverage Survey n.d. http://www.phac-aspc.gc.ca/im/nics-enva/vccc-cvec-eng.php

[9] Shearer BD, HPV Vaccination: Understanding the Impact on HPV Disease. National Collaborating Centre for Infectious Diseases. Purple Paper Dec 2011; Issue 34.

[10] Wilson SE, Harris T, Sethi P, Fediurek J, Macdonald L, Deeks SL. Coverage from Ontario, Canada's school-based HPV vaccine program: the first three years. Vaccine 2013;31:757–62.

Table 43: National HPV Immunization programme in Newfoundland (Canada)

	Female	Male
Year of introduction	2007	-
Primary target age (years)	11-12	-
Organized catch-up age (years)	-	-
Opportunistic catch-up age (years)	-	-
Strategy	Sch. (Grade 6)	-
Schedule[a,b]	3-doses standard	-

Catch-up program for grade 9 during 2008-10 (girls 14-15)

Data updated on 11 Jul 2017 (data as of 31 Dec 2016)

[a] 2 doses: 0-6m if not otherwise stated. Since 2014, based on clinical trials results several agencies responsible for the scientific evaluation of medicines, like the European Medicines Agency, aproved a two-dose schedule for girls aged less than 15 or 14 depending on the vaccine (Cervarix or Gardasil).

[b] 3-doses standard: administration of three doses following the standard vaccination schedule as 0-2-6 months for the quadrivalent vaccine or 0-1-6 months for the bivalent vaccine.

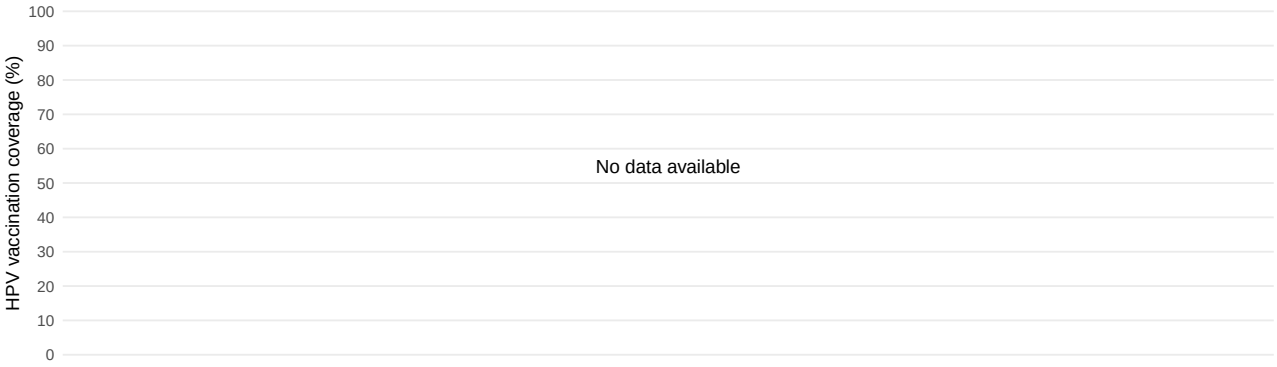
Data sources:

[1] Adapted from Bruni et al 2016 Lancet Global Health (data up to October 2014).

Specifically, data from Newfoundland was extracted from:

[2] Canadian immunization commitee, Public Health Agency of Canada. Recommendations for human papillomavirus immunization programs [Internet]. 2014. Available from: http://publications.gc.ca/collections/collection_2014/aspc-phac/HP40-107-2014-eng.pdf

Figure 44: Reported HPV vaccination coverage in females by birth cohort in National HPV Immunization programme in Newfoundland (Canada)



Data updated on 11 Jul 2017 (data as of 31 Oct 2014)

Data sources:

[1] Adapted from Bruni et al 2016 Lancet Global Health (data up to October 2014).

[2] BC Centre for Disease Control. Immunization Programs & Vaccine Preventable Diseases Service. Immunization Uptake in Grade 6 Students. 2002-13

[3] BC Centre for Disease Control. Immunization Programs & Vaccine Preventable Diseases Service. Immunization Uptake in Grade 9 Students. 2002-13

[4] Canadian immunization commitee, Public Health Agency of Canada. Recommendations for human papillomavirus immunization programs. 2014.

[5] LaJeunesse C. HPV vaccine: Exploring less than favourable uptake. Western Canada Immunization Forum Mar 5 & 6 2014.

[6] Nova Scotia Department of Health and Wellness. Population Health Assessment and Surveillance.School-based immunization coverage in Nova Scotia: 2008-09 to 2011-12

[7] Ontario Agency for Health Protection and Promotion. Lim GH, McIntyre MA, Wilson S. Immunization coverage and exemptions among Ontario's school pupils for 2011–12: Findings and implications for future information systems. PHO Ground Rounds August 20, 2013

[8] Public Health Agency of Canada. Vaccine Coverage in Canadian Children: Results from the 2011 Childhood National Immunization Coverage Survey n.d. http://www.phac-aspc.gc.ca/im/nics-enva/vccc-cvec-eng.php

[9] Shearer BD, HPV Vaccination: Understanding the Impact on HPV Disease. National Collaborating Centre for Infectious Diseases. Purple Paper Dec 2011; Issue 34.

[10] Wilson SE, Harris T, Sethi P, Fediurek J, Macdonald L, Deeks SL. Coverage from Ontario, Canada's school-based HPV vaccine program: the first three years. Vaccine 2013;31:757–62.

Table 44: National HPV Immunization programme in North West Territories (Canada)

	Female	Male
Year of introduction	2009	-
Primary target age (years)	9-10	-
Organized catch-up age (years)	-	-
Opportunistic catch-up age (years)	-	-
Strategy	Sch. (Grade 4)	-
Schedule[a,b]	3-doses standard	-

Catch-up program for girls in Grades 11 and 12 (2009-2010), Grades 10 and 11 (2010-2011), Grades 9 and 10 (2011-2012), Grade 9 (2012-2014)

Data updated on 11 Jul 2017 (data as of 31 Dec 2016)

[a] 2 doses: 0-6m if not otherwise stated. Since 2014, based on clinical trials results several agencies responsible for the scientific evaluation of medicines, like the European Medicines Agency, aproved a two-dose schedule for girls aged less than 15 or 14 depending on the vaccine (Cervarix or Gardasil).

[b] 3-doses standard: administration of three doses following the standard vaccination schedule as 0-2-6 months for the quadrivalent vaccine or 0-1-6 months for the bivalent vaccine.

Data sources:

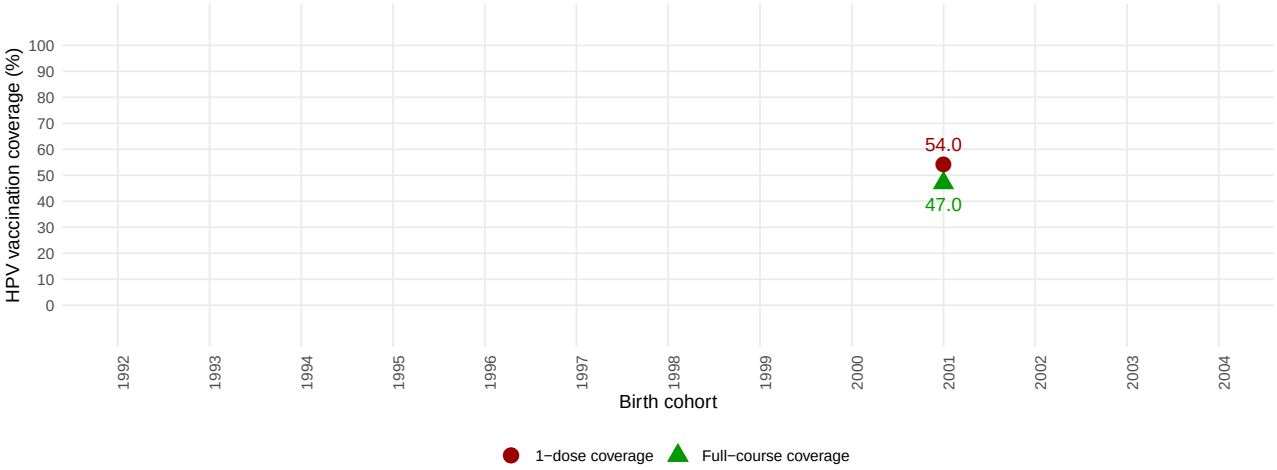
[1] Adapted from Bruni et al 2016 Lancet Global Health (data up to October 2014).

Specifically, data from North West Territories was extracted from:

[2] Government of Canada, Public Health Agency of Canada. Publicly funded Immunization Programs in Canada - Routine Schedule for Infants and Children including special programs and catch-up programs (as of March 2014) [Internet]. Available from: http://www.phac-aspc.gc.ca/im/ptimprog-progimpt/table-1-eng.php#fn_2

[3] Government of Canada, Public Health Agency of Canada. Update On Human Papillomavirus (HPV) Vaccines - Canada Communicable Disease Report Monthly - Public Health Agency of Canada [Internet]. 2012. Available from: http://www.phac-aspc.gc.ca/publicat/ccdr-rmtc/12vol38/acs-dcc-1/index-eng.php#a4-4

Figure 45: Reported HPV vaccination coverage in females by birth cohort in National HPV Immunization programme in North West Territories (Canada)



Data updated on 11 Jul 2017 (data as of 31 Oct 2014)

Data sources:

[1] Adapted from Bruni et al 2016 Lancet Global Health (data up to October 2014).

[2] BC Centre for Disease Control. Immunization Programs & Vaccine Preventable Diseases Service. Immunization Uptake in Grade 6 Students. 2002-13

[3] BC Centre for Disease Control. Immunization Programs & Vaccine Preventable Diseases Service. Immunization Uptake in Grade 9 Students. 2002-13

[4] Canadian immunization commitee, Public Health Agency of Canada. Recommendations for human papillomavirus immunization programs. 2014.

[5] LaJeunesse C. HPV vaccine: Exploring less than favourable uptake. Western Canada Immunization Forum Mar 5 & 6 2014.

[6] Nova Scotia Department of Health and Wellness. Population Health Assessment and Surveillance.School-based immunization coverage in Nova Scotia: 2008-09 to 2011-12

[7] Ontario Agency for Health Protection and Promotion. Lim GH, McIntyre MA, Wilson S. Immunization coverage and exemptions among Ontario's school pupils for 2011–12: Findings and implications for future information systems. PHO Ground Rounds August 20, 2013

[8] Public Health Agency of Canada. Vaccine Coverage in Canadian Children: Results from the 2011 Childhood National Immunization Coverage Survey n.d. http://www.phac-aspc.gc.ca/im/nics-enva/vccc-cvec-eng.php

[9] Shearer BD, HPV Vaccination: Understanding the Impact on HPV Disease. National Collaborating Centre for Infectious Diseases. Purple Paper Dec 2011; Issue 34.

[10] Wilson SE, Harris T, Sethi P, Fediurek J, Macdonald L, Deeks SL. Coverage from Ontario, Canada's school-based HPV vaccine program: the first three years. Vaccine 2013;31:757–62.

Table 45: National HPV Immunization programme in Nova Scotia (Canada)

	Female	Male
Year of introduction	2007	-
Primary target age (years)	12-13	-
Organized catch-up age (years)	-	-
Opportunistic catch-up age (years)	-	-
Strategy	Sch. (Grade 7)	-
Schedule[a,b]	3-doses standard	-

Catch-up program for 15-16 girls in Grade 10 (2009-2010 only),and 13-14 girls in Grade 8 (2010-2011 only)

Data updated on 11 Jul 2017 (data as of 31 Dec 2016)

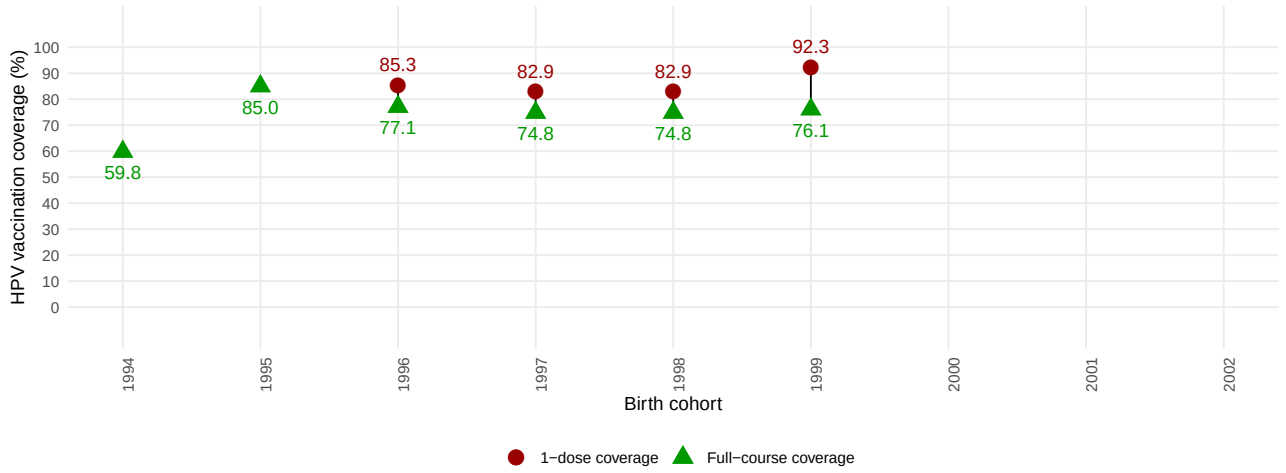
[a] 2 doses: 0-6m if not otherwise stated. Since 2014, based on clinical trials results several agencies responsible for the scientific evaluation of medicines, like the European Medicines Agency, aproved a two-dose schedule for girls aged less than 15 or 14 depending on the vaccine (Cervarix or Gardasil).

[b] 3-doses standard: administration of three doses following the standard vaccination schedule as 0-2-6 months for the quadrivalent vaccine or 0-1-6 months for the bivalent vaccine.

Data sources:

[1] Adapted from Bruni et al 2016 Lancet Global Health (data up to October 2014).

Figure 46: Reported HPV vaccination coverage in females by birth cohort in National HPV Immunization programme in Nova Scotia (Canada)



Data updated on 11 Jul 2017 (data as of 31 Oct 2014)

Data sources:

[1] Adapted from Bruni et al 2016 Lancet Global Health (data up to October 2014).

[2] BC Centre for Disease Control. Immunization Programs & Vaccine Preventable Diseases Service. Immunization Uptake in Grade 6 Students. 2002-13

[3] BC Centre for Disease Control. Immunization Programs & Vaccine Preventable Diseases Service. Immunization Uptake in Grade 9 Students. 2002-13

[4] Canadian immunization commitee, Public Health Agency of Canada. Recommendations for human papillomavirus immunization programs. 2014.

[5] LaJeunesse C. HPV vaccine: Exploring less than favourable uptake. Western Canada Immunization Forum Mar 5 & 6 2014.

[6] Nova Scotia Department of Health and Wellness. Population Health Assessment and Surveillance.School-based immunization coverage in Nova Scotia: 2008-09 to 2011-12

[7] Ontario Agency for Health Protection and Promotion. Lim GH, McIntyre MA, Wilson S. Immunization coverage and exemptions among Ontario's school pupils for 2011–12: Findings and implications for future information systems. PHO Ground Rounds August 20, 2013

[8] Public Health Agency of Canada. Vaccine Coverage in Canadian Children: Results from the 2011 Childhood National Immunization Coverage Survey n.d. http://www.phac-aspc.gc.ca/im/nics-enva/vccc-cvec-eng.php

[9] Shearer BD, HPV Vaccination: Understanding the Impact on HPV Disease. National Collaborating Centre for Infectious Diseases. Purple Paper Dec 2011; Issue 34.

[10] Wilson SE, Harris T, Sethi P, Fediurek J, Macdonald L, Deeks SL. Coverage from Ontario, Canada's school-based HPV vaccine program: the first three years. Vaccine 2013;31:757–62.

Table 46: National HPV Immunization programme in Nunavut (Canada)

	Female	Male
Year of introduction	2010	-
Primary target age (years)	11-12	-
Organized catch-up age (years)	-	-
Opportunistic catch-up age (years)	-	-
Strategy	Sch. (Grade 6)	-
Schedule[a,b]	3-doses standard	-

Starting in 2012, girls in Grades 9–12 who didn't receive or didn't complete the three-dose HPV immunization in Grade 8 can now get their vaccines free of charge, until the end of Grade 12.

Data updated on 11 Jul 2017 (data as of 31 Dec 2016)

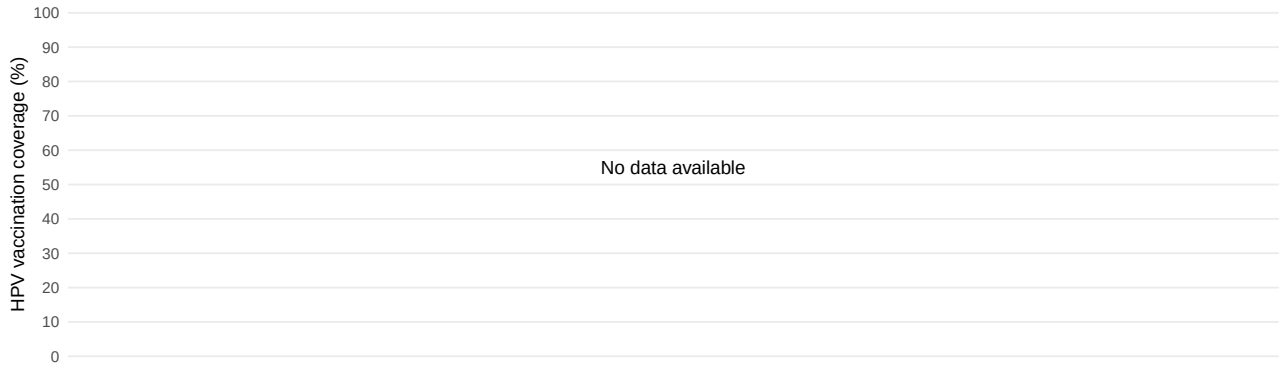
[a] 2 doses: 0-6m if not otherwise stated. Since 2014, based on clinical trials results several agencies responsible for the scientific evaluation of medicines, like the European Medicines Agency, aproved a two-dose schedule for girls aged less than 15 or 14 depending on the vaccine (Cervarix or Gardasil).

[b] 3-doses standard: administration of three doses following the standard vaccination schedule as 0-2-6 months for the quadrivalent vaccine or 0-1-6 months for the bivalent vaccine.

Data sources:

[1] Adapted from Bruni et al 2016 Lancet Global Health (data up to October 2014).

Figure 47: Reported HPV vaccination coverage in females by birth cohort in National HPV Immunization programme in Nunavut (Canada)



Data updated on 11 Jul 2017 (data as of 31 Oct 2014)

Data sources:

[1] Adapted from Bruni et al 2016 Lancet Global Health (data up to October 2014).

[2] BC Centre for Disease Control. Immunization Programs & Vaccine Preventable Diseases Service. Immunization Uptake in Grade 6 Students. 2002-13

[3] BC Centre for Disease Control. Immunization Programs & Vaccine Preventable Diseases Service. Immunization Uptake in Grade 9 Students. 2002-13

[4] Canadian immunization commitee, Public Health Agency of Canada. Recommendations for human papillomavirus immunization programs. 2014.

[5] LaJeunesse C. HPV vaccine: Exploring less than favourable uptake. Western Canada Immunization Forum Mar 5 & 6 2014.

[6] Nova Scotia Department of Health and Wellness. Population Health Assessment and Surveillance.School-based immunization coverage in Nova Scotia: 2008-09 to 2011-12

[7] Ontario Agency for Health Protection and Promotion. Lim GH, McIntyre MA, Wilson S. Immunization coverage and exemptions among Ontario's school pupils for 2011–12: Findings and implications for future information systems. PHO Ground Rounds August 20, 2013

[8] Public Health Agency of Canada. Vaccine Coverage in Canadian Children: Results from the 2011 Childhood National Immunization Coverage Survey n.d. http://www.phac-aspc.gc.ca/im/nics-enva/vccc-cvec-eng.php

[9] Shearer BD, HPV Vaccination: Understanding the Impact on HPV Disease. National Collaborating Centre for Infectious Diseases. Purple Paper Dec 2011; Issue 34.

[10] Wilson SE, Harris T, Sethi P, Fediurek J, Macdonald L, Deeks SL. Coverage from Ontario, Canada's school-based HPV vaccine program: the first three years. Vaccine 2013;31:757–62.

Table 47: National HPV Immunization programme in Ontario (Canada)

	Female	Male
Year of introduction	2007	-
Primary target age (years)	13-14	-
Organized catch-up age (years)	-	-
Opportunistic catch-up age (years)	-	-
Strategy	Sch. (Grade 8)	-
Schedule[a,b]	3-doses standard	-

Data updated on 11 Jul 2017 (data as of 31 Dec 2016)

[a] 2 doses: 0-6m if not otherwise stated. Since 2014, based on clinical trials results several agencies responsible for the scientific evaluation of medicines, like the European Medicines Agency, aproved a two-dose schedule for girls aged less than 15 or 14 depending on the vaccine (Cervarix or Gardasil).

[b] 3-doses standard: administration of three doses following the standard vaccination schedule as 0-2-6 months for the quadrivalent vaccine or 0-1-6 months for the bivalent vaccine.

Data sources:

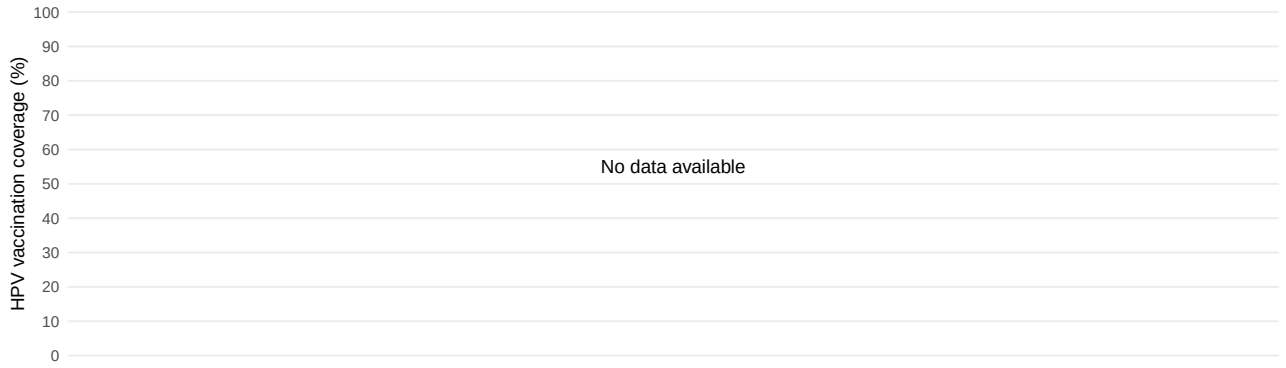
[1] Adapted from Bruni et al 2016 Lancet Global Health (data up to October 2014).

Specifically, data from Ontario was extracted from:

[2] Government of Canada, Public Health Agency of Canada. Publicly funded Immunization Programs in Canada - Routine Schedule for Infants and Children including special programs and catch-up programs (as of March 2014) [Internet]. Available from: http://www.phac-aspc.gc.ca/im/ptimprog-progimpt/table-1-eng.php#fn_2

[3] Government of Ontario. Ministry of Health and Long-Term Care. Ontario's HPV Vaccination Program [Internet]. Available from: http://www.health.gov.on.ca/en/ms/hpv/

Figure 48: Reported HPV vaccination coverage in females by birth cohort in National HPV Immunization programme in Ontario (Canada)



Data updated on 11 Jul 2017 (data as of 31 Oct 2014)

Data sources:

[1] Adapted from Bruni et al 2016 Lancet Global Health (data up to October 2014).

[2] BC Centre for Disease Control. Immunization Programs & Vaccine Preventable Diseases Service. Immunization Uptake in Grade 6 Students. 2002-13

[3] BC Centre for Disease Control. Immunization Programs & Vaccine Preventable Diseases Service. Immunization Uptake in Grade 9 Students. 2002-13

[4] Canadian immunization commitee, Public Health Agency of Canada. Recommendations for human papillomavirus immunization programs. 2014.

[5] LaJeunesse C. HPV vaccine: Exploring less than favourable uptake. Western Canada Immunization Forum Mar 5 & 6 2014.

[6] Nova Scotia Department of Health and Wellness. Population Health Assessment and Surveillance.School-based immunization coverage in Nova Scotia: 2008-09 to 2011-12

[7] Ontario Agency for Health Protection and Promotion. Lim GH, McIntyre MA, Wilson S. Immunization coverage and exemptions among Ontario's school pupils for 2011–12: Findings and implications for future information systems. PHO Ground Rounds August 20, 2013

[8] Public Health Agency of Canada. Vaccine Coverage in Canadian Children: Results from the 2011 Childhood National Immunization Coverage Survey n.d. http://www.phac-aspc.gc.ca/im/nics-enva/vccc-cvec-eng.php

[9] Shearer BD, HPV Vaccination: Understanding the Impact on HPV Disease. National Collaborating Centre for Infectious Diseases. Purple Paper Dec 2011; Issue 34.

[10] Wilson SE, Harris T, Sethi P, Fediurek J, Macdonald L, Deeks SL. Coverage from Ontario, Canada's school-based HPV vaccine program: the first three years. Vaccine 2013;31:757–62.

Table 48: National HPV Immunization programme in Prince Edward Island (Canada)

	Female	Male
Year of introduction	2007	-
Primary target age (years)	11-12	11-12
Organized catch-up age (years)	-	-
Opportunistic catch-up age (years)	-	-
Strategy	Sch. (Grade 6)	-
Schedule[a,b]	3-doses standard	-

Catch-up program for grade 9 during 2009-10 (girls 14-15). HPV vaccination program expanded to boys since 2013.

Data updated on 11 Jul 2017 (data as of 31 Dec 2016)

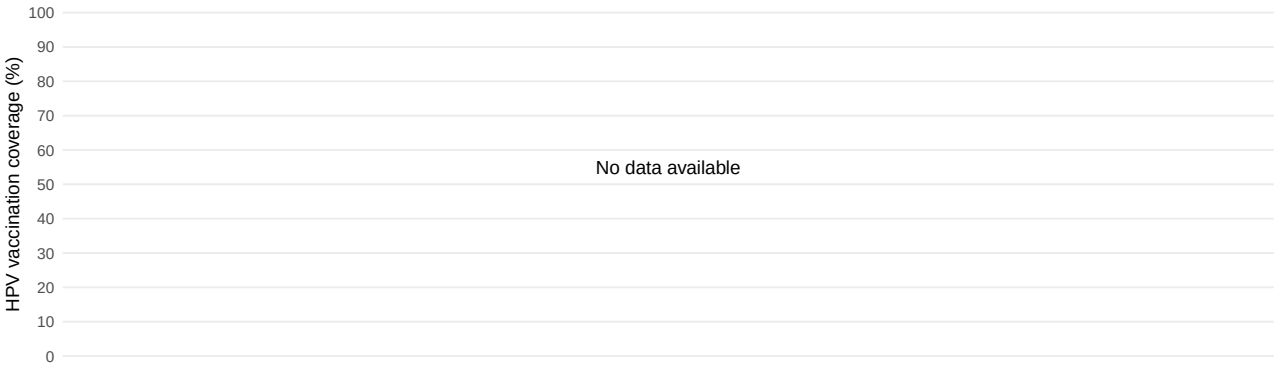
[a] 2 doses: 0-6m if not otherwise stated. Since 2014, based on clinical trials results several agencies responsible for the scientific evaluation of medicines, like the European Medicines Agency, aproved a two-dose schedule for girls aged less than 15 or 14 depending on the vaccine (Cervarix or Gardasil).

[b] 3-doses standard: administration of three doses following the standard vaccination schedule as 0-2-6 months for the quadrivalent vaccine or 0-1-6 months for the bivalent vaccine.

Data sources:

[1] Adapted from Bruni et al 2016 Lancet Global Health (data up to October 2014).

Figure 49: Reported HPV vaccination coverage in females by birth cohort in National HPV Immunization programme in Prince Edward Island (Canada)



Data updated on 11 Jul 2017 (data as of 31 Oct 2014)

Data sources:

[1] Adapted from Bruni et al 2016 Lancet Global Health (data up to October 2014).

[2] BC Centre for Disease Control. Immunization Programs & Vaccine Preventable Diseases Service. Immunization Uptake in Grade 6 Students. 2002-13

[3] BC Centre for Disease Control. Immunization Programs & Vaccine Preventable Diseases Service. Immunization Uptake in Grade 9 Students. 2002-13

[4] Canadian immunization commitee, Public Health Agency of Canada. Recommendations for human papillomavirus immunization programs. 2014.

[5] LaJeunesse C. HPV vaccine: Exploring less than favourable uptake. Western Canada Immunization Forum Mar 5 & 6 2014.

[6] Nova Scotia Department of Health and Wellness. Population Health Assessment and Surveillance.School-based immunization coverage in Nova Scotia: 2008-09 to 2011-12

[7] Ontario Agency for Health Protection and Promotion. Lim GH, McIntyre MA, Wilson S. Immunization coverage and exemptions among Ontario's school pupils for 2011–12: Findings and implications for future information systems. PHO Ground Rounds August 20, 2013

[8] Public Health Agency of Canada. Vaccine Coverage in Canadian Children: Results from the 2011 Childhood National Immunization Coverage Survey n.d. http://www.phac-aspc.gc.ca/im/nics-enva/vccc-cvec-eng.php

[9] Shearer BD, HPV Vaccination: Understanding the Impact on HPV Disease. National Collaborating Centre for Infectious Diseases. Purple Paper Dec 2011; Issue 34.

[10] Wilson SE, Harris T, Sethi P, Fediurek J, Macdonald L, Deeks SL. Coverage from Ontario, Canada's school-based HPV vaccine program: the first three years. Vaccine 2013;31:757–62.

Table 49: National HPV Immunization programme in Quebec (Canada)

	Female	Male
Year of introduction	2008	-
Primary target age (years)	9-10	-
Organized catch-up age (years)	-	-
Opportunistic catch-up age (years)	<18 years and 18-26 immunosupressed or HIV positives	9-26 (immunosupressed or HIV positive)
Strategy	Sch. (Grade 4)	-
Schedule[a,b]	2-doses	-

Since 2008, Québec has used a 0, 6 and 60 month school based extended HPV vaccine schedule for girls in grade 4. The provision of the 3rd dose of the HPV vaccine to grade 9 girls was to commence in 2013. However, Québec's HPV vaccine schedule was updated

Data updated on 11 Jul 2017 (data as of 31 Dec 2016)

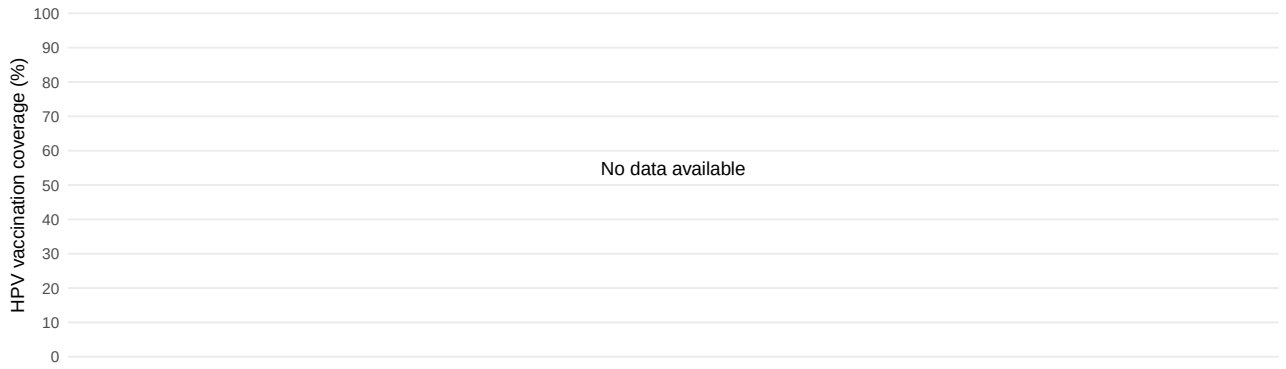
[a] 2 doses: 0-6m if not otherwise stated. Since 2014, based on clinical trials results several agencies responsible for the scientific evaluation of medicines, like the European Medicines Agency, aproved a two-dose schedule for girls aged less than 15 or 14 depending on the vaccine (Cervarix or Gardasil).

[b] 3-doses standard: administration of three doses following the standard vaccination schedule as 0-2-6 months for the quadrivalent vaccine or 0-1-6 months for the bivalent vaccine.

Data sources:

[1] Adapted from Bruni et al 2016 Lancet Global Health (data up to October 2014).

Figure 50: Reported HPV vaccination coverage in females by birth cohort in National HPV Immunization programme in Quebec (Canada)



Data updated on 11 Jul 2017 (data as of 31 Oct 2014)

Data sources:

[1] Adapted from Bruni et al 2016 Lancet Global Health (data up to October 2014).

[2] BC Centre for Disease Control. Immunization Programs & Vaccine Preventable Diseases Service. Immunization Uptake in Grade 6 Students. 2002-13

[3] BC Centre for Disease Control. Immunization Programs & Vaccine Preventable Diseases Service. Immunization Uptake in Grade 9 Students. 2002-13

[4] Canadian immunization commitee, Public Health Agency of Canada. Recommendations for human papillomavirus immunization programs. 2014.

[5] LaJeunesse C. HPV vaccine: Exploring less than favourable uptake. Western Canada Immunization Forum Mar 5 & 6 2014.

[6] Nova Scotia Department of Health and Wellness. Population Health Assessment and Surveillance.School-based immunization coverage in Nova Scotia: 2008-09 to 2011-12

[7] Ontario Agency for Health Protection and Promotion. Lim GH, McIntyre MA, Wilson S. Immunization coverage and exemptions among Ontario's school pupils for 2011–12: Findings and implications for future information systems. PHO Ground Rounds August 20, 2013

[8] Public Health Agency of Canada. Vaccine Coverage in Canadian Children: Results from the 2011 Childhood National Immunization Coverage Survey n.d. http://www.phac-aspc.gc.ca/im/nics-enva/vccc-cvec-eng.php

[9] Shearer BD, HPV Vaccination: Understanding the Impact on HPV Disease. National Collaborating Centre for Infectious Diseases. Purple Paper Dec 2011; Issue 34.

[10] Wilson SE, Harris T, Sethi P, Fediurek J, Macdonald L, Deeks SL. Coverage from Ontario, Canada's school-based HPV vaccine program: the first three years. Vaccine 2013;31:757–62.

Table 50: National HPV Immunization programme in Saskatchewan (Canada)

	Female	Male
Year of introduction	2008	-
Primary target age (years)	11-12	-
Organized catch-up age (years)	-	-
Opportunistic catch-up age (years)	-	-
Strategy	Sch. (Grade 6)	-
Schedule[a,b]	3-doses standard	-
Catch-up program for grade 7 during 2008-9 (girls 12-13)		

Data updated on 11 Jul 2017 (data as of 31 Dec 2016)

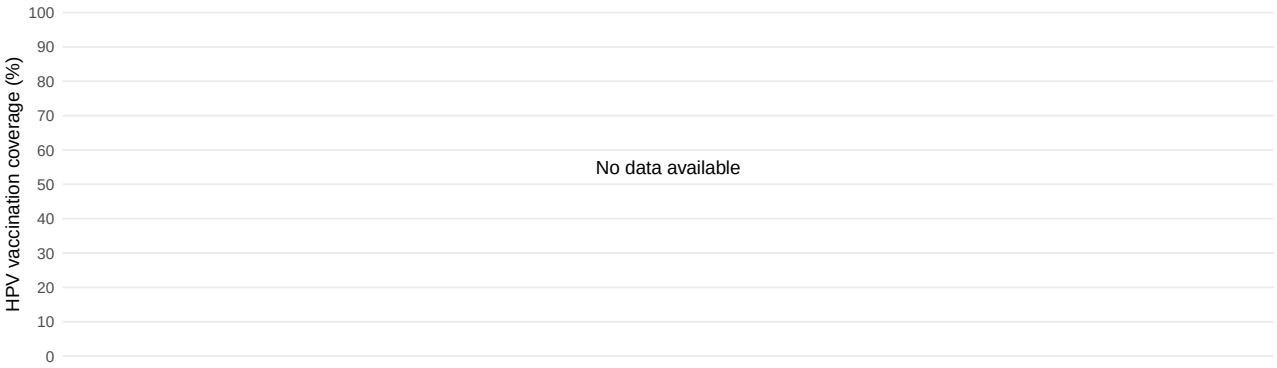
[a] 2 doses: 0-6m if not otherwise stated. Since 2014, based on clinical trials results several agencies responsible for the scientific evaluation of medicines, like the European Medicines Agency, aproved a two-dose schedule for girls aged less than 15 or 14 depending on the vaccine (Cervarix or Gardasil).

[b] 3-doses standard: administration of three doses following the standard vaccination schedule as 0-2-6 months for the quadrivalent vaccine or 0-1-6 months for the bivalent vaccine.

Data sources:

[1] Adapted from Bruni et al 2016 Lancet Global Health (data up to October 2014).

Figure 51: Reported HPV vaccination coverage in females by birth cohort in National HPV Immunization programme in Saskatchewan (Canada)



Data updated on 11 Jul 2017 (data as of 31 Oct 2014)

Data sources:

[1] Adapted from Bruni et al 2016 Lancet Global Health (data up to October 2014).

[2] BC Centre for Disease Control. Immunization Programs & Vaccine Preventable Diseases Service. Immunization Uptake in Grade 6 Students. 2002-13

[3] BC Centre for Disease Control. Immunization Programs & Vaccine Preventable Diseases Service. Immunization Uptake in Grade 9 Students. 2002-13

[4] Canadian immunization commitee, Public Health Agency of Canada. Recommendations for human papillomavirus immunization programs. 2014.

[5] LaJeunesse C. HPV vaccine: Exploring less than favourable uptake. Western Canada Immunization Forum Mar 5 & 6 2014.

[6] Nova Scotia Department of Health and Wellness. Population Health Assessment and Surveillance.School-based immunization coverage in Nova Scotia: 2008-09 to 2011-12

[7] Ontario Agency for Health Protection and Promotion. Lim GH, McIntyre MA, Wilson S. Immunization coverage and exemptions among Ontario's school pupils for 2011–12: Findings and implications for future information systems. PHO Ground Rounds August 20, 2013

[8] Public Health Agency of Canada. Vaccine Coverage in Canadian Children: Results from the 2011 Childhood National Immunization Coverage Survey n.d. http://www.phac-aspc.gc.ca/im/nics-enva/vccc-cvec-eng.php

[9] Shearer BD, HPV Vaccination: Understanding the Impact on HPV Disease. National Collaborating Centre for Infectious Diseases. Purple Paper Dec 2011; Issue 34.

[10] Wilson SE, Harris T, Sethi P, Fediurek J, Macdonald L, Deeks SL. Coverage from Ontario, Canada's school-based HPV vaccine program: the first three years. Vaccine 2013;31:757–62.

Table 51: National HPV Immunization programme in Yukon (Canada)

	Female	Male
Year of introduction	2009	-
Primary target age (years)	11-12	-
Organized catch-up age (years)	-	-
Opportunistic catch-up age (years)	-	-
Strategy	Sch. (Grade 6)	-
Schedule[a,b]	3-doses standard	-

Catch-up program for grades 7 and 8 during 2009-10 (girls 12-14). Free to girls 9-18 from 2011 to 2013.

Data updated on 11 Jul 2017 (data as of 31 Dec 2016)

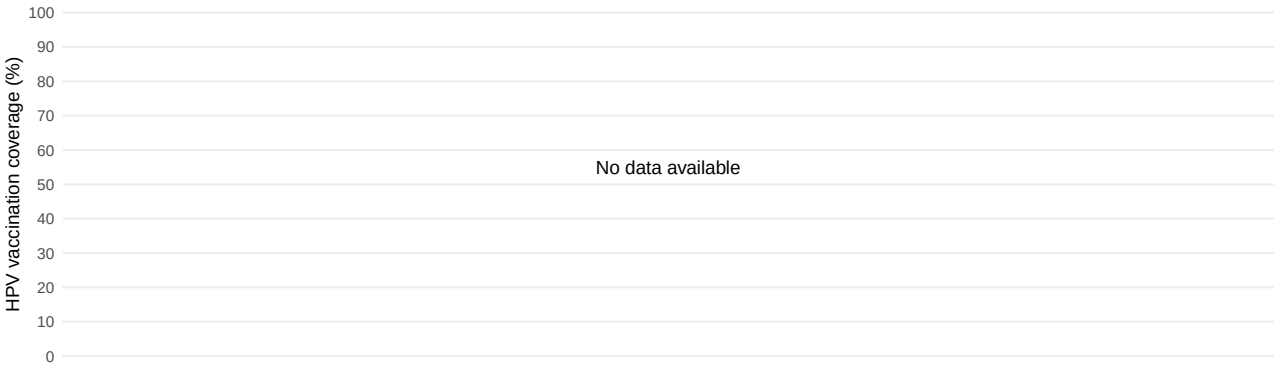
[a] 2 doses: 0-6m if not otherwise stated. Since 2014, based on clinical trials results several agencies responsible for the scientific evaluation of medicines, like the European Medicines Agency, aproved a two-dose schedule for girls aged less than 15 or 14 depending on the vaccine (Cervarix or Gardasil).

[b] 3-doses standard: administration of three doses following the standard vaccination schedule as 0-2-6 months for the quadrivalent vaccine or 0-1-6 months for the bivalent vaccine.

Data sources:

[1] Adapted from Bruni et al 2016 Lancet Global Health (data up to October 2014).

Figure 52: Reported HPV vaccination coverage in females by birth cohort in National HPV Immunization programme in Yukon (Canada)



Data updated on 11 Jul 2017 (data as of 31 Oct 2014)

Data sources:

[1] Adapted from Bruni et al 2016 Lancet Global Health (data up to October 2014).

[2] BC Centre for Disease Control. Immunization Programs & Vaccine Preventable Diseases Service. Immunization Uptake in Grade 6 Students. 2002-13

[3] BC Centre for Disease Control. Immunization Programs & Vaccine Preventable Diseases Service. Immunization Uptake in Grade 9 Students. 2002-13

[4] Canadian immunization commitee, Public Health Agency of Canada. Recommendations for human papillomavirus immunization programs. 2014.

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8 Protective factors for cervical cancer

Male circumcision and the use of condoms have shown a significant protective effect against HPV transmission.

Table 52: Prevalence of male circumcision in Canada

Reference	Prevalence % (95% CI)	Methods
Ogilvie 2009	50.4 (44.2-56.6)	N=262: STD Clinics patients
Quayle 2003	80.5 (79.4-81.6)	N=4,992: Children undergoing circumcision between january 1997 - december 2001 in a communitary hospital
WHO 2007	20-80	Data from Demographic and Health Surveys (DHS) and other publications to categorize the country-wide prevalence of male circumcision as <20%, 20-80%, or >80%.

Data accessed on 31 Aug 2015.
95% CI: 95% Confidence Interval;
Please refer to country-specific reference(s) for full methodologies.
Data sources:
Based on systematic reviews and meta-analysis performed by ICO. The ICO HPV Information Centre has updated data until August 2015. Reference publication: Albero G, Sex Transm Dis. 2012 Feb;39(2):104-13.
Ogilvie GS, Sex Transm Infect 2009; 85: 221 | Quayle SS, J Urol 2003; 170: 1533 | WHO 2007: Male circumcision: Global trends and determinants of prevalence, safety and acceptability

Table 53: Prevalence of condom use in Canada

Indicator	Year of estimate	Prevalence %[a]
Condom use	2006	54.3

Data accessed on 21 Mar 2017.
Please refer to original source for methods of estimation.
[a] Condom use: Proportion of male partners who are using condoms with their female partners of reproductive age (15-49 years) to whom they are married or in union by country.
Data sources:
United Nations, Department of Economic and Social Affairs, Population Division (2016). World Contraceptive Use 2016 (POP/DB/CP/Rev2016). http://www.un.org/en/development/desa/population/publications/dataset/contraception/wcu2016.shtml. Available at: [Accessed on March 22, 2017].
Canada 2006 Contraceptive Studies

9 Indicators related to immunisation practices other than HPV vaccines

This section presents data on immunisation coverage and practices for selected vaccines. This information will be relevant for assessing the country's capacity to introduce and implement the new HPV vaccines. The data are periodically updated and posted on the WHO Immunisation surveillance, assessment and monitoring website at http://who.int/immunization_monitoring/en/.

9.1 Immunisation schedule

Table 54: General immunization schedule in Canada

Vaccine	Schedule	Coverage[a]	Comment
Bacille Calmette-Guérin vaccine	-	-	BCG-Infants & children belonging to groups with high rates of infection
Hexavalent diphtheria, tetanus toxoid with acellular pertussis, Hib, hepatitis B and IPV vaccine	2, 4, 6 months;	-	-
Diphtheria and tetanus toxoid with acellular pertussis, Hib and IPV vaccine	2, 4, 6, 18 months;	-	-
Diphtheria and tetanus toxoid with acellular pertussis, and IPV vaccine	4-6 years;	entire	-
Hepatitis A vaccine	-	-	high risk groups
Hepatitis B vaccine	-	-	Early infancy (3 doses) or pre-teen (2-3 doses)
Human Papillomavirus vaccine	1st contact; +2, +6 months;	entire	-
Influenza vaccine	> 6 months; > 18 years;	entire	-
Meningococcal C conjugate vaccine	-	entire	Infancy (1-4 doses) and pre-teen (1 dose)
Measles mumps and rubella vaccine	12, 18 months; or 4-6 years;	entire	-
Pneumococcal conjugate vaccine	2, 4, 6, 12-16 months;	entire	-
Pneumococcal polysaccharide vaccine	>=65 years;	entire	-
Rotavirus vaccine	2, 4, 6 months;	entire	-
Tetanus and diphtheria toxoid for older children / adults vaccube	-	-	every 10 years for those who have completed primary series
Tetanus and diphtheria toxoids and acellular pertussis vaccine	14-16 years;	entire	-
Varicella vaccine	12 months; 18 months or 4-6 years;	entire	Recommended for susceptible older children, adolescents and adults

Data accessed on 27 Jan 2017.
The shedules are the country official reported figures
[a] Entire:introduced in the entire country. Part:partially introduced.
Data sources:
Annual WHO/UNICEF Joint Reporting Form (Update of 2015/July/15). Geneva, Immunization, Vaccines and Biologicals (IVB), World Health Organization. Available at: http://www.who.int/immunization/monitoring_surveillance/en/

9.2 Immunisation coverage estimates

Table 55: Immunization coverage estimates in Canada

Indicator	Year of estimation	Coverage (%)
Third dose of diphtheria toxoid, tetanus toxoid and pertussis vaccine	2015	91
Third dose of hepatitis B vaccine administered to infants	2015	55
Third dose of Haemophilus influenzae type B vaccine	2015	91
Measles-containing vaccine	2015	90
Third dose of polio vaccine	2015	91

Data accessed on 27 Jan 2017.

The coverage figures (%) are the country official reported figures. Immunization coverage levels are presented as a percentage of a target population that has been vaccinated.

Data sources:

Annual WHO/UNICEF Joint Reporting Form and WHO Regional offices reports (Update of 2015/July/16). Geneva, Immunization, Vaccines and Biologicals (IVB),World Health Organization. Available at: http://www.who.int/immunization/monitoring_surveillance/en/

10 Glossary

Table 56: Glossary

Term	Definition
Incidence	Incidence is the number of new cases arising in a given period in a specified population. This information is collected routinely by cancer registries. It can be expressed as an absolute number of cases per year or as a rate per 100,000 persons per year (see Crude rate and ASR below). The rate provides an approximation of the average risk of developing a cancer.
Mortality	Mortality is the number of deaths occurring in a given period in a specified population. It can be expressed as an absolute number of deaths per year or as a rate per 100,000 persons per year.
Prevalence	The prevalence of a particular cancer can be defined as the number of persons in a defined population who have been diagnosed with that type of cancer, and who are still alive at the end of a given year, the survivors. Complete prevalence represents the number of persons alive at certain point in time who previously had a diagnosis of the disease, regardless of how long ago the diagnosis was, or if the patient is still under treatment or is considered cured. Partial prevalence , which limits the number of patients to those diagnosed during a fixed time in the past, is a particularly useful measure of cancer burden. Prevalence of cancers based on cases diagnosed within one, three and five are presented as they are likely to be of relevance to the different stages of cancer therapy, namely, initial treatment (one year), clinical follow-up (three years) and cure (five years). Patients who are still alive five years after diagnosis are usually considered cured since the death rates of such patients are similar to those in the general population. There are exceptions, particularly breast cancer. Prevalence is presented for the adult population only (ages 15 and over), and is available both as numbers and as proportions per 100,000 persons.
Crude rate	Data on incidence or mortality are often presented as rates. For a specific tumour and population, a crude rate is calculated simply by dividing the number of new cancers or cancer deaths observed during a given time period by the corresponding number of person years in the population at risk. For cancer, the result is usually expressed as an annual rate per 100,000 persons at risk.
ASR (age-standardised rate)	An age-standardised rate (ASR) is a summary measure of the rate that a population would have if it had a standard age structure. Standardization is necessary when comparing several populations that differ with respect to age because age has a powerful influence on the risk of cancer. The ASR is a weighted mean of the age-specific rates; the weights are taken from population distribution of the standard population. The most frequently used standard population is the World Standard Population. The calculated incidence or mortality rate is then called age-standardised incidence or mortality rate (world). It is also expressed per 100,000. The world standard population used in GLOBOCAN is as proposed by Segi [1] and modified by Doll and al. [2]. The age-standardised rate is calculated using 10 age-groups. The result may be slightly different from that computed using the same data categorised using the traditional 5 year age bands.
Cumulative risk	Cumulative incidence/mortality is the probability or risk of individuals getting/dying from the disease during a specified period. For cancer, it is expressed as the number of new born children (out of 100, or 1000) who would be expected to develop/die from a particular cancer before the age of 75 if they had the rates of cancer observed in the period in the absence of competing causes.
Cytologically normal women	No abnormal cells are observed on the surface of their cervix upon cytology.

(Continued)

Table 56 – Continued

Term	Definition
Cervical Intraepithelial Neoplasia (CIN) / Squamous Intraepithelial Lesions (SIL)	SIL and CIN are two commonly used terms to describe precancerous lesions or the abnormal growth of squamous cells observed in the cervix. SIL is an abnormal result derived from cervical cytological screening or Pap smear testing. CIN is a histological diagnosis made upon analysis of cervical tissue obtained by biopsy or surgical excision. The condition is graded as CIN 1, 2 or 3, according to the thickness of the abnormal epithelium (1/3, 2/3 or the entire thickness).
Low-grade cervical lesions (LSIL/CIN-1)	Low-grade cervical lesions are defined by early changes in size, shape, and number of ab-normal cells formed on the surface of the cervix and may be referred to as mild dysplasia, LSIL, or CIN-1.
High-grade cervical lesions (HSIL / CIN-2 / CIN-3 / CIS)	High-grade cervical lesions are defined by a large number of precancerous cells on the sur-face of the cervix that are distinctly different from normal cells. They have the potential to become cancerous cells and invade deeper tissues of the cervix. These lesions may be referred to as moderate or severe dysplasia, HSIL, CIN-2, CIN-3 or cervical carcinoma in situ (CIS).
Carcinoma in situ (CIS)	Preinvasive malignancy limited to the epithelium without invasion of the basement membrane. CIN 3 encompasses the squamous carcinoma in situ.
Invasive cervical cancer (ICC) / Cervical cancer	If the high-grade precancerous cells invade the basement membrane is called ICC. ICC stages range from stage I (cancer is in the cervix or uterus only) to stage IV (the cancer has spread to distant organs, such as the liver).
Invasive squamous cell carcinoma	Invasive carcinoma composed of cells resembling those of squamous epithelium
Adenocarcinoma	Invasive tumour with glandular and squamous elements intermingled.
Eastern Europe	References included in Belarus, Bulgaria, Czech Republic, Hungary, Poland, Republic of Moldova, Romania, Russian Federation, Slovakia, and Ukraine.
Northern Europe	References included in Denmark, Estonia, Finland, Iceland, Ireland, Latvia, Lithuania, Norway, Sweden, and United Kingdom of Great Britain and Northern Ireland.
Southern Europe	References included in Albania, Bosnia and Herzegovina, Croatia, Greece, Italy, Malta, Montenegro, Portugal, Serbia, Slovenia, Spain, The former Yugoslav Republic of Macedonia.
Western Europe	References included in Austria, Belgium, France, Germany, Liechtenstein, Luxembourg, Netherlands, and Switzerland.
Europe PREHDICT	References included in Albania, Austria, Belarus, Belgium, Bosnia and Herzegovina, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Israel, Italy, Latvia, Liechtenstein, Lithuania, Luxembourg, Malta, Montenegro, Netherlands, Norway, Poland, Portugal, Republic of Moldova, Romania, Russian Federation, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, The former Yugoslav Republic of Macedonia, Turkey, Ukraine, and United Kingdom of Great Britain and Northern Ireland.

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Institut Català d'Oncologia (ICO), in alphabetic order
Albero G, Barrionuevo-Rosas L, Bosch FX, Bruni L, de Sanjosé S, Gómez D, Mena M, Muñoz J, Serrano B.

7th Framework Programme grant PREHDICT project: health-economic modelling of PREvention strategies for Hpv-related Diseases in European CounTries. Coordinated by Drs. Johannes Berkhof and Chris Meijer at VUMC, Vereniging Voor Christelijk Hoger Onderwijs Wetenschappelijk Onderzoek En Patientenzorg, the Netherlands.
(http://cordis.europa.eu/projects/rcn/94423_en.html)

7th Framework Programme grant HPV AHEAD project: Role of human papillomavirus infection and other co-factors in the aetiology of head and neck cancer in India and Europe. Coordinated by Dr. Massimo Tommasino at IARC, International Agency of Research on Cancer, Lyon, France.
(http://cordis.europa.eu/project/rcn/100268_en.html)

International Agency for Research on Cancer (IARC)

Note to the reader

Anyone who is aware of relevant published data that may not have been included in the present report is encouraged to contact the HPV Information Centre for potential contributions.

Although efforts have been made by the HPV Information Centre to prepare and include as accurately as possible the data presented, mistakes may occur. Readers are requested to communicate any errors to the HPV Information Centre, so that corrections can be made in future volumes.

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Contact information:

ICO/IARC HPV Information Centre
Institut Català d'Oncologia
Avda. Gran Via de l'Hospitalet, 199-203
08908 L'Hospitalet de Llobregat (Barcelona, Spain)
e-mail: info@hpvcentre.net
internet adress: www.hpvcentre.net