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Immunization Coverage Report for School Pupils in Ontario

2018–19 School Year

Technical Report

August 2020

Public Health Ontario

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Contents

Introduction

Immunization Coverage

Immunization coverage refers to the proportion of a population that is appropriately immunized against a vaccine-preventable disease (VPD) at a point in time. Achieving and maintaining high immunization coverage is essential for the effective prevention and control of VPDs. Accurate and timely immunization coverage assessment is essential to evaluate immunization programs, predict population-level susceptibility to VPDs and identify sub-populations with inadequate coverage that may be at risk of VPD outbreaks. The Canadian National Standards for Immunization Coverage Assessment recommend that antigen-level coverage should be reported annually for 2-, 7- and 17-year-olds, as well as for school-age programs.[1]

Publicly-Funded Immunization Programs

In Ontario, publicly-funded immunization programs are available for healthy infants, children, adolescents and adults, as well as high-risk individuals with particular medical conditions, behavioural risk factors or high-risk exposures.[2] Vaccines administered to infants and young children are predominantly delivered by community-based primary health care providers, while adolescent vaccines are largely delivered by public health units (PHUs) through school-based immunization programs.

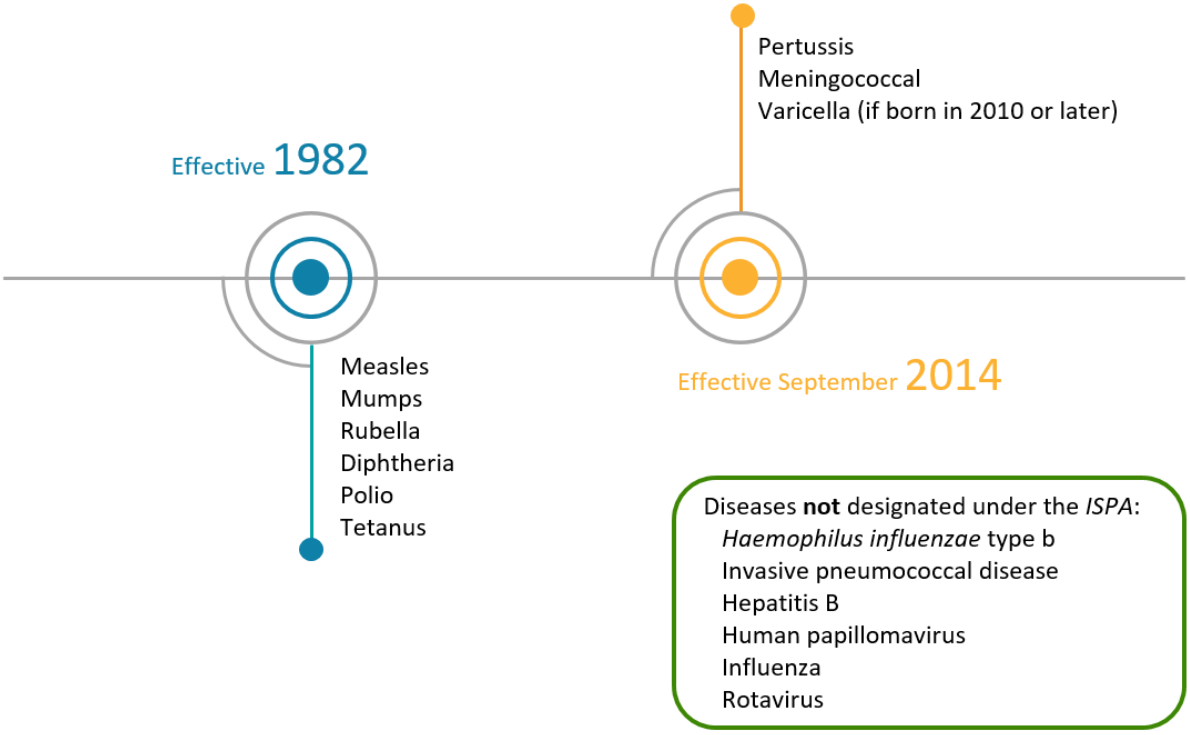
Immunization of School Pupils Act

Ontario's *Immunization of School Pupils Act* (ISPA)[3,4] directs Medical Officers of Health (MOHs) of PHUs to maintain a record of immunization for designated diseases for each pupil attending school in their jurisdiction (Figure 1). Students can be suspended if they do not receive immunizations against ISPA-designated diseases or if documentation of a medical exemption or religious/conscientious (also referred to as non-medical) exemption is not provided.[3,4] As well, un-immunized and under-immunized students can be excluded from school if there is an outbreak or immediate risk of an outbreak of an ISPA-designated disease. Additionally Ontario's *Child Care and Early Years Act* (CCYEA), Ontario Regulation 37/15 requires child care operators to receive proof of immunization or a valid exemption for children who are enrolled in their child care programs and not otherwise subject to ISPA.[5,6]

Digital Health Immunization Repository

In Ontario, immunization records are maintained by PHUs in the Digital Health Immunization Repository (DHIR). Since the collection of immunization information in Ontario is driven by the ISPA and the CCYEA, the DHIR does not contain complete information for all immunizations administered to Ontario residents. As such, coverage for children before school-entry and coverage among adults cannot be assessed.

Figure 1. Designated diseases under the ISPA



Scope and Objectives

This year's report focuses on provincial highlights for immunization coverage for the 2018–19 school year. Highlights are further described in a Key Messages document. Additional details on PHU-specific estimates are found in the accompanying Data Tables.

The objectives of this report are:

- To present provincial and PHU-level immunization coverage estimates for the 2018–19 school year for Ontario's publicly-funded childhood immunization programs, with the exception of influenza and rotavirus vaccines.
- To describe trends in provincial immunization coverage over six school years.
- To describe non-medical and medical immunization exemptions for diseases designated under the ISPA for the 2018–19 school year.

Methods

Data for this report were obtained from the DHIR – the provincial immunization repository. Data collection in the DHIR is driven by the ISPA, as immunization information for students is collected from parents and guardians at the time of school enrolment and/or when school immunization assessment activities are carried out by PHUs.

> Please see the Technical Annex for a detailed description of the DHIR and methods used for the assessment of student immunization and exemption status, including details on cohort creation and up-to-date coverage assessment by age and antigen, as well as a description of the limitations.

Results

Public Health Unit Specific Estimates: Immunization Coverage for the 2018–19 School Year

> PHU-specific coverage estimates, as well as exemptions by antigen for Ontario and by PHU, can be found in the accompanying Data Tables.

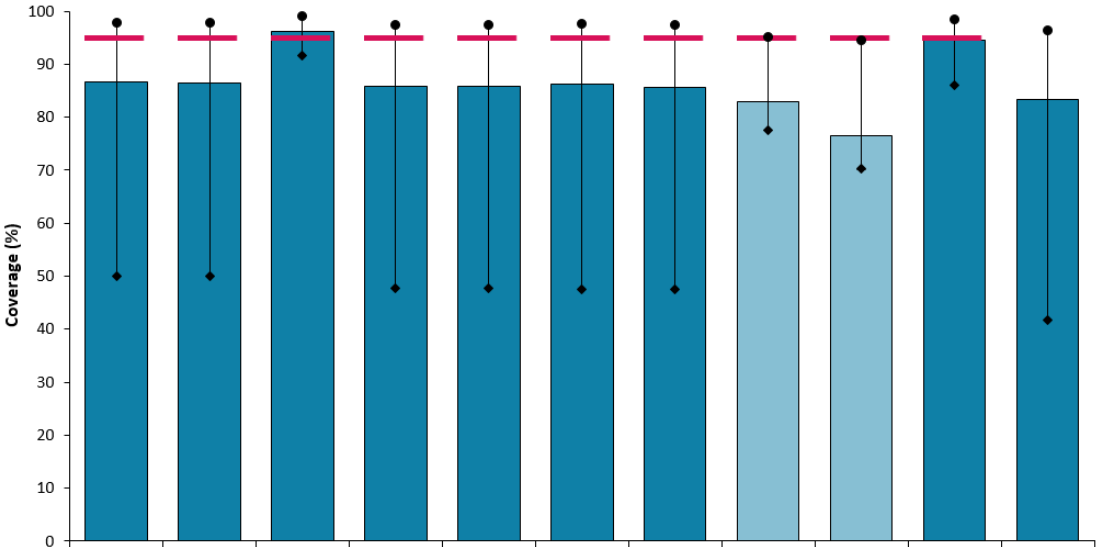
Provincial Highlights: Immunization Coverage for the 2018–19 School Year

> For most antigens, coverage estimates are below the 2025 **national goals**; however, many PHUs have local estimates that surpass national goals.
>
> **ISPA designation**, **the number of doses** in a series and **timing of assessment** are factors that affect coverage estimates.
>
> **Geographic variability** in coverage estimates across the province may highlight areas at increased risk of certain vaccine-preventable diseases.
>
> The combined **provincial estimates** for up-to-date coverage for **all ISPA-designated diseases** among 7- and 17-year-olds are 80.4% and 72.3%, respectively.
>
> The proportion of students registering **exemptions to immunization is low**.

Immunization Programs Started in Infancy and Early Childhood among 7- and 17-Year-Olds

Provincial estimates of immunization coverage for publicly-funded childhood immunization programs that started in infancy and early childhood and assessed children and adolescents 7 and 17 years of age for the 2018–19 school year are presented in Figure 2 and Figure 3.

Figure 2. Immunization coverage for programs started in infancy and early childhood among 7-year-olds in Ontario: 2018–19 school year

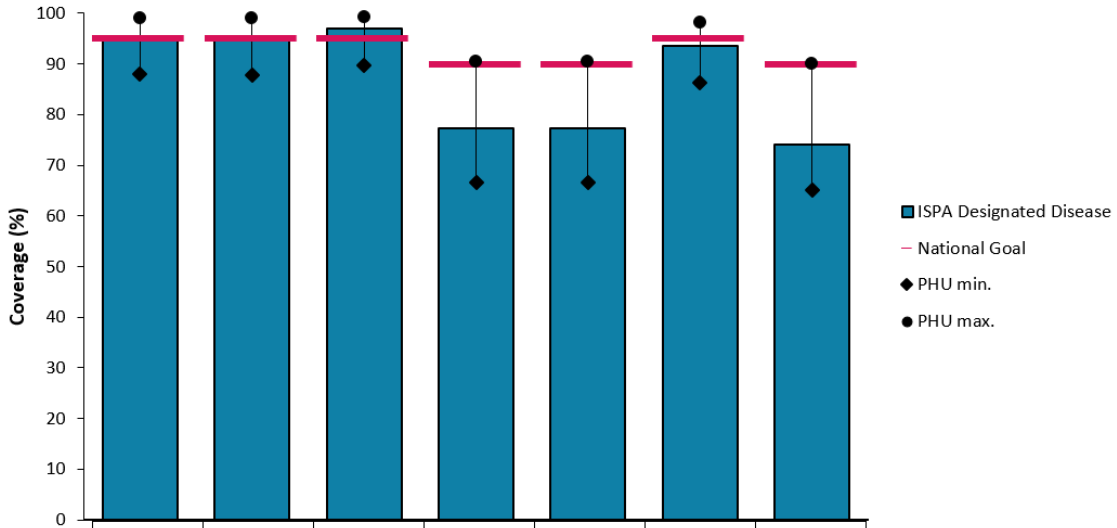


	Meas	Mumps	Rubella	Dip	Tet	Polio	Pertuss	Hib	Pneum	MCC	Var
Provincial Estimate	86.6	86.5	96.1	85.8	85.8	86.2	85.7	82.9	76.6	94.5	83.4

Notes:

- The diamonds and circles attached to the black bars represent the minimum and maximum PHU-specific estimates, respectively.
- Meas=Measles, Dip=Diphtheria, Tet=Tetanus, Pertuss=Pertussis, Hib=*Haemophilus influenzae* type b, Pneum=Pneumococcal, MCC=Meningococcal C conjugate, Var=Varicella
- National coverage goals (to be reached by 2025) are defined as:
    - Achieve 95% vaccination coverage by 7 years of age for the following childhood vaccines: five doses of diphtheria, tetanus and pertussis vaccine; four doses of polio vaccine; two doses of measles, mumps and rubella vaccine.
    - Achieve 95% vaccine coverage by two years of age for the following childhood vaccines: four doses of *Haemophilus influenzae* type b (Hib) vaccine; three or four doses of pneumococcal vaccine; one dose of meningococcal C vaccine.
    - There is no coverage goal for two-dose varicella coverage. A goal of 95% vaccination coverage by two years of age for one dose of varicella has been established.

Figure 3. Immunization coverage for programs started in infancy and early childhood among 17-year-olds in Ontario: 2018–19 school year



	Meas	Mumps	Rubella	Dip	Tet	Polio	Pertuss
Provincial Estimate	95.5	95.2	97.1	77.3	77.3	93.5	74.1

Notes:

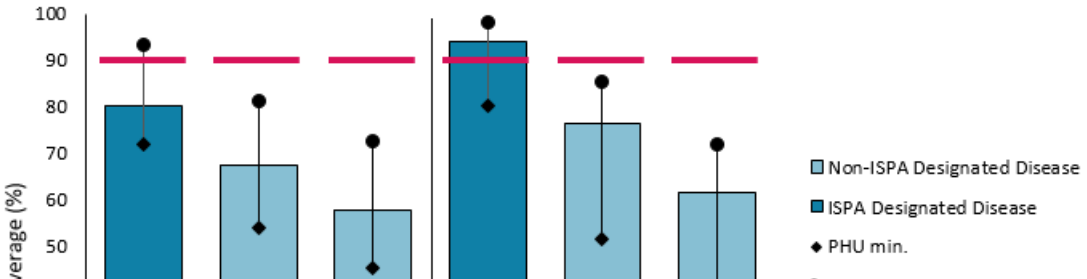
- The diamonds and circles attached to the black bars represent the minimum and maximum PHU-specific estimates, respectively.
- Meas=Measles, Dip=Diphtheria, Tet=Tetanus, Pertuss=Pertussis
- National coverage goals (to be reached by 2025) are defined as:
  - Achieve 95% vaccination coverage by 7 years of age for the following childhood vaccines: four doses of polio vaccine; two doses of measles, mumps and rubella vaccine.
  - Achieve 90% vaccination coverage by 17 years of age for the following adolescent vaccines: one dose of tetanus-diphtheria-pertussis booster vaccine (Tdap) given between 14 and 16 years of age.

School-Based Immunization Programs among 12- and 17-Year-Olds

Provincial coverage estimates for the three vaccine series (Hepatitis B, human papillomavirus (HPV) and quadrivalent meningococcal conjugate (MCV4)) administered to students in Grade 7 through Ontario's school-based immunization programs for the 2018–19 school year are shown in Figure 4. In this report, coverage is assessed at both 12 years of age and, for the first time, at 17 years of age. This analysis allows coverage assessment for school programs with extended eligibility.

For HPV, series initiation (the proportion of the eligible cohort that received only a single dose) and series completion (the proportion of the eligible cohort that complete the series) at ages 12 and 17 are shown in Figure 5.

Figure 4. Immunization coverage for school-based immunization programs among 12- and 17-year-olds in Ontario: 2018–19 school year

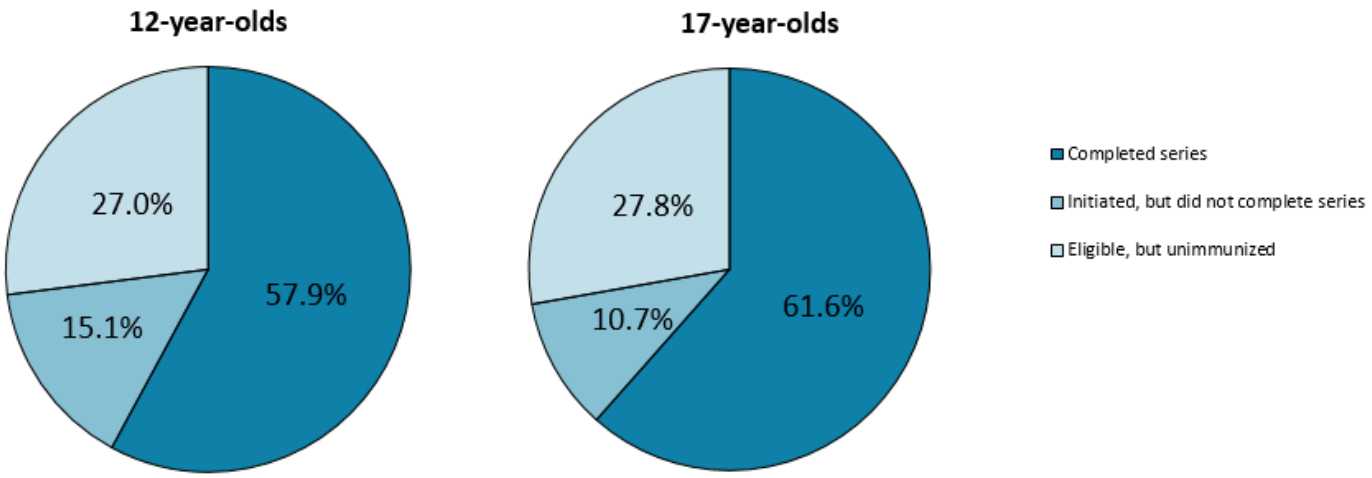


	12 year olds			17 year olds		
	MCV4	Hep B	HPV	MCV4	Hep B	HPV
Provincial Estimate	80.1	67.3	57.9	93.9	76.6	61.6

Notes:

- The diamonds and circles attached to the black bars represent the minimum and maximum PHU-specific estimates, respectively.
- MCV4=Quadrivalent meningococcal conjugate, Hep B = Hepatitis B virus, HPV=Human papillomavirus
- In the 2016–17 school year, the HPV program was expanded to include males, in addition to females who have been included in the program since the 2007–08 school year. Coverage is therefore assessed for all sexes for 12-year-olds and females only for 17-year-olds.
- National coverage goals (to be reached by 2025) are defined as:
    - Achieve 90% vaccination coverage by 17 years of age for the following adolescent vaccines: one dose of meningococcal vaccine; one or more doses of hepatitis B vaccine; two or more doses of human papillomavirus vaccine (HPV).
- Coverage estimates for Windsor and Essex County (WEC) are excluded from the PHU minimum and maximum for 12-year-olds, but are included in provincial coverage estimates. During the 2018–19 school year, WEC experienced a labour disruption that delayed delivery of 2018–19 school-based immunization programs that were subsequently delivered in the fall of the 2019–20 school year.

Figure 5. Series initiation and completion for human papillomavirus (HPV) immunization programs among 12- and 17-year-olds in Ontario: 2018–19 school year



Notes:

- Students who initiated the series received at least one valid dose of the vaccine series.
- Students who completed the series received all recommended doses for age.
- The HPV program was expanded to include males in the 2016–17 school year, prior to that the program included females only. Coverage is therefore assessed for all sexes for 12-year-olds and females only for 17-year-olds.

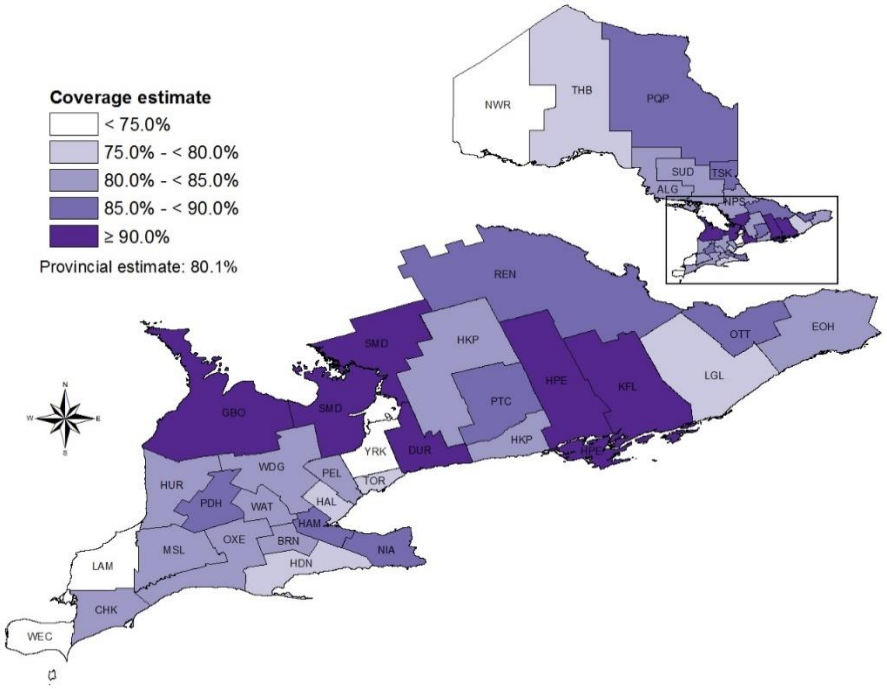
Provincial Immunization Coverage Estimates for Up-to-date for all ISPA-designated diseases

The combined provincial immunization coverage estimates for up-to-date coverage for all ISPA-designated diseases among 7- and 17-year-olds are 80.4% and 72.3%, respectively.

Geographic Distribution

One example of geographic distribution is provided below. PHU-specific coverage estimates for the school-based single-dose ISPA-designated MCV4 immunization program are displayed as a map in Figure 6. The figure highlights geographic variability in estimates for this program across the province despite less complex programmatic factors.

Figure 6. Immunization coverage for quadrivalent meningococcal conjugate vaccine (MCV4) among 12-year-olds by public health unit in Ontario: 2018–19 school year



Note:

- Health unit legend available in the Appendix.

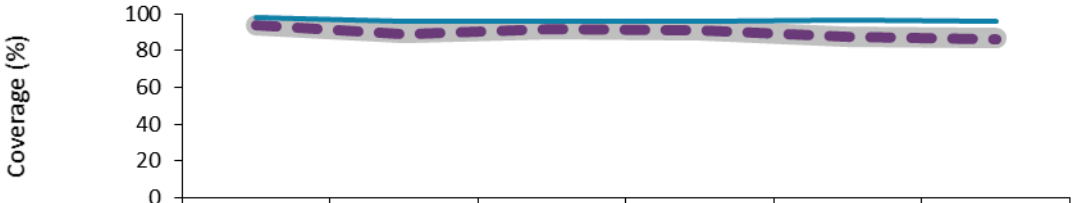
Temporal Trends in Immunization Coverage

Trends over time from the 2013–14 school year (when the up-to-date methodology was first used) to the 2018–19 school year for immunization programs that started in infancy and early childhood, as well as school-based immunization programs, are presented below in Figures 7a, 7b, 7c, Figures 8a, 8b and Figure 9.

Please note that antigens included in a multicomponent vaccine (e.g., measles, mumps and rubella containing-vaccines) may have very similar antigen-specific coverage estimates, as seen in the overlapping lines in some graphs in this section.

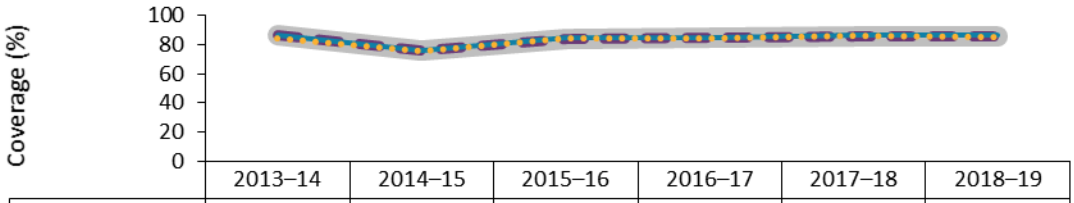
Immunization Programs Started in Infancy and Early Childhood among 7-Year-Olds

Figure 7a. Measles, mumps and rubella immunization coverage among 7-year-olds in Ontario: 2013–14 to 2018–19 school years



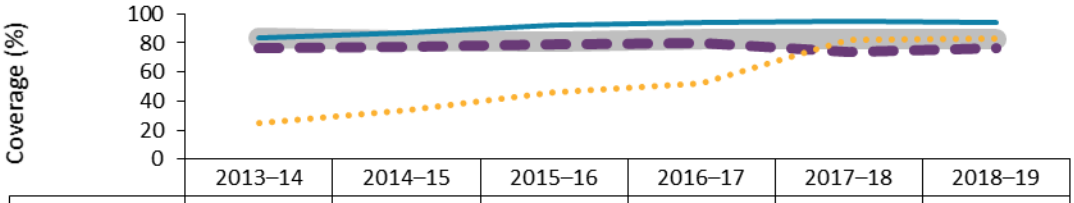
	2013–14	2014–15	2015–16	2016–17	2017–18	2018–19
Measles	94.0	89.4	91.8	91.2	87.6	86.6
Mumps	93.6	89.1	91.6	91.1	87.4	86.5
Rubella	98.2	96.1	95.9	96.2	96.4	96.1

Figure 7b. Diphtheria, tetanus, polio and pertussis immunization coverage among 7-year-olds in Ontario: 2013–14 to 2018–19 school years



	2013–14	2014–15	2015–16	2016–17	2017–18	2018–19
Diphtheria	86.4	76.1	84.3	84.7	85.9	85.8
Tetanus	86.4	76.1	84.3	84.7	85.9	85.8
Polio	86.6	76.2	84.5	85.0	86.3	86.2
Pertussis	84.8	75.6	84.1	84.6	85.8	85.7

Figure 7c. *Haemophilus influenzae* type b (Hib), pneumococcal, meningococcal C conjugate (MCC) and varicella immunization coverage among 7-year-olds in Ontario: 2013–14 to 2018–19 school years



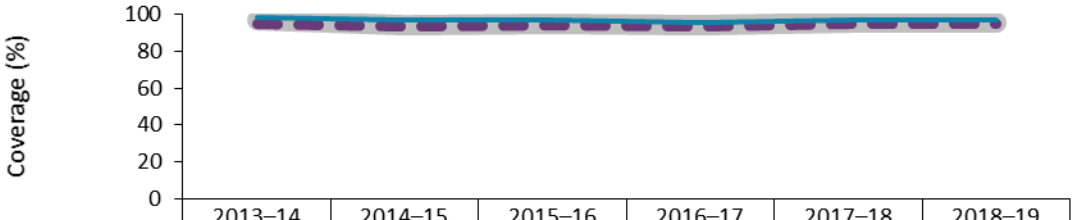
	2013–14	2014–15	2015–16	2016–17	2017–18	2018–19
Hib	83.1	81.4	81.3	82.2	82.4	82.9
Pneumo	76.6	77.3	79.0	79.7	74.1	76.6
MCC	83.5	87.2	92.1	94.2	94.7	94.5
Varicella	24.8	33.8	46.4	52.3	82.6	83.4

Note:

- Coverage estimates for previous school years are point-in-time estimates from previous annual reports and are not re-calculated, as new estimates are added for the current school year.

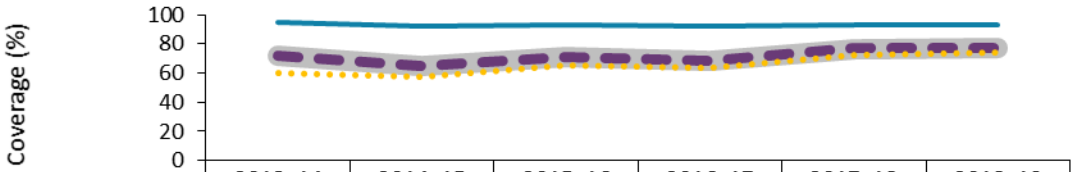
Immunization Programs Started in Infancy and Early Childhood among 17-Year-Olds

Figure 8a. Measles, mumps and rubella immunization coverage among 17-year-olds in Ontario: 2013–14 to 2018–19 school years



	2013–14	2014–15	2015–16	2016–17	2017–18	2018–19
Measles	96.7	94.3	94.6	94.0	95.3	95.5
Mumps	95.0	93.2	94.0	93.5	95.0	95.2
Rubella	98.5	96.7	96.9	95.8	97.1	97.1

Figure 8b. Diphtheria, tetanus, polio and pertussis immunization coverage among 17-year-olds in Ontario: 2013–14 to 2018–19 school years



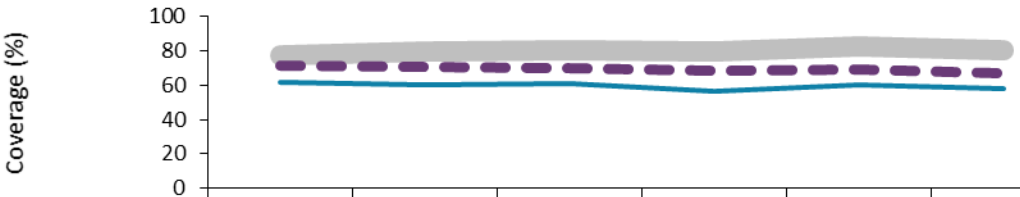
	2013–14	2014–15	2015–16	2016–17	2017–18	2018–19
Diphtheria	72.2	65.2	71.5	68.6	76.8	77.3
Tetanus	72.2	65.2	71.5	68.6	76.9	77.3
Polio	94.9	92.5	92.9	92.5	93.5	93.5
Pertussis	60.4	57.4	65.0	63.2	72.1	74.1

Note:

- Coverage estimates for previous school years are point-in-time estimates from previous annual reports and are not re-calculated, as new estimates are added for the current school year.

School-Based Immunization Programs among 12-Year-Olds

Figure 9. Immunization coverage for quadrivalent meningococcal conjugate vaccine (MCV4), human papillomavirus (HPV) and hepatitis B among 12-year-olds in Ontario: 2013–14 to 2018–19 school years



	2013–14	2014–15	2015–16	2016–17	2017–18	2018–19
MCV4	77.5	79.4	80.6	79.6	82.4	80.1
Hepatitis B	71.7	70.7	69.9	68.6	69.2	67.3
HPV	61.5	60.4	61.0	56.3	59.9	57.9

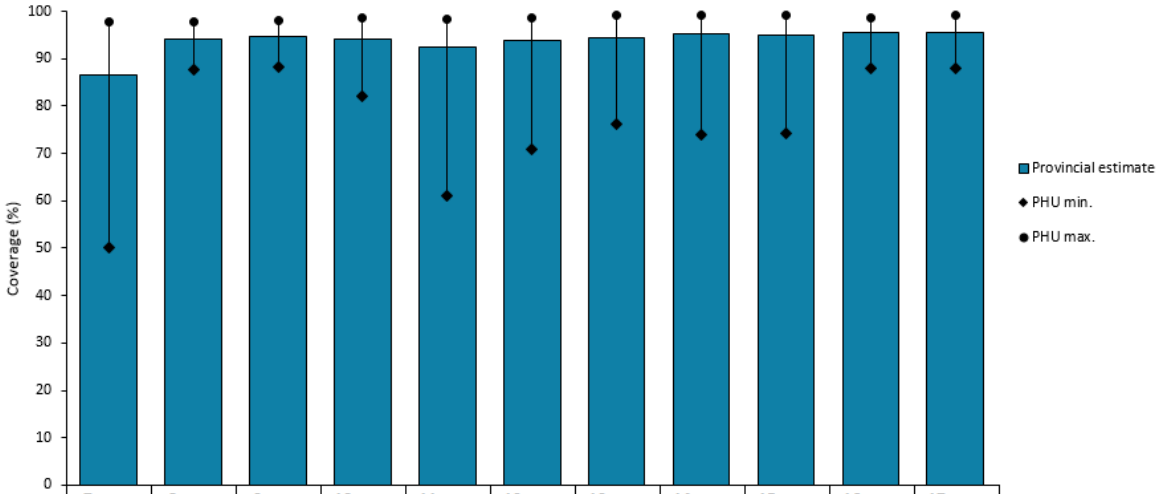
Notes:

- Coverage estimates for previous school years are point-in-time estimates from previous annual reports and are not re-calculated, as new estimates are added for the current school year.
- HPV coverage estimates for 2013–14 to 2015–16 school years represent 13-year-old female cohorts, whereas the 2016–17 school year represents 12-year-old male and females combined and the 2017–18 and 2018–19 school year represents all 12-year-old students (male, female and unknown gender combined). Students who completed either a valid two-dose or three-dose series were considered up-to-date for all assessment years.

Measles Coverage by Age at Time of Assessment

The following figure presents measles coverage for children between 7 and 17 years of age for the 2018–19 school year (Figure 10). This figure has been included to illustrate the impact of age at the time of assessment on coverage estimates, using measles as an example, as no further doses are recommended on or after the age of 7 years. As shown below, measles coverage assessed at 7 years of age is lower compared to all other ages.

Figure 10. Measles immunization coverage among 7- to 17-year-olds in Ontario: 2018–19 school year



	7 years	8 years	9 years	10 years	11 years	12 years	13 years	14 years	15 years	16 years	17 years
Provincial Estimate	86.6	94.2	94.6	94.1	92.5	94.0	94.5	95.2	95.1	95.7	95.5

Note:

- The diamonds and circles attached to the black bars represent the minimum and maximum PHU-specific estimates, respectively.
- Age shown is as of December 31, 2018, while immunizations administered and entered in the DHIR up to the end August 31, 2019 are included in the calculation of coverage estimates.

Immunization Exemptions

This section describes non-medical and medical exemptions to immunization. Non-medical exemptions include children with an exemption submitted due to conscientious objection or religious belief and medical exemptions include children with an exemption submitted due to a medical contraindication.

The percentage of 7-yearolds with a non-medical exemption for at least one ISPA-designated disease in the 2018–19 school year was 2.1% and the percent with a medical exemption was 0.6%. The percentage of 17-year-olds with a non-medical exemption for at least one ISPA-designated disease was 2.5% and the percent with a medical exemption was 0.3%.

Notes on Interpretation

There are a number of factors that influence coverage estimates presented in this report. Key factors are described below.

Ontario's Immunization System

Ontario's immunization system is complex and involves multiple providers and organizations within both the primary care and public health sectors. With the exception of the three school-based adolescent programs primarily delivered by local PHUs, the vast majority of infant and childhood immunizations are delivered by community-based health care providers.

Local PHUs obtain immunization information from parents and guardians, who are responsible for reporting their child's immunizations. Parents and guardians may only become aware of their responsibility to report this information when their child starts attending school or after being notified by their local PHU that their child is missing vaccine doses. As such, it is possible that some coverage estimates may be underestimates if not all vaccine doses administered have been captured within the DHIR.

The DHIR is a dynamic system, where immunization information is constantly updated. Thus, this report represents a snapshot in time of immunization coverage estimates in Ontario. This is most evident when comparing temporal trends in measles coverage among 7-year-olds from 2013–14 to 2017–18 (Figure 7a) and measles coverage among 8- to 12-year-olds in 2018–19 (Figure 10). As new information is added over time, measles coverage is generally higher among those 8 to 12 years of age for the most recent school year (2018–19) compared to estimates calculated when these cohorts were 7-year-olds in previous school years (Figure 7a).

ISPA-Designated Diseases

Diseases designated under the ISPA, such as measles and rubella, tend to have higher coverage than non-ISPA designated diseases, such as *Haemophilus influenzae* type b and pneumococcal disease. This trend is most evident among 7-year-olds where provincial estimates are lowest for *Haemophilus influenzae* type b and pneumococcal disease compared to the other antigens (Figure 2).

Further, the school-based immunization programs, particularly hepatitis B and HPV (neither of which are designated under the ISPA) have some of the lowest coverage estimates at the provincial-level, notably lower than the quadrivalent meningococcal vaccine (MCV4), which, although only a single dose, is designated under the ISPA (Figure 4).

Number of Doses

Coverage estimates are typically higher for one dose compared to multiple dose programs, regardless of ISPA designation. For example, coverage estimates for rubella and meningococcal C at age 7, which both require only a single dose, are among the highest in the province (Figure 2). Provincial coverage estimates for diphtheria, tetanus, pertussis and polio are lower as five doses are required to be considered up-to-date.

Timing of Assessment

Analysis of coverage for school-based programs for Grade 7 students (in particular HPV and Hepatitis B) does not incorporate doses delivered after Grade 7. Provincial coverage estimates are therefore higher for both HPV and Hepatitis B at 17 years of age compared to 12 years of age (Figure 4), which allows more time for vaccine delivery.

Geographic Variability

There is considerable variability in coverage estimates across PHUs, highlighting areas within the province with lower herd immunity and therefore greater risk for certain VPDs. Although programmatic factors, such as health unit follow-up of students to obtain immunization information may influence coverage, geographic variability persists also for the school-based programs that are implemented by PHUs. For example, meningococcal disease is a school-based immunization program delivered and entered into DHIR by PHUs for a disease designated under the ISPA and requires only one dose yet coverage estimates vary widely across PHUs (Figure 6).

National Coverage Goals

Ontario's provincial coverage estimates for the 2018–19 school year and Canada's national coverage goals are compared throughout the report. It should be noted that the national goals are set to be achieved by 2025, giving a number of years for them to be fully achieved. While provincial coverage estimates do not necessarily meet national coverage goals, many PHUs have local coverage estimates which surpassed the national goals for various antigens and ages assessed. There are some differences in the degree to which the national goals align with the provincial up-to-date coverage specifications (e.g., numbers of doses required), and these differences in specifications are an additional consideration when making comparisons between provincial estimates and national goals.

Immunization Exemptions

Monitoring trends in immunizations exemptions continues to be important to provide insight into vaccine hesitancy. The overall proportion of students with non-medical exemptions at the provincial level is low and medical exemptions are rare.

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Appendix: Public Health Unit Abbreviations

Table 1. Public Health Unit abbreviations

Code	Public Health Unit
ALG	Algoma Public Health
BRN	Brant County Health Unit
CHK	Chatham-Kent Public Health
DUR	Durham Region Health Department
EOH	Eastern Ontario Health Unit
GBO	Grey Bruce Health Unit
HAL	Halton Region Public Health
HAM	City of Hamilton Public Health Services
HDN	Haldimand-Norfolk Health Unit
HKP	Haliburton, Kawartha, Pine Ridge District Health Unit
HPE	Hastings Prince Edward Public Health
HUR	Huron County Health Unit
KFL	Kingston, Frontenac and Lennox & Addington Public Health
LAM	Lambton Public Health
LGL	Leeds, Grenville & Lanark District Health Unit
MSL	Middlesex-London Health Unit
NIA	Niagara Region Public Health
NPS	North Bay Parry Sound District Health Unit
NWR	Northwestern Health Unit
OTT	Ottawa Public Health
OXE	Southwestern Public Health

Code	Public Health Unit
PDH	Perth District Health Unit
PEL	Peel Public Health
PQP	Porcupine Health Unit
PTC	Peterborough Public Health
REN	Renfrew County and District Health Unit
SMD	Simcoe Muskoka District Health Unit
SUD	Public Health Sudbury & Districts
THB	Thunder Bay District Health Unit
TOR	Toronto Public Health
TSK	Timiskaming Health Unit
WAT	Region of Waterloo Public Health and Emergency Services
WDG	Wellington-Dufferin-Guelph Public Health
WEC	Windsor-Essex County Health Unit
YRK	York Region Public Health

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