

Vaccine Preventable Disease Monitoring Report Pertussis, 2015 and 2016

Report release date: May, 2017

Purpose:

The Saskatchewan Ministry of Health's Population Health Branch provides routine surveillance of notifiable diseases at the provincial and regional health authority (RHA), First Nations and Inuit Health Branch (FNIHB) and Northern Inter-Tribal Health Authority (NITHA) levels.

This report presents the most recent data for reportable communicable diseases as collected by the Integrated Public Health Information System (iPHIS) and immunization coverage information as collected by the Saskatchewan Immunization Management System (SIMS) and Panorama. Limitations associated with these systems have been described elsewhere.

Under *The Public Health Act, 1994* and the accompanying Disease Control Regulations, local medical health officers (MHOs) must report Categories I and II Communicable Diseases, as well as any communicable disease outbreaks to the Chief and Deputy Chief Medical Health Officers. Pertussis is a Category I disease.

Report Features:

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Background

Pertussis (whooping cough) is a highly contagious bacterial disease that begins with mild respiratory symptoms, cough and sometimes fever, and can progress to severe coughing attacks characterized by a "whoop sound" when a breath is taken.

Infants are the most vulnerable and are often infected by older siblings, parents or caregivers who may not know they have the disease. One to three deaths related to pertussis occur each year in Canada, particularly in infants who are too young to be immunized, or in unimmunized or partially immunized children. Deaths were not required to be reported prior to 2014, although it was common practice to do so. There was one infant death from 2011 to 2015.

Symptoms usually develop five to 10 days after exposure, but can take up to 21 days.

Pertussis is caused by the bacteria *Bordetella pertussis*. The bacteria are easily spread by droplets from the nose or mouth or through direct contact with the respiratory secretions of an infected person.

Pertussis becomes more active on a cyclical basis with increased cases being reported every two to five years. The variability in the number of pertussis cases from one year to the next and in different geographical regions is often because of outbreaks. Saskatchewan last experienced a peak year in 2015, with 213 cases.

Immunization

Acellular pertussis vaccine is only available in combination vaccines. The Saskatchewan Routine Childhood Immunization Schedule recommends a four dose primary series of pertussis vaccine at two, four, six and 18 months of age, one booster at four to six years of age and a second booster in Grade 8. Adults are eligible to receive one lifetime pertussis vaccine dose.

Transmission is less likely in or to people who are vaccinated. Adolescents and adults who have not

received a booster are at risk of infection and are often the source of infection for infants. Infants too young for vaccination are at the greatest risk for serious pertussis complications and deaths.

The efficacy of acellular pertussis vaccine following the primary series is estimated to be about 85%, and approximately 90% following booster immunization.

Surveillance

Under *The Public Health Act, 1994*, Saskatchewan health care providers are required to report cases of pertussis to the local medical health officer (MHO) who then reports the case to the Chief and Deputy Chief Medical Health Officers using the case definition in the Saskatchewan Communicable Disease Manual.

Notifiable diseases may be undetected, therefore underreported, due to a number of factors including lack of contact with the health care system or inability of laboratory tests to identify the organism. Some communicable diseases occur rarely and therefore, rates are based on small numbers of cases which can fluctuate dramatically over time. In these situations, year to year comparisons should be interpreted with caution.

Surveillance case definitions ensure uniform reporting to allow comparability of surveillance data. The definitions are not intended to be used for clinical or laboratory diagnosis or management of cases.

Currently molecular epidemiology genotyping is not available for pertussis.

EPIDEMIOLOGY SUMMARY

Pertussis in Saskatchewan: 2015

- Two hundred thirteen (213) cases of lab-confirmed pertussis were reported in 2015. Ages ranged from three weeks to 69 years.
- Community outbreaks occurred in four RHAs. One in a largely under-immunized community accounted for many of the cases. The highest rates of illness were in the health regions where outbreaks occurred: Saskatoon, Sunrise, Mamawetan Churchill River and Prairie North.
- Five of 19 infant cases were too young to be adequately protected by immunization. Another six cases who were eligible for vaccine had not started their primary immunization series.
- Six infants were hospitalized.
- There were no reported deaths from pertussis.

Pertussis in Saskatchewan: 2011 to 2015

- Three hundred sixty-one (361) cases of pertussis ranging in age from three weeks to 79 years were reported. The median age of cases was 11 years.
- One-third of the cases (34%) lived in the Saskatoon Health Region and 19% in Regina Qu'Appelle Health Region. Fifteen percent (15%) lived in NITHA and FNIHB communities.
- Thirty-five cases were reported hospitalized for pertussis illnesses, 20 among infants.
- One case of pertussis under the age of one year is known to have died.
- Thirteen of 57 infant cases were too young to begin their primary immunization series for pertussis. Five of the twenty cases old enough to receive one or two doses of vaccine had not been started. Eight of sixteen infant cases, old enough to complete their series, had not started. Eight who had completed their primary series still became infected.

Pertussis Coverage in Saskatchewan: 2012 to 2016

- From 2012 to 2016, while provincial coverage rates steadily improved up to and including five years of age, they steadily declined for children older than five years.

Table 1: Pertussis case counts by year

	2016*	2015	2014	2013	2012	2011	Total
Saskatchewan	195	213	47	19	34	48	556
Canada	N/A	N/A	1529	1275	4649	691	8144

*preliminary counts
N/A = not available

Table 2: Pertussis case characteristics, 2011-2015

Characteristics of pertussis cases – Saskatchewan 2011 - 2015		Cases	Percent of Cases
Total		361	100
Sex	Male	184	51
	Female	177	49
Age	Less than 1 year	57	16
	1 - 4 years	41	11
	5 - 19 years	163	45
	20 - 49 years	76	21
	50 years and over	24	7
Hospitalized	Yes	35	10
	No	326	90
	Unknown	0	0
Immunization status for pertussis vaccine**	3 doses	8	2
	2 doses	6	2
	1 dose	15	4
	0 dose	9	2
	Too young	13	4
	Unknown	310	86
Source	International	0	0
	Canada	0	0
	Saskatchewan	361	100
Genotype	Not applicable	N/A	N/A

**Immunization status is monitored for infant cases only.

Table 3: Pertussis vaccine coverage for Saskatchewan, 2012-2016

Age	Doses	2016	2015	2014	2013	2012
3 months	1	85.0%	85.0%	84.1%	83.3%	82.8%
5 months	2	77.0%	76.0%	73.7%	73.7%	72.0%
8 months	3	78.8%	77.3%	76.4%	75.7%	74.5%
12 months	3	85.6%	84.9%	84.7%	84.4%	84.7%
	4	89.1%	88.5%	88.8%	89.1%	88.8%
20 months	4	60.9%	60.5%	60.1%	58.7%	59.3%
	3	89.9%	89.3%	89.8%	90.4%	89.3%
24 months	4	76.8%	74.6%	75.7%	76.3%	75.4%
	3	87.7%	85.1%	87.8%	87.2%	87.1%
5 years	4	87.7%	85.1%	87.8%	87.2%	87.1%
7 years	5	76.2%	74.8%	77.8%	78.3%	77.6%
13 years	5	76.9%	77.5%	80.2%	80.7%	82.4%
15 years	6	67.3%	66.9%	72.2%	72.9%	73.1%
17 years	6	70.6%	71.1%	74.3%	75.0%	67.3%^A

^AImmunization records may be incomplete for children born prior to 1996. Therefore, the 2012 coverage rate for 17-year-old adolescents may not reflect actual provincial or RHA rates.

EPIDEMIOLOGY SUMMARY

Table 4: Pertussis Vaccine Coverage by Health Region, 2016

Health Region, by Peer Group	Vaccine coverage (% immunized), by age and dose												
	3 months 1 dose	5 months 2 doses	8 months 3 doses	12 months 3 doses	20 months 3 doses	24 months 4 doses	24 months 3 doses	5 years 4 doses	7 years 5 doses	13 years 5 doses	15 years 6 doses	17 years 6 doses	
Saskatchewan	85.0	77.0	78.8	85.6	89.1	60.9	89.9	76.8	87.7	76.2	76.9	67.3	70.6
Peer Group A													
Regina Qu'Appelle	87.0	78.5	79.8	85.3	87.4	58.4	89.0	74.9	86.4	76.0	73.9	66.4	67.7
Saskatoon	83.9	76.1	77.8	85.9	90.9	63.3	91.4	80.8	87.8	74.3	74.3	67.9	69.5
Peer Group D													
Cypress	87.1	80.6	82.6	88.6	93.2	71.2	94.9	87.8	92.7	82.0	84.3	76.0	77.6
Five Hills	89.1	80.0	83.2	89.2	90.5	63.6	90.2	77.2	87.3	78.3	83.6	71.6	80.0
Heartland	88.6	79.9	83.0	90.8	93.5	68.6	93.5	82.6	93.2	82.7	86.9	79.5	84.1
Kelsey Trail	86.2	77.5	82.7	88.9	90.4	66.4	90.9	76.7	87.5	80.7	81.9	72.9	75.8
Sun Country	90.3	89.6	92.0	93.8	94.3	78.3	94.4	88.8	94.4	84.9	85.9	79.1	83.4
Sunrise	87.6	82.5	83.5	86.3	88.9	60.4	90.1	73.9	89.3	81.6	81.0	75.8	77.8
Peer Group F													
Athabasca Health Authority	90.2	65.9	70.3	88.2	94.4	55.6	94.3	82.9	96.9	92.3	78.7	44.0	62.7
Keewatin Yatthé	66.7	55.0	56.4	70.5	79.5	35.5	82.0	54.7	83.1	72.3	82.1	35.3	55.8
Mamawetan Churchill River	74.6	63.3	61.9	77.9	86.8	42.9	89.2	66.2	85.5	71.0	76.4	43.0	49.6
Peer Group H													
Prairie North	83.1	74.7	76.2	80.8	85.1	52.0	86.4	69.0	83.5	71.7	72.0	55.9	62.1
Prince Albert Parkland	76.2	64.1	66.0	78.2	82.0	48.3	82.9	61.0	85.8	70.4	77.0	60.2	67.1

Table 5: Pertussis Vaccine Coverage by Health Region, 2015

Health Region, by Peer Group	Vaccine coverage (% immunized), by age and dose												
	3 months 1 dose	5 months 2 doses	8 months 3 doses	12 months 3 doses	20 months 3 doses	24 months 4 doses	24 months 3 doses	5 years 4 doses	7 years 5 doses	13 years 5 doses	15 years 6 doses	17 years 6 doses	
Saskatchewan	85.0	76.0	77.3	84.9	88.5	60.5	89.3	74.6	85.1	74.8	77.5	66.9	71.1
Peer Group A													
Regina Qu'Appelle	85.7	77.0	78.1	84.4	88.5	64.0	88.7	75.0	83.7	74.0	74.6	66.0	68.1
Saskatoon	84.8	77.7	78.4	86.0	88.9	61.2	89.8	76.6	83.7	73.6	75.0	67.3	71.3
Peer Group D													
Cypress	85.1	74.1	81.0	90.7	91.7	71.0	92.6	80.1	90.5	82.3	83.5	77.2	78.0
Five Hills	88.6	79.5	78.9	85.6	90.2	54.8	90.6	73.3	86.3	77.2	85.6	73.2	73.9
Heartland	86.8	80.6	84.5	91.5	91.7	66.3	92.2	80.9	92.5	85.7	85.8	79.2	80.2
Kelsey Trail	85.1	77.1	80.9	88.5	90.8	55.7	89.8	71.6	91.8	77.6	83.5	71.1	78.1
Sun Country	93.2	88.4	89.7	92.6	94.5	74.2	94.9	85.0	94.4	80.9	88.8	79.3	82.3
Sunrise	82.2	74.7	78.3	85.5	90.9	63.7	89.5	74.2	86.3	78.6	81.8	67.8	77.2
Peer Group F													
Athabasca Health Authority	82.4	59.0	66.7	88.6	100.0	69.7	100.0	85.3	91.5	78.9	75.5	52.8	78.8
Keewatin Yatthé	65.3	46.6	47.6	68.9	75.6	39.3	82.8	58.9	83.0	73.5	84.4	37.0	61.4
Mamawetan Churchill River	80.4	58.1	63.2	81.0	84.2	43.3	87.6	65.5	83.9	70.6	77.4	41.8	57.0
Peer Group H													
Prairie North	84.2	69.6	70.9	80.5	84.7	52.8	87.3	69.6	81.1	66.7	71.2	55.2	62.8
Prince Albert Parkland	78.5	63.6	64.2	73.6	81.3	43.3	83.2	60.7	84.0	72.8	75.1	64.2	66.4

- Two years of coverage data in 13 age-dose categories are provided by RHA. Yellow highlight indicates RHAs below the provincial coverage rate.
- At the provincial level, coverage from 2015 to 2016 declined at 13 years from 77.5% to 76.9% and at 17 years from 71.1% to 70.6%.
- Coverage at three months remained the same between 2015 and 2016. All other age groups except 13 and 17 years, showed modest improvements.
- At 12 and 24 months of age for 2016, eight RHAs exceeded the provincial average for three doses and five were below. At 13 years of age, nine RHAs exceeded the provincial average and four were below.
- For 2016, the three-dose coverage rate was higher among the 20-month age group compared to the eight-month age group: 89.1% vs. 78.8%. Likewise, the four-dose coverage rate for the 24-month age group was higher than the 20-month age group: 76.8% vs. 60.9%.
- In 2016 two RHAs were below the provincial rate in all thirteen age-dose categories and two were below in twelve categories.
- In 2016 three RHAs were at or above the provincial rate in all age-dose categories and one was at or above the provincial average in all but one category.
- Coverage rates for health regions in Peer Groups F and H should be interpreted with caution (see Data Notes).

SURVEILLANCE CASE DEFINITION: Saskatchewan CDC Manual

Respiratory and Direct Contact Pertussis

Notification Timeline:

From Lab/Practitioner to Public Health: Immediate.

From Public Health to Ministry of Health: Within 2 weeks.

Public Health Follow-up Timeline: Immediate

Case Definition (adopted from Public Health Agency of Canada, 2008)

Confirmed Case	<p>Laboratory confirmation of infection:</p> <ul style="list-style-type: none"> isolation of <i>Bordetella pertussis</i> from an appropriate clinical specimen OR detection of <i>B. pertussis</i> DNA from an appropriate clinical specimen AND one or more of the following: <ul style="list-style-type: none"> cough lasting 2 weeks or longer paroxysmal cough of any duration cough with inspiratory "whoop" cough ending in vomiting or gagging, or associated with apnea <p>OR</p> <p>Epidemiologic link to a laboratory-confirmed case AND one or more of the following for which there is no other known cause:</p> <ul style="list-style-type: none"> paroxysmal cough of any duration cough with inspiratory "whoop" cough ending in vomiting or gagging, or associated with apnea
Probable Case	<p>Cough lasting 2 weeks or longer in the absence of appropriate laboratory tests and not epidemiologically linked to a laboratory-confirmed case AND one or more of the following, with no other known cause:</p> <ul style="list-style-type: none"> paroxysmal cough of any duration cough with inspiratory "whoop" cough ending in vomiting or gagging, or associated with apnea
Suspect Case	<p>One or more of the following, with no other known cause:</p> <ul style="list-style-type: none"> paroxysmal cough of any duration cough with inspiratory "whoop"



Photo Courtesy of Centers for Disease Control

DATA NOTES

Case Data Source: The Saskatchewan Integrated Public Health Information System (iPHIS) is a provincially mandated integrated client-centered case management information system that supports public health surveillance. Confirmed cases must meet the provincial surveillance case definition.

There are 10 peer groups used by Statistic Canada, each identified by a letter (A to J). A peer group consists of health regions with similar socio-economic characteristics which facilitates comparisons within a peer group. The twelve health regions and one health authority in Saskatchewan fall into four groups identified by letters A, D, F and H.

Vaccine Coverage Data Source: The Saskatchewan Immunization Management System (SIMS) is a client-based registry recording vaccines delivered by regional public health services. It does not include vaccines delivered out of province or by First Nations communities that declined to use SIMS. Immunization data from Keewatin Yatthé and Mamawetan Churchill River health regions and historical data from Athabasca Health Authority are incomplete. As a result, this report does not provide immunization coverage for the entire provincial or regional populations.

Panorama is a comprehensive, integrated public health information system. Of the five modules in the system, two have been implemented: vaccine inventory and immunization. When fully functional, it will help public health professionals work together to effectively manage vaccine inventories, immunizations, investigations, outbreaks and family health. Panorama's immunization module

replaced the former SIMS, on January 27, 2015. SIMS had been used province-wide since 2001. To learn more, please visit: www.ehealthsask.ca/services/panorama/Pages/default.aspx.

Most FNIHB and NITHA communities, with the exception of those in the Athabasca Health Authority (AHA), are not currently using Panorama. Therefore, immunization data for most First Nations children are missing or are incomplete. This report includes only those children with Saskatchewan health coverage and registered in Panorama under a health region jurisdiction as of January 12, 2017. In other words, children with Saskatchewan health coverage and registered in Panorama under FNIHB or NITHA jurisdiction are excluded (including those from FNIHB and NITHA communities in AHA). This means this report does not include coverage statistics for the entire provincial or regional population.

The four-dose primary series pertussis containing vaccine is administered as diphtheria, tetanus, acellular pertussis, inactivated polio & *Haemophilus influenzae* type B (DTaP-IPV-Hib). The first booster at four to six years of age is DTaP-IPV vaccine and the second and final booster at Grade 8 is tetanus, diphtheria & acellular pertussis (Tdap) vaccine. Immunization coverage is based on those who turned three, five, eight, 12, 20 and 24 months, and five, seven, 13, 15 and 17 years by December 31 in 2015 and 2016. For example, the immunization coverage for seven-year-old children in 2016 is based on clients who were born in 2009 and the immunization doses they received by their seventh birthdays.