

# Vaccine Preventable Disease Monitoring Report Diphtheria, 2017 and 2018

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**PREPARED BY POPULATION HEALTH BRANCH, SASKATCHEWAN MINISTRY OF HEALTH**

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<p><b>Purpose:</b></p> <p>The Saskatchewan Ministry of Health's Population Health Branch provides routine surveillance of notifiable diseases at the provincial, Athabasca Health Authority (AHA), former regional health authority (RHA), First Nations and Inuit Health Branch - Saskatchewan (FNIHB-SK) and Northern Inter-Tribal Health Authority (NITHA) levels.</p> <p>This report presents the most recent data for reportable communicable diseases as collected by Panorama and the Integrated Public Health Information System (iPHIS), and immunization coverage information as collected by Panorama. Limitations associated with these systems have been described elsewhere.</p> <p>Under <i>The Public Health Act, 1994</i> 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. Diphtheria is a Category I disease.</p> <p><b>Report Features:</b></p> <p>Background Epidemiological Summary Surveillance Case Definition Case Counts by Year Case Characteristics Vaccine Coverage by AHA and former RHA</p> <p><b>Data Source:</b></p> <p>Panorama (as of October 1, 2019)</p>	<div> <div> <h2>Background</h2> <p>Diphtheria is a contagious disease that begins with a low-grade fever and sore throat. It can progress quickly to produce a thick membrane over the tonsils and throat resulting in breathing and swallowing difficulties, particularly in infants and young children. The bacteria can also release a toxin that can cause abnormal heart rhythms or paralysis of the breathing muscles, which can lead to suffocation or even death.</p> <p>Diphtheria can also cause infections of the skin, nose, larynx, eye, and vagina. These infections present as a shallow ulcer with a thick grey coating and are usually found in warmer climates or among the homeless.</p> <p>Diphtheria is caused by a bacterium, <i>Corynebacterium diphtheriae</i>. Diphtheria bacteria live in the mouth,</p> </div> <div> <p>throat and nose of an infected person and can be spread directly from coughing or sneezing or via contaminated articles such as clothing.</p> <p>Diphtheria vaccine was introduced in Canada in 1926 resulting in a remarkable decline in the morbidity and mortality associated with the disease. In the last 20 years, fewer than five cases of diphtheria were reported each year in Canada with the exception of 2017 with 10 cases reported . It continues to occur worldwide, especially in countries with limited immunization programs.</p> </div> </div> <div> <h2>Immunization</h2> <p>Diphtheria toxoid is only available in combination vaccines. The Saskatchewan Routine Childhood Immunization Schedule recommends a four dose primary series of diphtheria toxoid-containing 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. A booster dose of tetanus and diphtheria toxoid-containing vaccine is recommended for adults every 10 years.</p> <p>Transmission is less likely among people who are vaccinated. Inadequately immunized or unimmunized travellers to areas with endemic diphtheria are at higher risk of acquiring disease. In Canada, blood serum surveys indicate that approximately 20% of the healthy adult population does not have a protective concentration of antibodies to diphtheria; adult booster doses are required.</p> <p>The efficacy of diphtheria toxoid-containing vaccine following the primary series is estimated to be about 97%, and approximately 100% following booster immunization. Antitoxin antibodies are believed to persist at protective concentrations for 10 years or more.</p> </div> <div> <h2>Surveillance</h2> <p>Under <i>The Public Health Act, 1994</i>, Saskatchewan health care providers are required to report cases 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 Control Manual.</p> <p>Notifiable diseases may be undetected, therefore underreported, due to a number of factors including lack of contact with the health care system or lack of detection related to lab methodology. All membranous pharyngitis should be cultured for diphtheria. Lab requisitions for diphtheria should be flagged since selective media is necessary for laboratory diagnosis.</p> <p>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.</p> <p>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.</p> <p>Currently molecular epidemiology genotyping is not available for diphtheria.</p> </div>
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# EPIDEMIOLOGY AND VACCINE COVERAGE SUMMARY

## Diphtheria in Saskatchewan: 2018

- No cases of lab-confirmed diphtheria were reported that met the surveillance case definition.
- Cutaneous diphtheria is no longer monitored.

**Table 1: Diphtheria case counts by year**

	2018	2017	2016	2015	2014	Total
Saskatchewan	0	0	0	0	0	0
Canada	N/A	10	1	2	2	15

N/A = not available

## Diphtheria in Saskatchewan: 2014 to 2018

- One diphtheria case reported in the 2014 report was cutaneous and is not reported here. It was most likely acquired through environmental exposure. The vaccine produces an anti-toxin but does not eliminate the organism from the community.

**Table 2: Diphtheria case characteristics, Saskatchewan 2014-2018**

		Cases	Percent of Cases
Total		0	0
Sex	Male	0	0
	Female	0	0
Age	Less than 1 year	0	0
	1 - 4 years	0	0
	5 - 19 years	0	0
	20 – 49 years	0	0
	50 years and over	0	0
Hospitalized	Yes	0	0
	No	0	0
	Unknown	0	0
Immunization status for diphtheria vaccine	5 doses	0	0
	4 doses	0	0
	0 dose	0	0
	Too young	0	0
	Unknown	0	0
Source	International	0	0
	Canada	0	0
	Saskatchewan	0	0
Provincial source	Domestic Travel	0	0
	Epidemiologically-linked to travel case	0	0
	Epidemiologically-linked to case with unknown source	0	0
	No identified source	0	0
Genotype	Unknown	0	0

## Diphtheria Coverage in Saskatchewan: 2014 to 2018

- From 2014 to 2018, provincial immunization coverage rates improved up to and including 24 months of age.
- Rates for five-year-old children fluctuated between 85.1% and 87.9% over the five year period.
- For children older than five years, the rates when based strictly on the number of doses received, declined between from 2014 to 2016.
- However, when rates were based on up-to-date status (i.e., adjusting for delayed or interrupted series) in 2017 and 2018, coverage either improved or remained stable for children older than five years.

**Table 3: Diphtheria vaccine coverage rates for Saskatchewan by age, dose and year, 2014-2018**

Age	Doses	2018	2017	2016 <sup>a</sup>	2015 <sup>a</sup>	2014 <sup>b</sup>
3 months	1	87.1%	86.2%	85%	85%	84.2%
5 months	2	78.5%	78%	77%	76%	73.8%
8 months	3	80.6%	79.6%	78.8%	77.3%	76.4%
12 months	3	87.3%	86.6%	85.6%	84.9%	84.7%
20 months	3	90.7%	89.9%	89.1%	88.5%	88.8%
	4	68.1%	63.7%	60.9%	60.5%	60.2%
24 months	3	91.6%	90.5%	89.9%	89.3%	89.8%
	4	80.7%	77.6%	76.8%	74.6%	75.7%
5 years	4	87.1%	86%	87.7%	85.1%	87.9%
	5	N/C	N/C	76.3%	74.9%	78%
7 years	up-to-date	81.8%	82.6%	N/C	N/C	N/C
	5	N/C	N/C	77.4%	78.2%	80.8%
13 years	up-to-date	79.2%	79.2%	N/C	N/C	N/C
	6	N/C	N/C	68.1%	67.6%	72.9%
15 years	up-to-date	82%	81.7%	N/C	N/C	N/C
	6	N/C	N/C	71.3%	71.9%	75.1%
17 years	up-to-date	84%	83.5%	N/C	N/C	N/C

<sup>a</sup> Vaccine Preventable Disease Monitoring Report: Diphtheria , 2015 and 2016  
(Data source: Panorama January 12, 2017)

<sup>b</sup> Vaccine Preventable Disease Monitoring Report: Diphtheria, 2014  
(Data source: SIMS January 16, 2015)

N/C = Not calculated. An up-to-date coverage rate provides a better estimate of the percentage of children protected from disease than an age-dose coverage rate when there has been a delay or interruption in the primary series.

# EPIDEMIOLOGY AND VACCINE COVERAGE SUMMARY

**Table 4: Diphtheria vaccine coverage by Athabasca Health Authority and former health region, 2018**

Jurisdiction (with former health region by Peer Group)	Immunization coverage (% immunized), by age and dose												
	3 months	5 months	8 months	12 months	20 months		24 months		5 years	7 years	13 years	15 years	17 years
	1 dose	2 doses	3 doses	3 doses	3 doses	4 doses	3 doses	4 doses	4 doses	up-to-date	up-to-date	up-to-date	up-to-date
Saskatchewan	87.1	78.5	80.6	87.3	90.7	68.1	91.6	80.7	87.1	81.8	79.2	82	84
Saskatchewan Health Authority	87.1	78.5	80.6	87.3	90.7	68.1	91.6	80.8	87.1	81.8	79.2	82	84
Peer Group A													
Regina Qu'Appelle	91.5	80.1	82.5	87.8	90.7	70.5	91.6	79.2	86	82.9	77.1	82.2	84.9
Saskatoon	83.6	77.9	79.7	87.3	91	64	91.6	81.5	84.9	77	76.3	80.9	85
Peer Group D													
Cypress	83.8	77.1	84.2	91.3	92.6	75	93.8	84.8	92.3	91.8	84.6	87.9	87.8
Five Hills	89.2	80.7	82.7	89.9	92.5	76	92.9	83.1	90.9	84.8	84.2	84.5	85.1
Heartland	89.9	84.1	82.5	90.9	92.8	76.6	92.2	87.1	92.2	89.5	86.1	88.7	90.9
Kelsey Trail	93.9	81.2	87	92.3	96.6	84	95.4	90	94.8	86.4	84	86.9	86.8
Sun Country	94.5	91.8	93.4	95.9	94.5	86.8	95.4	92.4	94.8	93.5	87.5	86.7	91.1
Sunrise	87	80.7	81.7	85.9	90	69.1	92.2	83.3	89	84.8	83.4	84.2	88.7
Peer Group F													
Athabasca Health Authority	85.3	71.4	82.1	100	93.3	70	100	68.6	100	86.7	81.7	85.1	83.3
Keewatin Yatth�	79.2	64.2	71.2	79.2	89.4	46.3	89.6	64.9	82	78.3	68.5	61.6	50
Mamawetan Churchill River	80.4	65	72.8	89.6	96.5	73.4	97	82.5	96.7	79.5	85	67.6	64.4
Peer Group H													
Prairie North	86.5	73.6	76.3	82.3	85.8	61.9	87.1	74.8	87.1	80.5	75.3	72.9	73.9
Prince Albert Parkland	82	68.4	66.5	78.1	86.3	54	88.1	70.5	85	79	83.8	85	80.4

**Table 5: Diphtheria vaccine coverage by Athabasca Health Authority and former health region, 2017**

Jurisdiction (with former health region by Peer Group)	Immunization coverage (% immunized), by age and dose												
	3 months	5 months	8 months	12 months	20 months		24 months		5 years	7 years	13 years	15 years	17 years
	1 dose	2 doses	3 doses	3 doses	3 doses	4 doses	3 doses	4 doses	4 doses	up-to-date	up-to-date	up-to-date	up-to-date
Saskatchewan	86.2	78	79.6	86.6	89.9	63.7	90.5	77.6	86	82.6	79.2	81.7	83.5
Saskatchewan Health Authority	86.2	78	79.6	86.6	89.9	63.7	90.5	77.6	86	82.6	79.1	81.7	83.4
Peer Group A													
Regina Qu'Appelle	87.5	79.4	80.2	87.1	90	61.9	89.8	75.4	85.6	83.6	76.7	82	83.3
Saskatoon	85	77.3	79.5	86.6	89.2	61.3	90.4	78.4	83.6	79.3	76.1	83	84.3
Peer Group D													
Cypress	88.1	79.1	80.2	88.6	92.4	72.4	91.6	82.6	91.4	89.4	86.2	85.1	88
Five Hills	88.9	83.1	82.8	86.6	91.7	70.9	93.2	80.3	87.9	85.2	83.6	83.5	84.6
Heartland	84.5	79.2	87.6	89.6	93.3	73	93.2	85.3	93	92	85.8	86.2	90.8
Kelsey Trail	90.5	84.7	89.9	93.1	94.8	75.5	96.3	84.9	91.1	88.8	85.5	84.4	86.7
Sun Country	94.5	90.7	90.4	93.8	95.2	84.6	95.1	89.7	93.4	92.4	85.6	88.9	90
Sunrise	84.8	79.6	83.3	88.6	90.8	70	90.5	79.5	87.4	81.7	84.8	84.4	84.3
Peer Group F													
Athabasca Health Authority	92	86.4	76.7	91.4	97.6	43.9	97.2	72.2	93.1	85.4	90	81.8	88.2
Keewatin Yatthé	76.7	56.7	52.5	74	86.3	43.2	85.1	62.7	85.5	77.6	80.5	50.7	54.3
Mamawetan Churchill River	83.5	70.4	68.2	83.7	93.1	63.2	92.5	72.4	94.4	83.8	78.8	65.6	65.2
Peer Group H													
Prairie North	84.6	73.7	73.7	82.1	87.4	59.7	88.1	72	83.7	79.6	77.9	74	74.7
Prince Albert Parkland	82.3	68	69.4	79	85.2	51.3	86.8	68.4	84.4	78.6	80.1	77.5	83.3

- Two years of coverage data in 13 age-dose/up-to-date categories are provided by Athabasca Health Authority (AHA) and former RHA. Yellow highlighted numbers indicate rates below the provincial coverage rate.
- Diphtheria vaccine is recommended at two, four, six and 18 months, with a booster dose between four and six years of age. If the primary series is delayed or interrupted, the schedule can be adjusted to bring the child up-to-date for protection. Data for three, five, eight, 12, 20, and 24 months; and five, seven, 13, 15 and 17 years are shown with seven, 13, 15 and 17 years reported as up-to-date.
- Up-to-date at seven years:
  - children who received the four-dose primary series at two, four, six and 18 months and a booster dose between four and six years of age AND
  - children who received four doses before the age of four years and one booster dose after the age of four years with at least a 24-week interval between the third and fourth doses, and the fourth and fifth doses AND
  - children who received four doses of vaccine with the fourth dose administered after the age of four years and at least 24 weeks after the third dose AND
  - children who received three doses of vaccine with the third dose at seven years and at least 24 weeks after the second dose.
- Up-to-date at 13 years:
  - a) to b) for seven years AND
  - children who received five doses with the third dose administered before four years of age, the fourth dose at least 24 weeks after the third dose, and the fifth dose at or after 11 years of age and at least 24 weeks after the fourth dose AND
- children who received four doses with the fourth dose administered at or after 11 years of age and a 24-week interval between the second and third doses, and third and fourth doses AND
- children who received three doses with the third dose administered at or after 11 years of age and a 24-week interval between the second and third doses and a one-month-interval between first and second doses.
- Up-to-date at 15 and 17 years:
  - children who received the four-dose primary series at two, four, six and 18 months and two booster doses at four to six years and Grade 8 (usually between 12 and 14 years of age) AND
  - b) to d) for 13 years.
- In 2018, nine former RHAs and AHA met or exceeded the provincial coverage rate for three doses at 24 months and three were below.
- In 2018, eight former RHAs and AHA met or exceeded the provincial coverage rates at 12 months, 20 months, five years, 13 years and 15 years while four former RHAs were below.
- For 2018, the four-dose coverage rate was higher among the 24-month age group compared to the 20-month age group: 80.7% vs. 68.1%. The four-dose coverage rate showed improvement at the age of five years as well (87.1%).
- In 2018, one former RHA was below the provincial rate in all thirteen age-dose/up-to-date categories and one was below in twelve categories.
- In 2018 four former RHAs were at or above the provincial rate in all thirteen age-dose/up-to-date categories and one former RHA was at or above the provincial average in all but two categories.
- 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 Diphtheria



Photo Courtesy of Centers for Disease Control

\*Clinical illness is characterized as an upper respiratory tract infection (nasopharyngitis, laryngitis or tonsillitis) with or without an adherent nasal, tonsillar, pharyngeal and/or laryngeal membrane, plus at least one of the following:

- gradually increasing stridor;
- cardiac (myocarditis) and/or neurologic involvement (motor and/or sensory palsies) one to six weeks after onset;
- death, with no known cause.

### Notification Timeline:

From Lab/Practitioner to Public Health: Immediate.

From Public Health to Ministry of Health: Immediate.

Public Health Follow-up Timeline: Initiate within 24-48 hours.

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

<b>Confirmed Case</b>	<p>Clinical illness* or systemic manifestations compatible with diphtheria in a person with an upper respiratory tract infection or infection at another site (e.g., wound, cutaneous) PLUS at least one of the following:</p> <ul style="list-style-type: none"> <li>• Laboratory confirmation of infection: <ul style="list-style-type: none"> <li>• isolation of <i>Corynebacterium diphtheriae</i> with confirmation of toxin from an appropriate clinical specimen, including the exudative membrane</li> </ul> </li> <li>OR</li> <li>• isolation of other toxigenic <i>Corynebacterium</i> species (<i>C. ulcerans</i> or <i>C. pseudotuberculosis</i>) from an appropriate clinical specimen, including the exudative membrane</li> <li>OR</li> <li>• histopathologic diagnosis of diphtheria.</li> </ul> <p>OR</p> <p>Epidemiologic link (contact within two weeks prior to onset of symptoms) to a laboratory-confirmed case.</p>
<b>Probable Case</b>	<ul style="list-style-type: none"> <li>• Clinical illness* in the absence of laboratory confirmation or epidemiologic link to a laboratory-confirmed case.</li> </ul>
<b>Suspect Case</b>	<ul style="list-style-type: none"> <li>• Upper respiratory tract infection (nasopharyngitis, laryngitis or tonsillitis) with or without a nasal, tonsillar, pharyngeal and/or laryngeal membrane.</li> </ul>

## DATA NOTES

Case Data Source: Panorama and the Integrated Public Health Information System (iPHIS) are information systems that support public health surveillance. Confirmed cases must meet the provincial surveillance case definition. Panorama replaced iPHIS on October 1, 2018.

There are 10 peer groups used by Statistic Canada, each identified by a letter (A to J). A peer group consists of former health regions with similar socio-economic characteristics which facilitates comparisons within a peer group. The twelve former health regions and one health authority in Saskatchewan fall into four groups identified by letters A, D, F and H. The peer groups in this report are based on Statistics Canada 2011 peer groupings and should not be compared to current Statistics Canada peer groupings (2014).

Vaccine Coverage Data Source: Panorama is a comprehensive, integrated public health information system. Of the five modules in the system, four have been implemented: vaccine inventory, immunization, investigations and outbreaks management. When fully functional, it will help public health professionals to work together to effectively manage vaccine inventories, immunizations, investigations, outbreaks and family health. To learn more, please visit: [www.ehealthsask.ca/services/panorama/Pages/default.aspx](http://www.ehealthsask.ca/services/panorama/Pages/default.aspx).

Many FNIHB and NITHA communities are not currently using Panorama. Therefore, immunization data for many First Nations children are missing or are incomplete. This report includes only

those children with Saskatchewan health coverage and registered in Panorama under a former health region or AHA as of October 1, 2019. In other words, children with Saskatchewan health coverage and registered in Panorama under FNIHB-SK or NITHA jurisdiction are excluded. This means this report does not include coverage statistics for the entire provincial or regional population.

The four-dose primary series of diphtheria-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 administered as diphtheria, tetanus, acellular pertussis and inactivated polio (DTaP-IPV) vaccine and the second 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 2017 and 2018. For example, the immunization coverage for seven-year-old children in 2018 is based on clients who were born in 2011 and the immunization doses they received by their seventh birthdays.