The State of Community Water Fluoridation across Canada

2017 Report

**Prepared by the Public Health Capacity and Knowledge Management Unit,
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Public Health Agency of Canada**

Agence de la santé publique du Canada
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Introduction

Fluoride is a naturally occurring mineral present in nearly all water sources. It is naturally released from rocks into the soil, water, and air. Drinking water that contains fluoride has long been associated with reduced tooth decay. In 1909, two U.S. dentists F. McKay and G. V. Black initiated a 15-year follow-up study in one Colorado town and observed very low caries rates among residents who had access to drinking water with a naturally high level of fluoride. Since then, numerous scientific findings have corroborated the preventive effect of fluoride on tooth decay. By exposing the teeth to a constant low level of fluoride, it helps reduce the cavity-causing effect of foods and bacteria. Fluoride molecules create stronger teeth by hardening tooth enamel, contributing to tooth surface re-mineralization and deterring oral bacteria[1].

At the population level, water fluoridation is associated with approximately a 25% to 30% reduction in tooth decay in children and adults[2]. The recommended concentration for caries prevention (called the optimal level) is 0.7 milligrams/liter (mg/L)[3] [4] [5] or 0.7 parts per million (ppm). Community water fluoridation (CWF) is the process of monitoring and adjusting the fluoride level in drinking water to the optimal level for caries prevention. Water fluoridation has been instrumental in the overall global reduction in dental caries and many communities around the world have access to CWF. The U.S. Centre for Disease Control considers CWF as one of the ten greatest public health achievements of the 20th century[6].

CWF is the most cost effective and equitable method to deliver fluoride to the population. This population-based preventive intervention contributes to oral health equity by overcoming common social determinants of health including age, education, income, and access to professional dental care. CWF yields a high return on investment that increases according to community population size, with a per capita annual benefit ranging from $5.49 to $93.19[7] per dollar invested.

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[1] MMWR Recomm Rep. 2001 Aug 17;50(RR-14):1-42.

[2] CDC (2015) Community Water Fluoridation. http://www.cdc.gov/fluoridation/; ; Tchouaket, E. & al (2013). The economic value of Quebec's water fluoridation program. Journal of Public Health. June 2013; 21 (6): 523-533 ; Rugg-Gunn. AJ & Do,L. (2012). Effectiveness of water fluoridation in caries prevention. Community Dent Oral Epidemiol. 2012 Oct; 40 suppl. 2:55-64. ; Griffin SO, Regnier E, Griffin PM, Huntley V. (2007). Effectiveness of fluoride in preventing caries in adults. J Dent Res. 2007;86(5):410–415

[3] Public Health Rep. 2015 Jul-Aug;130(4):318-31.

[4] Health Canada (2011) Guidelines for Canadian drinking water quality: Guideline technical document – Fluoride. http://www.hc-sc.gc.ca/ewh-semt/pubs/water-eau/2011-fluoride-fluorure/index-eng.php

[5] Health Canada (2007) Findings and recommendations of the fluoride expert panel (January 2007). http://www.hc-sc.gc.ca/ewh-semt/pubs/water-eau/2008-fluoride-fluorure/index-eng.php

[6] Public Health Rep. 2015 Jul-Aug;130(4):296-98.

[7] Ran, T. & Chattopadhyay, S.K & CPSTF (2015). Economic Evaluation of Community Water Fluoridation. A Community Guide Systematic Review. Am J Prev Med 2015. In press; Tchouaket, E. & al (2013). The economic value of Quebec's water fluoridation

CWF is endorsed by major public health bodies around the world, including the World Health Organization, the Canadian Dental Association, and the Public Health Agency of Canada (PHAC). The PHAC Position Statement on CWF, co-signed by the Chief Dental Officer of Canada and the Chief Public Health Officer of Canada, can be consulted at: https://www.canada.ca/en/services/health/publications/healthy-living/fluoride-position-statement.html.

In 2012, around 12 million Canadians (37.4%)[8] had access to CWF (through water systems), leaving the majority of Canadians not benefitting from the caries protective effect of fluoridated drinking water. In 2017, there are around 13.9 million Canadians (38.7%) who benefit from CWF.

In spite of its robust policy and scientific endorsement, a number of municipalities have discontinued CWF since 2012 (see Table 4), which has an impact on the percentage of the population which currently has access to fluoridated water (even though the total for the country has increased, Table 5 shows a decline in the majority of the Provinces and Territories). The rationale for the decision to discontinue CWF varies by jurisdiction and may be influenced by different factors, including community concern over putative health effects[9] and technical/financial aspects thought to be related to the delivery of fluoride.

To document the situation from a national perspective, the PHAC Office of the Chief Dental Officer (OCDO), working closely with the Federal Provincial Territorial Dental Directors Working Group (FPTDDWG), has taken a leadership role to update the data on the state of CWF across Canada every five years. The OCDO had already carried out this exercise three times: in 2005, 2007 and 2012. In addition to estimating the population's access to optimal levels of fluoride through a community water supply, the 2012 round also included data on population access to well water supplies that contained naturally occurring fluoride. The additional element in this 2017 report is the provision of estimates of access to fluoridated drinking water in Indigenous communities.

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program. Journal of Public Health. June 2013; 21 (6): 523-533 ; CDC (2013). Costs Saving of Community Water Fluoridation. http://www.cdc.gov/fluoridation/factsheets/cost.htm ; Griffin, S O, Jones, K and Tomar, S L. (2001). An economic evaluation of community water fluoridation. J Public Health Dent 2001; 61(2): 78-86.

[8] PHAC, the State of Community Water Fluoridation across Canada, 2012 report

[9] Decades of research and studies performed by recognized institutions have found that, in Canada, documented risks are limited to dental fluorosis. This condition is caused by exposure to too much fluoride during tooth development (i.e. under 6 years of age). The most common form of dental fluorosis is very mild and can change the appearance of tooth enamel, commonly resulting in small white spots on teeth. This is largely unnoticeable and not considered detrimental to the overall appearance or function of the teeth.

Methodological remarks

The members of the FPTDDWG provided data on drinking water fluoridation status for their respective Province/Territory. They gathered this information from their respective Provincial/Territorial environment or health ministries.

Provincial/Territorial estimates for total CWF coverage were calculated using the ratio of the population receiving CWF to the total population. In most cases, the data provided was from 2016. Therefore, Provincial/Territorial total populations were derived from the Statistics Canada 2016 census data[10]. The CWF coverage data was provided, as mentioned, by Provincial/Territorial environment or health ministries through their FPTDDWG member. One of the limitations of this report is that discrepancies in the timing of the data collection exist between Provinces/Territories (from 2014 to 2017).

Given the difference in reporting systems across jurisdictions, variations in the quality of the data and the level of completeness of the information were also observed. Some Provinces/Territories were able to provide very detailed information on all communities, whether they were fluoridated or not. Others were able to provide information only on fluoridated communities. Data collection related to well water supplies with naturally occurring fluoride was also challenging: data were incomplete for some Provinces/Territories because they did not historically collect this type of information.

Estimating the Provincial/Territorial population receiving well water with naturally occurring fluoride added another layer of complexity. Many wells are located on private property and thus do not receive government jurisdictional monitoring[11]. This situation was particularly true for remote and rural communities.

The level of fluoride in the well water is often unknown, making it challenging to determine if residents were benefiting from exposure at the optimal level of fluoride through this source. Moreover, some communities were served by multiple well water sources at different periods during the year which may have resulted in some communities receiving intermittent fluoridated water.

The current status of community water fluoridation in Indigenous communities across Canada was obtained from Health Canada, First Nations and Inuit Health Branch, Environmental Public Health Division (2011 data). On-Reserve population data were obtained from Statistics Canada, 2011 National Household Survey data[12].

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[10] With two exceptions :Saskatchewan, as the data provided is from a 2014-2015 report, therefore the population numbers were taken from https://www.ehealthsask.ca/health-data/covered-population/Documents/2014-covered-population.pdf; and Ontario as the CWF data provided by that Province was from 2017, so the 2017 population numbers were used for calculations (Statistics Canada Quarterly Demographic Estimates).

[11] It is worth nothing that, for example, about 40% of the population of New-Brunswick use private wells, which are out of the scope of this report, but because the report normalizes to the total population of NB, it introduces a bias in the numbers.

[12] It should be noted that the situation is different in Nunavut, Yukon and the Northwest Territories where there are no Indigenous Reserves per se.

Results

This report includes six tables:

- Table 1 presents estimates for fluoridated water systems coverage, 2017.
- Table 2 presents estimates for coverage of wells (containing naturally occurring fluoride), 2017.
- Table 3 presents estimates for total CWF coverage, 2017.
- Table 4 describes changes in CWF status between 2017 and 2012, where appropriate.
- Table 5 presents estimates for fluoridated water systems coverage for 2007, 2012 and 2017.
- Table 6 presents estimates for fluoridated water systems coverage in Indigenous communities, 2011.

NOTE: A mapping of estimates for Fluoridated Water Systems Coverage in Canada, 2017 has also been developed as a stand-alone document posted on Canada.ca. It reflects the data presented in Table 1. The map does not include the estimates for coverage of wells because the levels of fluoride that they contain are often unknown. The focus is on water systems from which people benefit from the optimal level of fluoride to prevent tooth decay.

Table 1: Provincial and Territorial estimates for fluoridated water systems coverage, 2017

Province/Territory	Total Population[1]	Population with fluoridated systems	Population without fluoridated systems	Percent with fluoridated systems	Percent without fluoridated systems
British Columbia	4 648 055	54 379	4 593 676	1.17%	98.83%
Alberta	4 067 175	1 725 540	2 341 635	42.43%	57.57%
Saskatchewan	1 146 173	453 849	692 324	39.6%	60.4%
Manitoba	1 278 365	882 160	396 205	69.01%	30.99%
Ontario	14 135 610	10 050 418	4 085 191	71.1%	28.9%
Quebec	8 164 361	203 700	7 960 661	2.49%	97.51%
New Brunswick	747 101	8 800	738 301	1.18%	98.82%
Nova Scotia	923 598	433 281	490 317	46.91%	53.09%
Prince Edward Island	142 907	34 582	108 325	24.20%	75.80%
Newfoundland/Labrador	519 716	7 572	512 144	1.46%	98.54%
Nunavut	35 944	10 362	25 582	28.83%	71.17%
Northwest Territories	41 786	27 123	14 663	64.91%	35.09%
Yukon	35 874	0	35 874	0.00%	100.00%
Canada	35 886 665	13 891 766	21 994 898	**38.7%**	**61.3 %**

[1] Source: Statistics Canada, 2016 Census Data - with two exceptions :Saskatchewan, as the data provided is from a 2014-2015 report, therefore the population numbers were taken from https://www.ehealthsask.ca/health-data/covered-population/Documents/2014-covered-population.pdf; and Ontario as the data provided by that Province was from 2017, so the 2017 population numbers were used for calculations (Statistics Canada Quarterly Demographic Estimates).

Table 2: Provincial and Territorial estimates for coverage of wells (containing naturally occurring fluoride), 2017

Province/Territory	Total Population[1]	Population with naturally occurring fluoride in well water	Population without naturally occurring fluoride in well water	Percent with naturally occurring fluoride in well water	Percent without naturally occurring fluoride in well water
British Columbia	4 648 055	4 240	4 643 815	0.09%	99.91%
Alberta	4 067 175	39 023	4 028 152	0.96%	99.04%
Saskatchewan	1 146 173	9 076	1 137 097	0.8%	99.2%
Manitoba	1 278 365	49 400	1 228 965	3.86%	96.14%
Ontario	14 135 610	70 678	14 064 932	0.5%	99.5%
Quebec[2]	8 164 361	Unknown	Unknown	Unknown	Unknown
New Brunswick	747 101	63 067	684 034	8.44 %	91.56 %
Nova Scotia	923 598	8 280	915 318	0.90%	99.10%
Prince Edward Island	142 907	0	142 907	0	100.00%
Newfoundland/Labrador	519 716	700	519 016	0.13%	99.87%
Nunavut[2]	35 944	Unknown	Unknown	Unknown	Unknown
Northwest Territories	41 786	1 409	40 377	3.37%	96.63%
Yukon	35 874	35 874	0	100.0%	0.0%

[1] Source: Statistics Canada, 2016 Census Data - -with two exceptions :Saskatchewan, as the data provided is from a 2014-2015 report, therefore the population numbers were taken from https://www.ehealthsask.ca/health-data/covered-population/Documents/2014-covered-population.pdf; and Ontario as the data provided by that Province was from 2017, so the 2017 population numbers were used for calculations (Statistics Canada Quarterly Demographic Estimates).

[2] **Most Provincial and Territorial authorities were unable to estimate and/or provide detailed data on the levels of naturally occurring fluoride in well water.**

Table 3: Provincial and Territorial estimates for total community water fluoridation coverage, 2017

Province/Territory	Total Population[1]	Population with fluoridated water	Population without fluoridated water	Percent with fluoridated water	Percent without fluoridated water
British Columbia	4 648 055	58 619	4 589 436	1.26%	98.74%
Alberta	4 067 175	1 764 563	2 302 612	43.39%	56.61%
Saskatchewan	1 146 173	462 925	638 248	40.4%	59.6%
Manitoba	1 278 365	882 160	396 205	72.87%	27.13%
Ontario	14 135 610	10 121 097	4 014 513	71.6 %	28.4%
Quebec	8 164 361	203 700	7 960 661	2.49%	97.51%
New Brunswick	747 101	71 867	675 234	9.62 %	90.38 %
Nova Scotia	923 598	441 561	482 037	47.81%	52.19%
Prince Edward Island	142 907	34 582	108 325	24.20%	75.80%
Newfoundland/Labrador	519 716	8 272	511 444	1.59%	98.41%
Nunavut	35 944	10 362	25 582	28.83%	0.00%
Northwest Territories	41 786	28 532	13 254	68.28%	31.72%
Yukon	35 874	35 874	0	100.00%	0.00%
Canada	35 886 665	14 124 114	21 762 551	**39.4%**	**60.6%**

[1] Source: Statistics Canada, 2016 Census Data - with two exceptions :Saskatchewan, as the data provided is from a 2014-2015 report, therefore the population numbers were taken from https://www.ehealthsask.ca/health-data/covered-population/Documents/2014-covered-population.pdf; and Ontario as the data provided by that Province was from 2017, so the 2017 population numbers were used for calculations (Statistics Canada Quarterly Demographic Estimates).

Table 4: Comparing 2017 and 2012 estimates

Province/Territory	Explanation for changes[13] since 2012 CWF Report
British Columbia	Sparwood and Prince George discontinued fluoridation in 2014
Alberta	Okotoks discontinued fluoridation in 2012
Saskatchewan	Meadow Lake, Langenburg (2011), Rosetown (2012), Melville, Moosomin, Tisdale (2013), Gull Lake, Indian Head, Eston (2014), and Wadena Outlook (2015) discontinued fluoridation
Manitoba	Flin Flon (2011-2012), Churchill, Melita, Pilot Mound (2012-2013), Reston (2014-2015), The Pas, Virden (2015-2016) discontinued fluoridation
Ontario	Kirkland Lake & Amherstburg (2012); Windsor, LaSalle, Tecumseh & New Tecumseth - Tottenham (2013); Lake of Bays & Huntsville (2014); Kingsville (2015); Nairn and Hyman, McDougall, Parry Sound & Cornwall (2016) discontinued fluoridation. Port Severn (Lone Pine) Drinking Water System, District Municipality of Muskoka: started CWF (2015)
Quebec	Trois-Rivières and Richmond discontinued fluoridation in 2012
New Brunswick	Moncton/Dieppe/Riverview (2012) and Saint John (2014) discontinued fluoridation
Nova Scotia	In October 2016 the Municipality of East Hants turned off their fluoride at the Enfield Water Treatment Plant due to a pump malfunction. On October 2nd, 2017 the inspector received notification that the pump issue was resolved and fluoridation was restored.
Prince Edward Island	No change
Newfoundland/Labrador	Gander discontinued fluoridation in 2010
Nunavut	Rankin Inlet temporarily discontinued fluoridation due to purported workers' safety issues in 2016.
Northwest Territories	Wells with naturally occurring fluoride reported in Fort Liard, Nahanni Butte, Whati and Wrigley
Yukon	Total population reported as having access to naturally fluoridated wells

[13] The dates entered in that column besides the name of different municipalities are there to indicate the year when CWF was discontinued, started or reintroduced in these locations.

Table 5: Provincial and Territorial estimates for fluoridated water systems coverage, 2007, 2012, 2017

Province/Territory	2007	2012	2017
British Columbia	3.9%	2.7%	1.2%
Alberta	74.6%	43.3%	42.4%
Saskatchewan	31.7%	36.7%	39.6%[14]
Manitoba	73.2%	75.3%	69.0%
Ontario[15]	70.3%	67.3%	71.1%
Quebec	6.9%	3.4%	2.5%
New Brunswick	19.1%	10.7%	1.2%
Nova Scotia	44.8%	49.6%	46.9%
Prince Edward Island	23.4%	24.7%	24.2%
Newfoundland/Labrador	3.5%	1.5%	1.5%
Nunavut	7.1%	35.7%	28.8%
Northwest Territories	53.8%	61.1%	64.9%
Yukon	0.0%	0.0%	0.0%
Canada	**42.6%**	**37.4%**	**38.7%**

[14] Data from 2014-15 from https://www.ehealthsask.ca/health-data/covered-population/Documents/2014-covered-population.pdf

[15] Despite the fact that most of the municipalities listed in Table 4 discontinued CWF, we see an increase in the % of people with access to CWF in Saskatchewan, in Ontario and in the Northwest Territories between 2012 and 2017 – this could be due to population growth in specific areas with fluoridated water, to the number of people who have moved in jurisdictions that have municipal systems that fluoridate the drinking water, and/or to different data collection or calculation methods used since 2012.

Table 6: Indigenous communities estimates for fluoridated water systems coverage, 2011

Province/Territory	Communities with CWF: Population	On Reserve population[16]	Percent with fluoridated systems[17]
British Columbia	(none)	78 660	0.0%
Alberta	Enoch; 985 Paul First Nation; 1095 Alexander; 1030	48 590	6.4%
Saskatchewan	Muskoday First Nation; 695 One Arrow First Nation; 675	56 625	2.4%
Manitoba	Dakota Tipi; 160 Roseau River; 695	62 965	1.4%
Ontario	Aamjiwnaang; 640	51 565	1.2%
Quebec	(none)	40 770	0.0%
New Brunswick	Oromocto; 285	7 970	3.6%
Nova Scotia	Millbrook; 995 Membertou; 910	9 535	20.0%
Prince Edward Island	(none)	500	0.0%
Newfoundland/Labrador	(none)	3 160	0.0%
Canada	8165	360 340	2.3%

The only Indigenous communities that have access to CWF are those that have a Municipal Transfer Agreement which allows them to obtain drinking water from a municipal source. However, CWF is not uniformly available and the provided estimate may overestimate the reality for some Indigenous communities. For example, sporadic interruptions in the provision of CWF have been reported in Muskoday First Nation community (Saskatchewan). In the Enoch community (Alberta), while some areas within the community have access to fluoridated water, the entire system will not be fully connected for another couple of years. Likewise, only the satellite community of Coal Harbour in Millbrook (Nova Scotia) currently has access to CWF.

See following page for Nunavut, Northwest Territories and Yukon.

[16] Source: Statistics Canada, 2011 National Household Survey and Census Profile

[17] Percent with fluoridated systems in this table were not verified as the data is not easily accessible

Table 6: Indigenous communities estimates for fluoridated water systems coverage, 2011 (con't)

Territory	Communities with CWF: Population	Indigenous population (2011)	Percent with fluoridated systems[18]
Nunavut[1]	Iqaluit ;6699 Rankin Inlet; 2266 Arviat; 1810	27 360	28.8%
Northwest Territories[1]	Yellowknife; 19 234 Inuvik; 3463 Fort Smith; 2093 (use with caution),	21 160	64.9%
Yukon[1]	(none)	7 705	0.0%

[1]In Nunavut and Northwest Territories, the majority of the population (86% for Nunavut; 52% for NT) is from an Indigenous background. It is around 23% for Yukon.

As Nunavut, NT and Yukon don't have Reserves per se, they are not included in the total "on Reserve population" in the main table (previous page), and we consequently provide for these three Territories' estimates for fluoridated water system coverage as previously presented in table 1 for the total population.

[18] Percent with fluoridated systems in this table were not verified as the data is not easily accessible