Arsenic

Environmental estimates (circa 2011): Supplemental data

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1. Data for lifetime excess cancer risk estimates

Overview

The summary data used to calculate lifetime excess cancer risk and the results for arsenic are provided in the tables below. For more detailed information on supporting data and sources, see below for each exposure pathway.

i. Environmental Concentrations

Exposure pathway	Units	Average	Maximum	Notes
Outdoor air	µg/m³	0.00043	0.0012	
Drinking water	µg/L	0.47	60	
Dust	µg/g	13.1	153	
Foods and beverages		See detailed data	Not estimated	

ii. Calculated Lifetime Daily Intake

Exposure pathway	Average intake (mg/kg bodyweight per day)	Maximum intake (mg/kg bodyweight per day)
Outdoor air	0.00000001	0.000000028
Drinking water	0.000012	0.00156
Dust	0.0000086	0.00010
Foods and beverages	0.000033	Not estimated

iii. Cancer Potency Factors

Exposure route	Health Canada	US EPA	CA OEHHA
Inhalation	27.0	15.05	12.0
Ingestion	1.8	1.5	1.5

Sources for Cancer Potency Factors:

- Health Canada, 2010. Federal Contaminated Site Risk Assessment in Canada, Part I: Guidance on Human Health Preliminary Quantitative Risk Assessment. Version 2.0.
- Health Canada, 2010. Federal Contaminated Site Risk Assessment in Canada, Part II: Health Canada Toxicological Reference Values (TRVs) and Chemical-Specific Factors. Version 2.0.
- United States Environmental Protection Agency Integrated Risk Information System
- California Office of Environmental Health Hazard Assessment, 2009. Air Toxics Hot Spots Risk Assessment Guidelines Part II: Technical Support Document for Cancer Potency Factors, Appendix A. (Updated 2011)

iv. Lifetime Excess Cancer Risk (per million people)

	Average[1]			Maximum[2]
Exposure pathway	Health Canada	US EPA	CA OEHHA[3]	
Outdoor air	0.27	0.15	0.12	0.75
Drinking Water	22.0	18.31	18.31	2804.47
Dust	15.49	12.90	12.90	180.88
Foods and beverages	59.43	49.53	49.53	Not estimated

[1]Lifetime excess cancer risk based on average intake x cancer potency factor from each agency
[2]Lifetime excess cancer risk based on maximum intake x highest cancer potency factor
[3]California Office of Environmental Health Hazard Assessment

Supporting data by exposure pathway

i. Outdoor air

Outdoor air concentrations are from the National Air Pollution Surveillance monitoring network operated by Environment Canada, for the year 2010.

Source	Stations (n)	Min	Max	Mean	DF
NAPS 2010 (µg/m³)	15	0.00012	0.0012	0.00043	1.0

DF = Detection frequency

We assume arsenic is present at these levels in all outdoor air, although concentrations may vary from one location to another.

ii. Indoor air

Indoor air concentrations are based on data published in peer-reviewed literature since 2000. A ranking system was used to select data most representative of Canadian conditions circa 2011:

1. Canadian data collected in 2000 or more recently, sample duration of 24 hours or longer;
2. US studies of similar currency and sample duration;
3. Studies from northern European countries of similar currency and sample duration;
4. Canadian, US or European studies with data collected prior to 2000 and similar sample duration; and
5. Studies with sample duration of less than 24 hours regardless of country or collection date, or studies from countries not comparable to Canada.

Rank: 2	Author:	Na (2004)					Location:	USA, Riverside CA			
Samples (n)	DF*	DL**	Sample Date	Units	Sample Duration	Min	Max	Mean (AM)	Med	Geomean (GM)	Percentile
12			2001-	µg/m³	6 days			0.005			
7			2002					0.006			
1								0.006			

Notes: Values listed in the following order: Non-Smoking, Occasional Smoking, Frequent Smoking. Analyzed using XRF (less accurate method)
*DF = Detection frequency
**DL = Detection limit

Rank: 4	Author:	Sax (2006)					Location:	New York City, Los Angeles			
Samples (n)	DF*	DL**	Sample Date	Units	Sample Duration	Min	Max	Mean (AM)	Med	Geomean (GM)	Percentile
79	1.0		1999-	µg/m³	48 hr		0.00106	0.0004	0.00035		
75	1.0		2000				0.00081	0.00044	0.00042		

Notes: Values listed in the following order: New York City, Los Angeles.. Analyzed using ICP-MS (most accurate method).
*DF = Detection frequency
**DL = Detection limit

Rank: 5	Author:	Dermentzoglou (2003)					Location:	Greece			
Samples (n)	DF*	DL**	Sample Date	Units	Sample Duration	Min	Max	Mean (AM)	Med	Geomean (GM)	Percentile
6				µg/m³	2 hrs			0.00153			
6								0.00136			
6								0.00074			
6								0.00212			

Notes: Values listed in the following order: Central Heating Central, Wood Burning Central , Cigarette Central, Cooking. Analyzed using hydride generation AAS (more accurate than XRF, not as accurate as ICP-MS)
*DF = Detection frequency
**DL = Detection limit

Rank: 5	Author:	Lai (2004)					Location:	Oxford, England			
Samples (n)	DF*	DL**	Sample Date	Units	Sample Duration	Min	Max	Mean (AM)	Med	Geomean (GM)	Percentile
50	0.76		1998-2000	µg/m³	48 hr			0.0047		0.0037	

Notes: Dec 1998- Feb 2000. Analyzed using XRF (less accurate method).
*DF = Detection frequency
**DL = Detection limit

Rank: 5	Author: Pekey (2010)							Location: Turkey			
Samples (n)	DF*	DL**	Sample Date	Units	Sample Duration	Min	Max	Mean (AM)	Med	Geomean (GM)	Percentile
15		0.0001	2006	µg/m³	daily			0.001			
								0.002			
								0.001			
								0.003			
								0.0012	0.0006		
								0.0011	0.0005		
								0.002	0.001		
								0.002	0.001		

Notes: Values listed in the following order: $PM_{2.5}$ Fraction S, $PM_{2.5}$ Fraction W, PM_{10} Fraction S, PM_{10} Fraction W, $PM_{2.5}$ Fraction Smoker, $PM_{2.5}$ Fraction Non-Smoker, PM_{10} Fraction Smoker, PM_{10} Fraction Non-Smoker (Summer May – June 2006, Winter Dec 2006 – Jan 2007). Analyzed using XRF (less accurate method).
*DF = Detection frequency
**DL = Detection limit

Sources for indoor air data:

- Dermentzoglou M, Manoli E, Samara C. 2003. Sources and patterns of polycyclic aromatic hydrocarbons and heavy metals in fine indoor particulate matter of Greek houses. Fresenius Environmental Bulletin 12: 1511-1519.
- Lai HK, Kendall M, Ferrier H, Lindup I, Alm S, Hanninen O, et al. 2004. Personal exposures and microenvironment concentrations of PM2.5, VOC, NO2 and CO in Oxford, UK. Atmospheric Environment 38: 6399-6410.
- Na K, Sawant AA, Cocker III DR. 2004. Trace elements in fine particulate matter within a community in western Riverside Country, CA: focus on residential sites and a local high school. Atmospheric Environment 38: 2867-2877.
- Pekey B, Bozkurt ZB, Pekey H, Dogan G, Zararsiz A, Efe N, et al. 2010. Indoor/outdoor concentrations and elemental composition of PM10/PM2.5 in urban/industrial areas of Kocaeli City, Turkey. Indoor Air 2010 20: 112-125.
- Sax SN, Bennett DH, Chillrud SN, Ross J, Kinney PL, Spengler JD. 2006. A cancer risk assessment of inner-city teenagers living in New York City and Los Angeles. Environmental Health Perspectives 114: 1558-1566.

iii. Dust

Indoor dust concentrations are based on data published in peer-reviewed literature since 2000. A ranking system was used to select data most representative of Canadian conditions circa 2011:

1. Canadian data collected in 2000 or more recently, sample duration of 24 hours or longer;
2. US studies of similar currency and sample duration;
3. Studies from northern European countries of similar currency and sample duration;
4. Canadian, US or European studies with data collected prior to 2000 and similar sample duration; and
5. Studies with sample duration of less than 24 hours regardless of country or collection date, or studies from countries not comparable to Canada.

Rank: 1 Author: Rasmussen (2013) Location: Canada National

Samples (n)	DF*	DL**	Sample Date	Units	Sample Duration	Min	Max	Mean (AM)	Med	Geomean (GM)	Percentile
1025		0.1	2001-2010	µg/g		0.1	153	13.1	9.1	7.7	25th 5.2 75th 15.3 90th 26.7 95th 40.6

Notes: Analyzed using ICP-MS (most accurate method). Sample represents a population-based urban baseline representative for Canada, not individual cities or provinces.
*DF = Detection frequency
**DL = Detection limit

Rank: 2 Author: Hensley (2007) Location: USA, Alabama

Samples (n)	DF*	DL**	Sample Date	Units	Sample Duration	Min	Max	Mean (AM)	Med	Geomean (GM)	Percentile
11			2006	µg/g		3.0	261.0	29.8	7.0		

Notes: Attic dust near a wood treatment facility, analyzed using ICP-MS (most accurate method)
*DF = Detection frequency
**DL = Detection limit

Rank: 2 Author: Rieuwerts (2006) Location: England

Samples (n)	DF*	DL**	Sample Date	Units	Sample Duration	Min	Max	Mean (AM)	Med	Geomean (GM)	Percentile
20				µg/g		43	486	149			
9						1.7	29	15			

Notes: Vacuum Sample, Values listed in the following order: Ex-mining area, Non-mining area, analyzed using ICP-MS (most accurate method)
*DF = Detection frequency
**DL = Detection limit

Rank: 2 Author: Tsuji (2005) Location: USA, NY State

Samples (n)	DF*	DL**	Sample Date	Units	Sample Duration	Min	Max	Mean (AM)	Med	Geomean (GM)	Percentile
96			2003	µg/g		1	172			10.8	

Notes: Vacuum Sample, analyzed using ICP-AES (detection limits not as good as ICP-MS)
*DF = Detection frequency
**DL = Detection limit

Rank: 5 Author: Davis (2005) Location: Australia, Sydney

Samples (n)	DF*	DL**	Sample Date	Units	Sample Duration	Min	Max	Mean (AM)	Med	Geomean (GM)	Percentile
38			1997 &	µg/g							
10			1999			9.0	79.7	31.2	26.3	26.3	
17						10.6	512.0	50.4	16.3	21.2	
10						7.2	17.8	12.8	11.7	12.2	
1								6.4			

Notes: 100 cm² sample, Attic dust only, values listed in the following order: Industrial, Semi-Industrial ,Non-Industrial, Rural
*DF = Detection frequency
**DL = Detection limit

Sources for dust data:

- Davis JJ, Gulson BL. 2005. Ceiling (attic) dust: A "museum" of contamination and potential hazard. Environmental Research 99: 177-194.
- Hensley AR, Scott A, Rosenfeld PE, Clark JJJ. 2007. Attic dust and human blood samples collected near a former wood treatment facility. Environmental Research 105: 194-199.
- Rasmussen PE, Levesque C, Chénier M, Gardner HD, Jones-Otazo, H, Petrovic S. 2013. Canadian House Dust Survey: Population-based concentrations of arsenic, cadmium, chromium, copper, nickel, lead, and zinc inside urban homes. Science of the Total Environment 443: 520-529.
- Rieuwerts JS, Searle P, Buck R. 2006. Bioaccessible arsenic in the home environment in southwest England. Sceince of The Total Environment 371: 89-98.
- Tsuji JS, Van Kerkove MD, Kaetzel RS, Scrafford CG, Mink PJ, Barraj LM, et al. 2005. Evaluation of exposure to arsenic in residential soil. Environmental Health Perspectives 113: 1735-1740.

iv. Drinking water

Drinking water data are from the Ontario Drinking Water Surveillance Program (DWSP) for 2011. A review of published reports was also conducted in order to compare how well the Ontario data represented other regions in Canada.

Source	Units	DL							
Ontario DWSP 2011	(µg/L)	+/-							
Sample Type	Parameter	Mean	SD	Min	25th	50th	75th	Max	N
Distribution (-)	Unfiltered total	0.20	0.32	0.0	0.0	0.13	0.23	3.2	307
Distribution (+)	Unfiltered total	0.73	0.40	0.37	0.37	0.67	0.77	4.8	307
Calculated mean		0.47	0.36	--	0.19	0.40	0.51	4.0	

DL = Detection limit
SD = Standard Deviation

Rank: 1 Author: Health Canada (2006) Location: Canada – national review

Samples (n)	DF*	DL**	Sample Date	Units	Sample Duration	Min	Max	Mean (AM)	Med	Geomean (GM)	Percentile
			1986 - 2002	µg/L		0.1	26.0	1.5			99th 10.0
			1990 - 2002			1.0	25.0 / 60.0	1.6			98th 10.0
			1997 - 2002			0.1	18.0	<= 0.7			99th 10.0
			1999 - 2002			< 2.5	68.0	< 2.5			
			1976 - 2002			0.5	105.0	3.0			97th 10
			1980 - 2002			0.1	1000	1.8			99th 10
			2002				6 to 288				
			200?			1.0	368				81st 10

Notes: Data presented in the following order: PEI groundwater supply; Quebec municipal treated surface / groundwater (523 / 562 communities); Ontario treated ground and surface water (726 communities); Ontario private laboratory data for raw and treated drinking water (higher values predominantly from wells); Saskatchewan municipal treated water (539 communities); Alberta treated ground and surface water (573 communities); Newfoundland public supply wells (54); Newfoundland school wells (16)
*DF = Detection frequency
**DL = Detection limit

Rank: 1 Author: Witmans (2008) Location: Saskatchewan

Samples (n)	DF*	DL**	Sample Date	Units	Sample Duration	Min	Max	Mean (AM)	Med	Geomean (GM)	Percentile
~ 205				µg/L			31.0	2.19			

Notes: Data presented in the following order: Alberta municipal treated surface water, Alberta municipal treated ground water,
*DF = Detection frequency
**DL = Detection limit

Rank: 1 Author: Wilson et al. (2008) Location: Surrey-Langley, British Columbia

Samples (n)	DF*	DL**	Sample Date	Units	Sample Duration	Min	Max	Mean (AM)	Med	Geomean (GM)	Percentile
99		0.2	August 2007	µg/L		<0.2	60.0	11.5			

Notes: Groundwater samples from private wells.
*DF = Detection frequency
**DL = Detection limit

Sources for drinking water data:

- Health Canada. 2006. Guidelines for Canadian Drinking Water Quality: Guideline Technical Document - Arsenic. Ottawa, Ontario, Canada: Water Quality and Health Bureau, Healthy Environments and Consumer Safety Branch, Health Canada.
- Wilson J, Schreier H, Brown S. 2008. Arsenic in groundwater in the Surrey-Langley area. Institute for Resources & Environment, University of British Columbia. For Fraser Health Authority Environmental Health Services and Ministry of Environment.
- Witmans MR, McDuffie HH, Karunanayake C, Kerrich R, Pahwa P. 2008. An exploratory study of chemical elements in drinking water and non-Hodgkin's lymphoma. Toxicological and Environmental Chemistry 90: 1227-1247.

v. Food and Beverages

Food consumption data are from the Statistics Canada Food Survey (2006) - Food available, adjusted for losses tables, and from the Nutrition Canada Survey (1970-1972).

Food concentration data are primarily from the US-FDA Total Diet Study (2003-2004), with additional data on metals and several PAHs from the Canadian Food Inspection Agency (CFIA) - National Chemical Residue Monitoring Program: 2009-2010 Annual Report and the US-FDA (TDS Statistics on Element Results - 2008).

In order to better represent actual intake, we incorporated data for cooked and/or processed foods, as in some cases, this can either add to or diminish the amount measured in raw food.

Concentration data were obtained for 48% of total meat consumed, 94% of total seafood consumed, 30% of total fruit consumed, 52% of total vegetables consumed, 9% of total dairy and eggs consumed, 65% of total grains consumed, and 35% of total beverages consumed.

Food or Beverage	Concentration (µg/g)	DF
Beef	0.00820	0.05130
Chicken	0.01290	0.50800
Mutton and lamb	0.07000	0.10000
Offal	0.00100	0.01000
Oils and fats	0.00000	0.01200
Pork	0.00810	0.22500
Salad oils		
Shortening and shortening oils		
Stewing hen		
Turkey	0.01720	0.58100
Veal	0.00680	0.35400
Fish fresh and frozen seafish	0.08800	0.02000
Fish freshwater		
Fish processed seafish	1.00000	0.01200
Apple pie filling		
Apple sauce	0.00000	0.00800
Apples canned		
Apples dried		
Apples fresh		
Apples frozen		
Apricots canned		
Apricots fresh	0.01550	0.33300
Bananas fresh		
Berries other fresh		
Blueberries canned		
Blueberries fresh	0.00620	0.75000
Blueberries frozen		
Cherries fresh	0.01520	0.66700
Cherries frozen		
Citrus other fresh		
Coconut fresh		
Cranberries fresh		
Dates fresh		
Figs fresh		
Fruit dried	0.01400	0.02000
Grapefruit fresh	0.00000	0.00800
Grapes fresh	0.00300	0.00800
Guava and mangoes fresh		
Kiwi fresh		
Lemons fresh		
Limes fresh		
Mandarins fresh		
Melons musk, cantaloupe fresh	0.01050	0.83300
Melons other fresh		
Melons watermelons fresh		
Melons, winter melons fresh		
Nectarines fresh		
Oranges fresh		
Papayas fresh		
Peaches canned		

Food or Beverage	Concentration (µg/g)	DF
Peaches fresh	0.01190	0.33300
Pears canned		
Pears fresh	0.00100	0.00800
Pineapples canned		
Pineapples fresh	0.00000	0.01000
Plums total fresh	0.00730	0.47600
Quinces fresh		
Raspberries frozen	0.00920	0.50000
Strawberries canned		
Strawberries fresh	0.00680	0.15000
Strawberries frozen		
Sugar maple		
Sugar refined	0.00000	0.02000
Honey	0.03221	0.22400
Artichokes fresh		
Asparagus canned		
Asparagus fresh	0.00780	0.56000
Avocados fresh		
Beans baked and canned		
Beans dry		
Beans green and wax canned		
Beans green and wax fresh	0.00960	1.00000
Beans green and wax frozen		
Beets canned		
Beets fresh	0.00770	0.75000
Broccoli fresh	0.00760	0.17600
Broccoli frozen		
Brussels sprouts fresh	0.00000	0.01000
Brussels sprouts frozen		
Cabbage Chinese fresh	0.01610	0.50000
Cabbage fresh	0.00600	0.25000
Carrots canned		
Carrots fresh	0.00890	1.00000
Carrots frozen		
Cauliflower fresh	0.00640	0.11100
Cauliflower frozen		
Celery fresh	0.01330	0.83300
Corn canned		
Corn flour and meal		
Corn fresh	0.00830	0.33300
Corn frozen		
Cucumbers fresh	0.01090	0.50000
Eggplant fresh	0.01440	0.37500
Garlic fresh		
Kohlrabi fresh		
Leeks fresh	0.00810	0.40000
Lettuce fresh	0.01520	0.75000
Lima beans frozen		
Manioc fresh		
Mushrooms canned		

Food or Beverage	Concentration (µg/g)	DF
Mushrooms fresh	0.05310	1.00000
Okra fresh		
Olives fresh		
Onions and shallots fresh	0.01560	0.81800
Parsley fresh	0.01550	1.00000
Parsnips fresh	0.01210	0.50000
Peas canned		
Peas dry		
Peas fresh	0.01950	0.12500
Peas frozen		
Peppers fresh		
Potatoes chips	0.00000	0.02000
Potatoes frozen		
Potatoes other processed		
Potatoes sweet fresh	0.00780	0.50000
Potatoes white fresh	0.00520	0.42500
Potatoes white fresh and processed		
Pumpkins and squash fresh		
Radishes fresh	0.04410	0.60000
Rappini fresh		
Rutabagas and turnip fresh		
Spinach fresh	0.01910	0.66700
Spinach frozen		
Tomatoes canned		
Tomatoes fresh	0.00100	0.01000
Tomatoes pulp, paste and puree		
Vegetables other edible root fresh		
Vegetables other leguminous fresh		
Vegetables unspecified canned		
Vegetables unspecified fresh		
Vegetables unspecified frozen		
Butter		
Cheese cheddar	0.00000	0.02000
Cheese cottage	0.00000	0.01000
Cheese processed	0.00200	0.02000
Cheese variety	0.00800	1.00000
Cream cereal 10%	0.00000	0.01000
Cream sour	0.00000	0.01000
Cream table 18%		
Cream whipping 32% or 35%		
Eggs	0.01540	0.44100
Ice cream	0.00000	0.01000
Ice milk		
Margarine		

Food or Beverage	Concentration (µg/g)	DF
Milk buttermilk		
Milk chocolate drink	0.00000	0.01000
Milk concentrated skim		
Milk concentrated whole		
Milk other whole milk products		
Milk partly skimmed 2%	0.00000	0.01000
Milk skim	0.00000	0.01000
Milk standard		
Milk sweetened concentrated skim		
Milkshake		
Powder buttermilk		
Powder skim milk		
Powder whey		
Sherbet		
Yogurt	0.00000	0.01000
Cereal products	0.13500	0.01000
Oatmeal and rolled oats	0.00200	0.01000
Peanuts	0.01300	0.02000
Pot and pearl barley		
Pulses and nuts		
Rice	0.06500	0.01000
Rye flour		
Tree nuts		
Wheat flour		
Ale, beer, stout and porter	0.00000	0.00700
Beverages alcoholic		
Coffee	0.00020	0.00800
Distilled spirits		
Juice apple	0.00500	0.00800
Juice grape	0.00700	0.00800
Juice tomato	0.00000	0.01000
Juice fruit	0.00500	0.00800
Juice grapefruit	0.00000	0.00800
Juice lemon		
Juice orange		
Juice pineapple	0.00000	0.00800
Juice vegetable		
Soft drinks	0.00000	0.00900
Tea	0.00000	0.00400
Water bottled	0.00000	0.00200
Wines	0.01000	0.00600
Cocoa		

2. Data quality for lifetime excess cancer risk estimates

Only publicly available data were used to calculate these indicators. Data that are not publicly available may produce different results.

No systematic method for measuring data quality was possible, so we provide the following assessments of how well the data used may represent the actual Canadian average levels. Quality is rated higher when there are data from a number of Canadian monitors, or from Canadian studies that show results similar to other comparable studies. Quality is rated lower when data from few monitors or studies were available, and lowest when estimates are based on non-Canadian data. Others may rate data quality differently.

Exposure Pathway	Data Quality	Notes
Outdoor air	Moderate	• Arsenic is regularly measured in outdoor air at 15 monitoring stations across Canada using accepted protocols.
Indoor air	Gap	• No recent data or studies identified using appropriately accurate analytical methods.
Indoor dust	Moderate	• One recent Canadian study was identified, representing a population-based urban baseline estimate representative for Canada, not individual cities or provinces.
Drinking water	Moderate	• Arsenic was detected in 307 samples from the Ontario Drinking Water Surveillance program in 2011. However, a national review of data up to the year 2002, and more recent studies from SK, and Surrey-Langley BC, suggest the Ontario data are not fully representative (too low).
Foods and beverages	Low	• Data from the CFIA (National Chemical Residue Monitoring Program: 2009-2010 Annual Report) were used for some foods, with additional data from the US-FDA (TDS Statistics on Element Results - 2008).

3. Data for mapping concentrations

The maps use geographic coordinates at the census block level to represent residential locations. Concentration estimates are mapped at the health region level, which are created with aggregated census block data.

We used a model to predict annual average concentrations of arsenic in outdoor air at residential locations for 2011. These are predicted using levels measured from the National Air Pollution Surveillance (NAPS) monitors and estimated concentrations from known emitters. For more information on how these estimates were created, please see the Mapping Methods document on the Environmental Approach section of our website.

Estimates by health region

The table below shows predicted arsenic concentrations by province based on data at the health region level. The median concentration of arsenic measured in outdoor air in 2011 at the health region level was 0.0006 µg/m^3, while the mean concentration was 0.0012 µg/m^3. Concentrations of arsenic can be higher or lower than average in many locations.

i. Provincial averages of predicted arsenic concentrations (µg/m^3) in outdoor air in 2011 based on health regions

Province	Median	Mean
BC	0.0011	0.0031
AB	0.0007	0.0012
SK	0.0004	0.0006
MB	0.0009	0.0011
ON	0.0006	0.0010
QC	0.0006	0.0008
NB	0.0005	0.0007
PE	0.0007	0.0007
NS	0.0005	0.0006
NL	0.0008	0.0008
YK	0.0026	0.0026
NT	0.0022	0.0022
NU	0.0012	0.0012
Canada	**0.0006**	**0.0012**

Estimates by census block

The table below shows provincial populations by concentration levels (either annual average or number of times above/below the national average) based on the census block data and the associated potential lifetime excess risk given different cancer potency factors.

i. Provincial population distribution by estimated average concentration (µg/m³) of arsenic in outdoor air in 2011 based on NAPS data at the census block

Estimated annual average concentration (µg/m³)	Less than 0.00014	0.00014 to 0.00017	0.00017 to 0.00022	0.00022 to 0.00029	0.00029 to 0.00043	0.00043 to 0.00065	0.00065 to 0.00086	0.00086 to 0.0011	0.0011 to 0.0013	More than 0.0013
Compared to national average (0.00043µg/m³)*	> 3x lower	2.5 to 3x lower	2 to 2.5x lower	1.5 to 2x lower	1 to 1.5x lower	1 to 1.5x higher	1.5 to 2x higher	2 to 2.5x higher	2.5 to 3x higher	> 3.0x higher
	← Below Average					→ Above Average				
BC	--	--	23,074 (0.5%)	2,505 (<0.1%)	1,925,567 (43.8%)	1,080,629 (24.6%)	121,703 (2.8%)	51,905 (1.2%)	292,033 (6.6%)	902,641 (20.5%)
AB	--	--	--	730,652 (20.0%)	1,414,810 (38.8%)	944,202 (25.9%)	137,656 (37.8%)	47,978 (1.3%)	26,909 (0.7%)	343,050 (9.4%)
SK	--	--	--	--	317,817 (30.8%)	457,616 (44.2%)	49,101 (4.8%)	36,649 (3.5%)	17,690 (1.7%)	154,508 (15.0%)
MB	--	--	--	--	548,951 (45.4%)	455,036 (37.7%)	50,935 (4.2%)	20,340 (1.7%)	10,151 (0.8%)	122,855 (10.2%)
ON	--	--	--	338,333 (2.6%)	6,379,793 (49.6%)	3,943,098 (30.7%)	872,313 (6.8%)	193,317 (1.5%)	83,249 (0.6%)	1,041,718 (8.1%)
QC	--	--	--	145,862 (1.8%)	1,498,688 (19.0%)	4,336,962 (54.9%)	888,774 (11.2%)	312,470 (4.0%)	180,113 (2.3%)	540,132 (6.8%)
NB	75,668 (10.1%)	4,452 (0.6%)	14,889 (2.0%)	23,715 (31.6%)	239,871 (31.9%)	281,040 (37.4%)	36,525 (4.9%)	20,542 (2.7%)	10,835 (1.4%)	43,634 (5.8%)
NS	--	277,895 (30.1%)	32,243 (3.5%)	53,611 (5.8%)	177,664 (19.3%)	302,957 (32.9%)	19,527 (2.1%)	15,044 (1.6%)	10,600 (1.2%)	32,186 (3.5%)
PE	--	--	--	--	33,367 (23.8%)	64,938 46.3%)	6,692 (4.8%)	8,736 (6.2%)	4,776 (3.4%)	21,695 (115.5%)
NL	--	--	--	--	160,420 (31.2%)	232,991 (45.3%)	22,458 (4.4%)	16,222 (3.2%)	10,478 (0.2%)	71,967 (14.0%)
NU	--	--	--	--	--	23,292 (73.0%)	--	0 (<0.1%)	0 (<0.1%)	8,614 (27.0%)
NT	--	--	--	--	816 (2.0%)	16,698 (40.3%)	172 (0.4%)	461 (1.1%)	496 (1.2%)	22,819 (55.0%)
YT	--	--	--	--	8,061 (23.8%)	8,244 (24.3%)	467 (1.4%)	1,163 (3.4%)	295 (0.9%)	15,667 (46.2%)
CANADA	75,668	282,347	70,206	1,294,678	12,705,825	12,147,703	2,206,323	724,827	647,625	3,321,486
% of pop.	(0.2%)	(0.8%)	(0.2%)	(3.9%)	(38.0%)	(36.3%)	(6.6%)	(2.2%)	(1.9%)	(9.9%)

ASSOCIATED LIFETIME EXCESS CANCER RISK (per million people):
RED = POTENTIAL LIFETIME EXCESS RISK IS GREATER THAN 1 PER MILLION PEOPLE

Health Canada CPF: 27.0	< 0.09	0.09 to < 0.11	0.11 to < 0.14	0.14 to < 0.18	0.18 to < 0.27	0.27 to < 0.41	0.41 to < 0.54	0.54 to < 0.68	0.68 to < 0.81	> 0.81
California OEHHA CPF: 12.0	< 0.04	0.04 to < 0.05	0.05 to < 0.06	0.06 to < 0.08	0.08 to < 0.12	0.12 to < 0.18	0.18 to < 0.24	0.24 to < 0.3	0.3 to < 0.36	> 0.36
US EPA CPF: 15.1	< 0.05	0.05 to < 0.06	0.06 to < 0.08	0.08 to < 0.1	0.1 to < 0.15	0.15 to < 0.23	0.23 to < 0.3	0.3 to < 0.38	0.38 to < 0.45	> 0.45

* measured at National Air Pollution Surveillance (NAPS) monitors in 2011
CPF: Cancer Potency Factor