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Tobacco use of Canadians, 2012 and 2013

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0^s value rounded to 0 (zero) where there is a meaningful distinction between true zero and the value that was rounded
^{p} preliminary
^{r} revised
x suppressed to meet the confidentiality requirements of the *Statistics Act*
^{E} use with caution
F too unreliable to be published
* significantly different from reference category ($p < 0.05$)

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Tobacco use of Canadians, 2012 and 2013

Exposure to tobacco through smoking cigarettes or use of other tobacco products has been associated with a range of adverse health effects including several types of cancer (e.g. lung, stomach, liver, and oral cancers), coronary heart disease, and asthma.[1], [2] The most common routes of exposure to tobacco are by smoking cigarettes, using other tobacco products, or through second-hand smoke.[3] Cotinine is a by-product of the metabolism of nicotine (a chemical found in tobacco products) in the human body; the measured levels in urine reflect recent exposure to tobacco.[4]

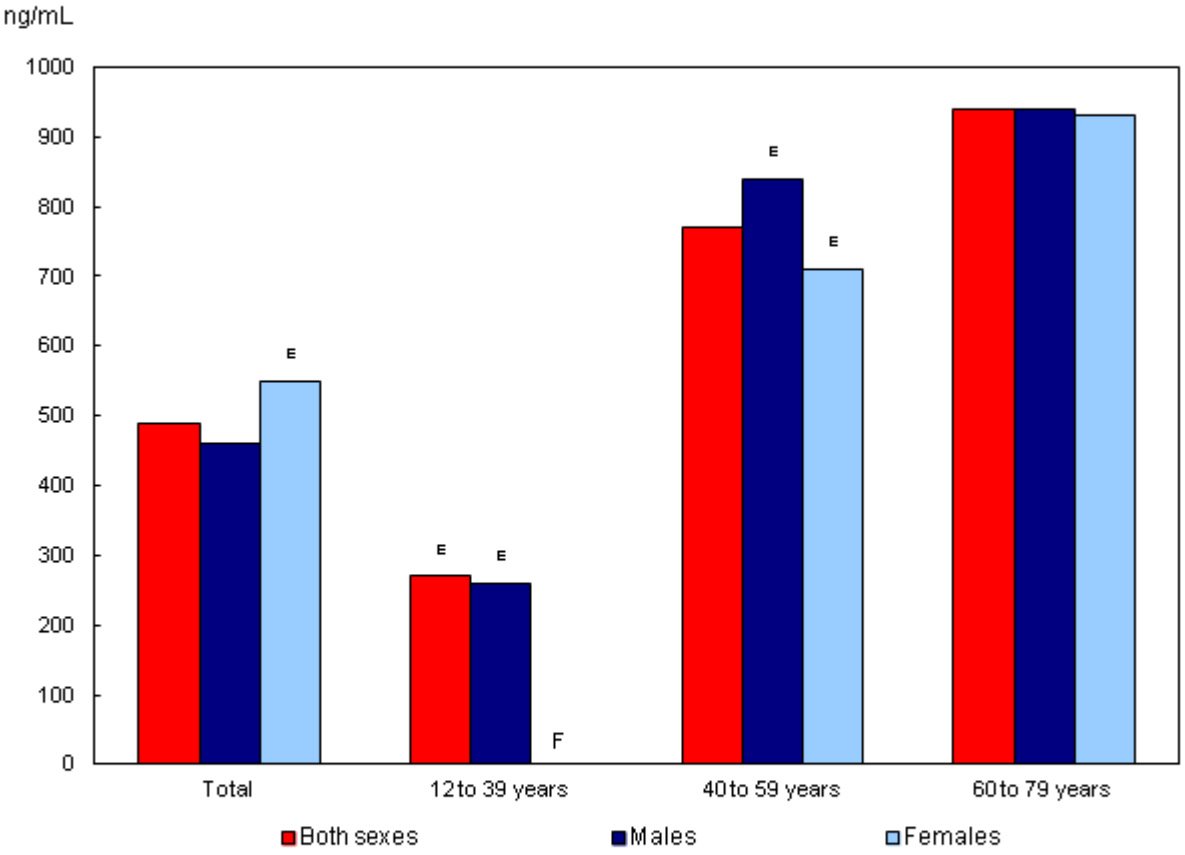
Urine cotinine concentration[5] and self-reported smoking status[6]

Results from the 2012 and 2013 Canadian Health Measures Survey (CHMS) indicate that average urine cotinine concentration of Canadians aged 12 to 79 was significantly higher among those who reported being daily or occasional smokers compared with those who reported being non-smokers. Smokers had an average cotinine concentration of 490 nanograms per millilitre (ng/mL) of cotinine in their urine (Chart 1). Among non-smokers aged 12 to 79, 89% had urine cotinine concentrations that were below the limit of detection (1.1 ng/mL) (data not shown).

Among smokers aged 12 to 79 year olds, 60 to 79 year olds had the highest urine cotinine concentration (940 ng/mL) and 12 to 39 year olds had the lowest (270 ng/mL) (Chart 1). Among smokers aged 40 to 59, males had a higher concentration of cotinine in their urine (840 ng/mL)

compared with females (710 ng/mL) (Chart 1).

Chart 1
Average urine cotinine concentration in self-reported smokers aged 12 to 79, by sex and age group, household population, Canada, 2012 and 2013



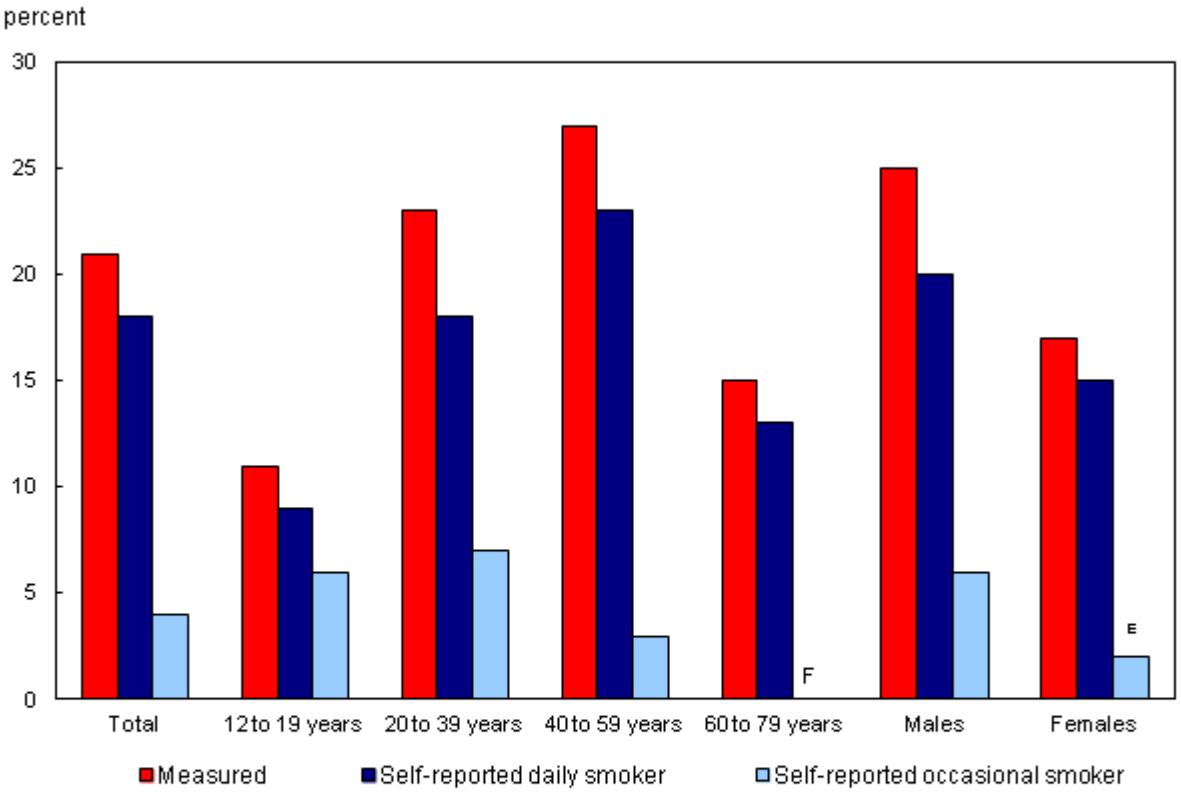
E use with caution (data with a coefficient of variation from 16.6% to 33.3%)
F too unreliable to be published (data with a coefficient of variation (CV) greater than 33.3%; supressed due to extreme sampling variability)
Note: Concentrations are presented as a geometric mean, which is a type of average that is less influenced by extreme values than the traditional arithmetic mean. The geometric mean provides a better estimate of central tendency for highly skewed data. This type of distribution is common in the measurement of environmental chemicals in blood and urine.
Source: Canadian Health Measures Survey, 2012 and 2013

Prevalence of smoking based on urine cotinine concentration versus self-reported smoking status

Individuals with a urine cotinine concentration of greater than 50 ng/mL are classified as smokers.[5] Results indicate that 21% or about 1 in 5 Canadians aged 12 to 79 years were smokers based on their measured urine cotinine concentration (Chart 2). Smoking was more prevalent among males (25%) than females (17%) and among middle-aged adults 40 to 59 years (27%) than among the older and younger age groups (Chart 2).

Among Canadians who reported being a daily or occasional smoker, approximately 3% had measured urine cotinine levels less than or equal to 50 ng/mL (data not shown). On the other hand, 10% of self-reported non-smokers had a urine cotinine concentration greater than 50 ng/mL. The prevalence of Canadians who reported being a daily or occasional smoker was not significantly different from those with measured urine cotinine concentration above 50 ng/mL.

Chart 2
Prevalence of smokers based on measured urinary cotinine concentration[1] and self-report,[2] by sex and age group, household population aged 12 to 79, Canada, 2012 and 2013



E use with caution (data with a coefficient of variation from 16.6% to 33.3%)
F too unreliable to be published (data with a coefficient of variation (CV) greater than 33.3%; supressed due to extreme sampling variability)
1. Individuals with measured urine cotinine concentrations that were greater than 50 ng/mL are classified as smokers.
2. A self-reported smoker is defined as someone who was a daily or occasional smoker.
Note: Concentrations are presented as a geometric mean, which is a type of average that is less influenced by extreme values than the traditional arithmetic mean. The geometric mean provides a better estimate of central tendency for highly skewed data. This type of distribution is common in the measurement of environmental chemicals in blood and urine.
Source: Canadian Health Measures Survey, 2012 and 2013

Exposure to second-hand smoke[7] among non-smokers

Among self-reported non-smokers, 21% indicated being exposed to second-hand smoke (data not shown). Canadians aged 12 to 19 had the highest prevalence of exposure to second-hand smoke (31%) compared with older and younger non-smokers. Approximately 13% of children aged 6 to 11

(who are assumed to be non-smokers), 25% of adults aged 20 to 39, 20% of adults aged 40 to 59, and 12% of older adults aged 60 to 79 reported being exposed to second-hand smoke (data not shown).

The majority of non-smokers (89%) had urine cotinine concentrations that were below detectable limits.[8] However, this differed significantly based on self-reported exposure to second-hand smoke. Among non-smokers who reported no recent exposure to second-hand smoke, 94% had urine cotinine concentrations that were below detectable limits (data not shown). In contrast, among non-smokers who reported recent exposure to second-hand smoke, 66% had urine cotinine concentrations below detectable limits.

About tobacco-related biomarkers

Nicotine is a naturally occurring chemical found in tobacco products. The metabolism of nicotine occurs in the liver and results in the production of several metabolites, including cotinine, which is known as the best biological marker of active or passive tobacco exposure.[1]

Cotinine (measured as free cotinine) was measured in the urine of Canadians aged 3 to 79, and is presented in nanograms per millilitre (ng/mL). Concentrations are presented as a geometric mean, which is a type of average that is less influenced by extreme values than the traditional arithmetic mean. The geometric mean provides a better estimate of central tendency for highly skewed data. This type of data is common in the measurement of environmental chemicals in blood and urine.

Other tobacco-related chemicals were measured in urine as part of the CHMS (for respondents aged 12 to 79) including anabasine, cotinine-n-glucuronide, nicotine-n-glucuronide, hydroxycotinine and NNAL.

Data

Additional information on cotinine and many other environmental substances are presented in Health Canada's *Third Report on Human Biomonitoring of Environmental Chemicals in Canada*.

Additional information is available at Canadian Health Measures Survey.

For more information on the Canadian Health Measures Survey, please contact Statistics Canada's Statistical Information Service (toll-free 1-800-263-1136; 514-283-8300; infostats@statcan.gc.ca).

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Notes

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1 National Biomonitoring Program. 2013. *Fact Sheet: Cotinine.* Centers for Disease Control and Prevention, Atlanta, GA. (accessed April 13, 2015).

2 Hecht. S.S. 2013. "Tobacco carcinogens, their biomarkers and tobacco-induced cancer." *Nature Reviews: Cancer.* Vol. 3. Nature Publication Group. Minneapolis, Minnesota (accessed March 13, 2015).

3 Health Canada. 2011. *Tobacco Scientific Facts.* Ottawa: Minister of Health. (accessed June 2, 2015).

4 Health Canada. 2014. *Biomarkers of Exposure.* Ottawa: Minister of Health. (accessed March 13, 2015).

5 This is the cut-point recommended by the Society for Research on Nicotine and Tobacco to distinguish tobacco users from non-tobacco users, including those exposed to second-hand smoke. Note that in some cases the cotinine levels of non-smokers can exceed 50 ng/mL.

6 A self-reported smoker is defined as someone who is a daily or occasional smoker. A self-reported non-smoker is defined as someone who does not smoke or has never smoked 100 cigarettes in their lifetime.

7 Self-reported exposure to second-hand smoke includes exposure in the home and outside the home: in a car or other vehicle; at work; at someone else's home; at indoor public places (e.g., bars, restaurants, shopping malls, arenas, bingo halls, bowling alleys, concerts or sporting facilities); at outdoor public places (e.g., patios, bus stops or shelters, entrances to buildings, school property, sidewalks or parks); or anywhere else. Exposure to second-hand smoke excludes exposure to their own smoke.

8 If greater than 40% of results are below the detectable limits, the average results cannot be calculated.