

Health Reports

Duration and quality of sleep among Canadians aged 18 to 79

by Jean-Philippe Chaput, Suzy L. Wong and Isabelle Michaud

Release date: September 20, 2017



Statistics
Canada

Statistique
Canada

Canada

How to obtain more information

For information about this product or the wide range of services and data available from Statistics Canada, visit our website, www.statcan.gc.ca.

You can also contact us by

email at STATCAN.infostats-infostats.STATCAN@canada.ca

telephone, from Monday to Friday, 8:30 a.m. to 4:30 p.m., at the following numbers:

- Statistical Information Service 1-800-263-1136
- National telecommunications device for the hearing impaired 1-800-363-7629
- Fax line 1-514-283-9350

Depository Services Program

- Inquiries line 1-800-635-7943
- Fax line 1-800-565-7757

Standards of service to the public

Statistics Canada is committed to serving its clients in a prompt, reliable and courteous manner. To this end, Statistics Canada has developed standards of service that its employees observe. To obtain a copy of these service standards, please contact Statistics Canada toll-free at 1-800-263-1136. The service standards are also published on www.statcan.gc.ca under "Contact us" > "Standards of service to the public."

Note of appreciation

Canada owes the success of its statistical system to a long-standing partnership between Statistics Canada, the citizens of Canada, its businesses, governments and other institutions. Accurate and timely statistical information could not be produced without their continued co-operation and goodwill.

Published by authority of the Minister responsible for Statistics Canada

© Minister of Industry, 2017

All rights reserved. Use of this publication is governed by the Statistics Canada [Open Licence Agreement](#).

An HTML version is also available.

Cette publication est aussi disponible en français.

Duration and quality of sleep among Canadians aged 18 to 79

by Jean-Philippe Chaput, Suzy L. Wong and Isabelle Michaud

Abstract:

This article provides recent estimates of the duration and quality of sleep of Canadian adults and of the percentage who adhere to sleep duration guidelines (7 to 9 hours per night at ages 18 to 64, and 7 to 8 hours per night at age 65 or older). The study is based on 10,976 respondents aged 18 to 79 from the 2007-to-2013 Canadian Health Measures Survey, a nationally representative, cross-sectional survey. Sleep duration and quality were self-reported. Mean sleep duration was 7.12 hours per night at ages 18 to 64 and 7.24 hours per night at ages 65 to 79. An estimated 65% of 18- to 64-year-olds and 54% of seniors slept the recommended number of hours per night. However, short sleep duration and poor sleep quality were relatively common. About a third slept fewer hours than recommended. At ages 18 to 64, an estimated 43% of men and 55% of women reported trouble going to sleep or staying asleep “sometimes/most of the time/all of the time”; the corresponding percentages at ages 65 to 79 were 40% and 59%.

Keywords: Insomnia, sleeplessness, prevalence, surveillance, population health

Insufficient sleep (short duration and poor quality) is associated with a range of adverse health outcomes, including obesity, type 2 diabetes, cardiovascular disease, injuries, all-cause mortality, depression, irritability, and reduced well-being.¹ In today’s 24/7 world, insufficient sleep is common.^{2,3} The factors that may be associated with insufficient sleep include exposure to artificial light at night, caffeine consumption, work demands, social commitments, and family dynamics (for example, working mothers and children with full agendas).¹ Sleep often receives relatively little attention as a component of a healthy lifestyle, and health care professionals and policy makers tend not to regard it as a public health concern.⁴

For adults aged 18 to 64 and seniors aged 65 or older, 7 to 9 hours and 7 to 8 hours of sleep per night, respectively, are recommended.⁵ Findings from the 2005 General Social Survey (respondents aged 15 or older) showed that men slept significantly fewer hours per night than did women (8.1 versus 8.3; $p < 0.05$). However, women were more likely to report trouble falling asleep or staying asleep (35% versus 25%; $p < 0.05$).⁶ The 2002 Canadian Community Health Survey: Mental Health and Well-being yielded similar results—35% of the population aged 15 or older had trouble going to sleep or staying asleep at least some of the time.⁷

Sleep duration estimates for Canadian children and adolescents have recently been published,^{8,9} but updated figures for adults are lacking. Information about the percentage of adults who sleep less than recommended and about the prevalence of poor sleep quality is important for surveillance and to inform health care providers, health policy makers, and the general

public. This study provides more recent estimates of sleep duration and quality in the context of sleep duration guidelines, based on the Canadian Health Measures Survey (CHMS) from 2007 to 2013 (see *The data*).

Percentage of 18- to 64-year-olds meeting sleep duration recommendations

During the 2007-to-2013 period, Canadians aged 18 to 64 averaged 7.12 hours of sleep per night (Table 1). About two-thirds reported the recommended 7 to 9 hours, and one-third, less than 7 hours. At these ages, sleeping more than 9 hours was rare (3.3%).

Consistent with previous Canadian findings,⁶ women’s average sleep duration was significantly longer than that of men (7.24 versus 7.00 hours per night). However, 2007-to-2013 estimates were below those reported in 2005 (8.3 and 8.1 hours for women and men, respectively).⁶ Variations in methodology (diary in 2005 versus self-reports in the 2007-to-2013 period) may explain some of this difference.

People aged 18 to 64 with higher household education and income were more likely to report sleeping the recommended number of hours per night, compared with those with less education and lower incomes.

Percentage of seniors meeting sleep duration recommendations

Seniors aged 65 to 79 averaged 7.24 hours of sleep per night (Table 2). About one-third of them reported fewer than the recommended 7 hours.

Table 1
Mean sleep duration and percentage distribution by sleep duration recommendations, by sex, education and income, household population aged 18 to 64, Canada excluding territories, 2007 to 2013

Sex, household education and household income	Hours of sleep per night			Percentage distribution by sleep duration recommendations (7 to 9 hours per night)								
	Mean	95% confidence interval		Recommended			Shorter than recommended			Longer than recommended		
		from	to	%	from	to	%	from	to	%	from	to
Total aged 18 to 64 (n = 8,914)	7.12	7.06	7.17	64.8	62.6	66.9	31.9	29.7	34.2	3.3	2.8	4.0
Sex												
Men	7.00	6.92	7.08	62.4	59.1	65.6	34.9	31.5	38.4	2.8	2.0	3.7
Women	7.24 [†]	7.14	7.33	67.1	64.5	69.6	29.0 [†]	26.4	31.7	3.9	3.1	4.8
Household education[‡]												
Secondary graduation or less	7.12	7.01	7.22	59.2	54.2	64.0	35.4	31.3	40.0	5.4	3.7	7.8
More than secondary graduation, less than bachelor's degree	7.10	7.00	7.20	64.4	60.6	68.0	32.7	29.2	36.4	2.9	2.0	4.1
Bachelor's degree or more	7.13	7.04	7.21	68.8 [§]	65.4	72.0	28.7	25.3	32.4	2.5 [§]	1.7	3.5
Household income												
Less than \$40,000	7.09	6.97	7.21	59.3	55.7	62.8	35.4	32.2	38.8	5.3	3.9	7.1
\$40,000 to less than \$80,000	7.11	7.03	7.19	64.3	60.9	67.7	32.1	28.9	35.6	3.5	2.6	4.7
\$80,000 or more	7.14	7.06	7.22	67.9 ^{††}	64.8	70.8	29.9	26.7	33.3	2.2 ^{††}	1.5	3.2

[†] significantly different from men (p < 0.05)

[‡] 236 missing values in 18 to 64 sample

[§] significantly different from "Secondary graduation or less" (p < 0.05)

^{††} significantly different from "Less than \$40,000" (p < 0.05)

Note: An adjustment for multiple comparisons was performed to detect significant differences.

Source: 2007 to 2013 Canadian Health Measures Survey.

Table 2
Mean sleep duration and percentage distribution by sleep duration recommendations, by sex, education and income, household population aged 65 to 79, Canada excluding territories, 2007 to 2013

Sex, household education and household income	Hours of sleep per night			Percentage distribution by sleep duration recommendations (7 to 8 hours per night)								
	Mean	95% confidence interval		Recommended			Shorter than recommended			Longer than recommended		
		from	to	%	from	to	%	from	to	%	from	to
Total aged 65 to 79 (n = 2,035)	7.24	7.15	7.33	54.2	50.4	58.0	31.0	27.6	34.7	14.7	12.8	16.9
Sex												
Men	7.27	7.14	7.41	56.1	50.8	61.2	30.0	25.2	35.2	14.0	11.2	17.3
Women	7.21	7.10	7.33	52.5	47.8	57.2	32.0	27.9	36.4	15.5	12.7	18.6
Household education[‡]												
Secondary graduation or less	7.32	7.17	7.47	49.4	42.5	56.2	31.3	25.6	37.6	19.4	16.3	22.8
More than secondary graduation, less than bachelor's degree	7.17	6.99	7.34	55.9	49.6	62.1	32.3	26.5	38.6	11.8 [§]	8.5	16.3
Bachelor's degree or more	7.21	7.08	7.34	60.1	52.1	67.6	28.7	23.2	35.0	11.2 [§]	7.8	15.9
Household income												
Less than \$40,000	7.28	7.14	7.41	49.2	43.9	54.6	32.0	27.7	36.7	18.7	15.1	23.1
\$40,000 to less than \$80,000	7.27	7.11	7.43	55.4	49.4	61.2	30.6	24.7	37.2	14.0	11.2	17.5
\$80,000 or more	7.10	6.93	7.28	63.0 [†]	56.5	69.1	29.8	24.2	36.2	7.2 ^{†††}	4.6	11.0

[†] 56 missing values in 65 to 79 sample

[‡] significantly different from "Less than \$40,000" (p < 0.05)

[§] significantly different from "Secondary graduation or less" (p < 0.05)

^{†††} significantly different from "\$40,000 to less than \$80,000" (p < 0.05)

Note: An adjustment for multiple comparisons was performed to detect significant differences.

Source: 2007 to 2013 Canadian Health Measures Survey.

Table 3
Sleep quality, by age group, sex and frequency of sleep characteristic, household population aged 18 to 79, Canada excluding territories, 2007 to 2013

Age group, sex and frequency of sleep quality characteristic	Trouble going to sleep or staying asleep (%)			Sleep is refreshing (%)			Difficulty staying awake during normal waking hours (%)		
	(n=10,965)			(n=10,967)			(n=10,966)		
	%	95% confidence interval		%	95% confidence interval		%	95% confidence interval	
from		to	from		to	from		to	
18 to 64									
Men									
Never	28.4	25.6	31.4	4.1	3.1	5.3	35.5	32.8	38.3
Rarely	28.7	26.4	31.2	9.9	8.3	11.7	34.2	32.0	36.4
Sometimes	24.3	22.1	26.7	27.1	23.9	30.5	25.3	22.8	27.9
Most of the time	11.3	9.5	13.5	44.1	41.0	47.2	4.1	2.9	5.5
All of the time	7.2	5.8	9.0	14.8	12.8	17.1	1.0	0.5	1.8
Women									
Never	19.9 [†]	17.5	22.5	5.4	4.3	6.9	33.1	30.4	36.0
Rarely	25.2	23.2	27.5	14.0 [†]	12.5	15.7	32.1	29.5	34.8
Sometimes	30.7 [†]	28.0	33.5	28.7	26.7	30.9	28.3	25.9	30.9
Most of the time	16.7 [†]	15.0	18.5	40.0	37.7	42.3	5.6	4.5	6.9
All of the time	7.5	6.2	9.1	11.9	10.3	13.6	0.9	0.4	1.5
65 to 79									
Men									
Never	33.7	28.9	38.8	1.5 [‡]	0.7	2.7	40.0	35.8	44.4
Rarely	26.5	23.0	30.2	7.7	5.5	10.7	26.4 [‡]	22.6	30.7
Sometimes	22.7	19.3	26.5	12 [‡]	9.6	14.9	27.8	22.9	33.2
Most of the time	12.2	9.6	15.3	52.7 [‡]	48.4	57.0	4.7	3.1	6.8
All of the time	5.0	3.4	7.1	26 [‡]	22.0	30.6	1.1	0.6	2.0
Women									
Never	17.1 [†]	14.5	20.0	3.7	2.2	6.0	46.7 [‡]	42.0	51.4
Rarely	24.0	20.2	28.4	6.6 [‡]	4.7	9.0	26.5	22.6	31.0
Sometimes	34.3 [†]	30.1	38.8	19.2 ^{‡†}	15.9	23.0	24.0	20.5	27.9
Most of the time	15.2	12.3	18.7	51 [‡]	45.1	56.8	2.4 [‡]	1.4	4.0
All of the time	9.4	6.9	12.5	19.5 [‡]	16.0	23.5	0.3 [†]	0.1	0.9

[†] significantly different from estimate for men in same age group ($p < 0.05$)

[‡] significantly different from 18- to 64-year-olds of same sex ($p < 0.05$)

Note: An adjustment for multiple comparisons was performed to detect significant differences.

Source: 2007 to 2013 Canadian Health Measures Survey.

Compared with 18- to 64-year-olds, a larger percentage of seniors (about 15%) slept longer than the recommended 8-hour maximum. Long sleep duration in the elderly can signal a need for medical, neurological, or psychiatric evaluation.^{5,10}

In contrast to 18- to 64-year-olds, no significant sleep duration differences emerged between senior men and women. However, as was the case at younger ages, seniors in higher-income households were more likely than those in lower-income households to sleep the recommended number of hours

per night. The pattern was similar for education, but did not reach statistical significance.

Sleep quality

According to results of the 2007-to-2013 CHMS, 43% of men and 55% of women aged 18 to 64 reported trouble going to sleep or staying asleep “sometimes/most of the time/all of the time” (Table 3). This was comparable to 2005, when a higher percentage of women than men reported trouble falling asleep or staying asleep (35% versus 25%).⁶ However, differences in the methodology used to collect sleep information preclude direct comparisons between studies.

Similarly, among seniors aged 65 to 79, women were more likely than men to report trouble going to sleep or staying asleep “sometimes/most of the time/all of the time” (59% versus 40%). Percentages for this sleep quality indicator did not differ statistically between 18- to 64-year-olds and 65- to 79-year-olds.

Three-quarters of seniors (75%) and about half (55%) of people aged 18 to 64 reported that sleep was refreshing “most of the time/all of the time.” Around a third (33% of 18- to 64-year-olds and 30% of seniors) reported difficulty staying awake during normal waking hours “sometimes/most of the time/all of the time.”

Sleep quality by sleep duration recommendation category

Men and women aged 18 to 64 who slept the recommended number of hours reported better sleep quality than did those who slept less or more than recommended (Table 4). They were more likely to report that sleep was usually refreshing, and less likely to report difficulty going to sleep, staying asleep, and staying awake during normal waking hours.

At ages 65 to 79, men and women who slept the recommended amount reported more refreshing sleep and less difficulty going to sleep and staying asleep, compared with those who slept fewer hours than recommended. As well, senior men and women who slept more hours

Table 4
Sleep quality, by age group, sex and frequency of meeting sleep duration recommendations, household population aged 18 to 79, Canada excluding territories, 2007 to 2013

Age group, sex and frequency of meeting sleep duration recommendations	Trouble going to sleep or staying asleep (10,944)			Sleep is refreshing (n = 10,946)			Difficulty staying awake during normal waking hours (n = 10,945)		
	95% confidence interval			95% confidence interval			95% confidence interval		
	%	from	to	%	from	to	%	from	to
18 to 64									
Men									
Recommended									
Never/Rarely	62.4	58.4	66.2	6.7	5.6	8.1	73.2	70.4	76.0
Sometimes/Most of the time/ All of the time	37.6	33.8	41.6	93.3	91.9	94.4	26.8	24.0	29.6
Shorter than recommended									
Never/Rarely	47.5	42.1	53	25.6	21.0	30.9	64.6	59.7	69.1
Sometimes/Most of the time/ All of the time	52.5 [†]	47.0	57.9	74.4 [†]	69.1	79.0	35.4 [†]	30.9	40.3
Longer than recommended									
Never/Rarely	55.8	33.0	76.4	31	11.8	60.2	52.0	29.3	73.8
Sometimes/Most of the time/ All of the time	44.2	23.6	67.0	69.0	39.8	88.2	48.0	26.2	70.7
Women									
Recommended									
Never/Rarely	50.8	47.4	54.3	12.1	10.4	14.0	69.5	66.0	72.7
Sometimes/Most of the time/ All of the time	49.2	45.7	52.6	87.9	86.0	89.6	30.5	27.3	34.0
Shorter than recommended									
Never/Rarely	31.6	26.6	37.0	35.3	31.3	39.6	55.9	51.8	59.9
Sometimes/Most of the time/ All of the time	68.4 [†]	63.0	73.4	64.7 [†]	60.4	68.7	44.1 [†]	40.1	48.2
Longer than recommended									
Never/Rarely	52.0	38.3	65.5	24.9	14.1	40.1	61.4	51.5	70.4
Sometimes/Most of the time/ All of the time	48.0 [†]	34.5	61.7	75.1	59.9	85.9	38.6	29.6	48.5
65 to 79									
Men									
Recommended									
Never/Rarely	61.3	55.7	66.7	6.0	3.5	10.1	67.2	60.8	73.1
Sometimes/Most of the time/ All of the time	38.7	33.3	44.3	94.0	89.9	96.5	32.8	26.9	39.2
Shorter than recommended									
Never/Rarely	46.7	38.8	54.9	16.4	11.5	22.8	63.1	54.6	70.9
Sometimes/Most of the time/ All of the time	53.3 [†]	45.1	61.2	83.6 [†]	77.2	88.5	36.9	29.1	45.4
Longer than recommended									
Never/Rarely	84.7	76.2	90.6	5.6	2.5	11.9	71.3	61.5	79.4
Sometimes/Most of the time/ All of the time	15.3 ^{††}	9.4	23.8	94.4 [†]	88.1	97.5	28.7	20.6	38.5
Women									
Recommended									
Never/Rarely	41.5	37.2	45.9	6.7	4.5	10.0	74.4	69.4	78.8
Sometimes/Most of the time/ All of the time	58.5	54.1	62.8	93.3	90.0	95.5	25.6	21.2	30.6
Shorter than recommended									
Never/Rarely	30.0	21.8	39.8	18.0	12.1	25.8	73.0	65.0	79.8
Sometimes/Most of the time/ All of the time	70.0	60.2	78.2	82.0 [†]	74.2	87.9	27.0	20.2	35.0
Longer than recommended									
Never/Rarely	63.1	52.4	72.8	5.6	2.8	10.7	69.5	61.3	76.6
Sometimes/Most of the time/ All of the time	36.9 ^{††}	27.2	47.6	94.4 [†]	89.3	97.2	30.5	23.4	38.7

[†] significantly different from "Recommended" in same age group and sex (p < 0.05)

^{††} significantly different from "Shorter than recommended" in same age group and sex (p < 0.05)

Notes: An adjustment for multiple comparisons was performed to detect significant differences. Sleep duration recommendations are 7 to 9 hours at ages 18 to 64 and 7 to 8 hours at ages 65 to 79.

Source: 2007 to 2013 Canadian Health Measures Survey.

than recommended reported less trouble going to sleep or staying asleep, staying awake and more refreshing sleep, compared with seniors who slept less than recommended.

Conclusion

Short sleep duration and poor sleep quality are prevalent among Canadian adults. About one-third sleep fewer hours per night than recommended for optimal physical and mental health. This group also experiences poor sleep quality more frequently than do those who sleep the recommended number of hours. Additional research is needed to determine the prevalence of adverse health outcomes among short and poor sleepers.

Acknowledgements

The authors thank the participants in the Canadian Health Measures Survey and all Statistics Canada staff involved in the operations of the survey.

The data

Data source

The data are from cycles 1 to 3 (2007 through 2013) of the Canadian Health Measures Survey (CHMS), an ongoing nationally representative, cross-sectional survey of the household population. Residents of First Nations Reserves or other Aboriginal settlements, institutions and some remote regions, and full-time members of the Canadian Forces were excluded. Ethics approval for the CHMS was obtained from Health Canada's Research Ethics Board.¹¹

Response rates for selected households were 69.6%, 75.9% and 74.1% for cycles 1, 2 and 3, respectively. From the responding households, 88.3% of participants completed the household questionnaire in cycle 1, 90.5% in cycle 2, and 88.4% in cycle 3. Combined data¹² for respondents aged 18 to 79 from cycle 1 (2007 to 2009; n = 3,721),¹³ cycle 2 (2009 to 2011; n = 3,866),¹⁴ and cycle 3 (2012 to 2013; n = 3,389)¹⁵ were used for the present analyses.

Definitions

Sleep duration was assessed with the question, "How many hours do you usually spend sleeping in a 24-hour period, excluding time spent resting?" Responses were rounded to the closest half hour. A total of 27 outliers/missing values were excluded from the analyses.

Sleep quality was assessed with three questions: (1) "How often do you have trouble going to sleep or staying asleep?"; (2) "How often do you find your sleep refreshing?"; and (3) "How often do you find it difficult to stay awake during your normal waking hours when you want to?" For each question, response options were: "Never," "Rarely," "Sometimes," "Most of the time," and "All of the time." Those who responded "Don't know" or who did not answer the question were removed from the analyses: (1) n=11; (2) n=9; (3) n=10.

Respondents were classified as meeting the recommended sleep duration range (7 to 9 hours per night at ages 18 to 64 and 7 to 8 hours per night at age 65 or older), sleeping less than recommended, or sleeping longer than recommended.⁵

In addition to age group and sex, participants were examined by household education and household income. Household education was the highest level acquired by any member of the household; three categories were created (secondary graduation or less, secondary graduation but less than a bachelor's degree, and a bachelor' degree or more). Annual household income was reported by participants and collapsed into three levels: less than \$40,000, \$40,000 to less than \$80,000, and \$80,000 or more.

To account for the survey design, means and percentages were estimated using survey weights, and their variances were estimated using the survey bootstrap technique.^{16,17} Then, 95% confidence intervals were calculated, and small percentage confidence intervals were used by SUDAAN version 11 for estimated percentages $\leq 5\%$. T-tests were performed to compare means and proportions between different domains. P-values were adjusted for multiple comparisons using the False Discovery Rate (FDR) adjustment method. Differences between estimates were tested for statistical significance at a FDR adjusted p-value < 0.05 . All analyses were conducted with SAS version 9.3 and SUDAAN version 11.

Limitations

Data from the Canadian Health Measures Survey do not include important sleep duration and quality characteristics such as timing, architecture (how individuals cycle through the stages of sleep), consistency, and continuity. Self-reports generally overestimate actual sleep duration and are subject to recall and/or social desirability bias.¹⁸ Sleeping fewer hours than recommended does not necessarily adversely affect health.

References

- Institute of Medicine Committee on Sleep Medicine and Research. Colten HR, Altevogt BM, eds. *Sleep Disorders and Sleep Deprivation: An Unmet Public Health Problem*. Washington, D.C.: The National Academies Press, 2006.
- Hillman DR, Lack LC. Public health implications of sleep loss: The community burden. *Medical Journal of Australia* 2013; 199(8): S7-10.
- Ohayon MM. Determining the level of sleepiness in the American population and its correlates. *Journal of Psychiatric Research* 2012; 46(4): 422-7.
- Chaput JP, Carson V, Gray CE, Tremblay MS. Importance of all movement behaviors in a 24-hour period for overall health. *International Journal of Environmental Research and Public Health* 2014; 11(12): 12575-81.
- Hirshkowitz M, Whiton K, Albert SM, et al. National Sleep Foundation's updated sleep duration recommendations: Final report. *Sleep Health* 2015; 1: 233-43.
- Hurst M. Who gets any sleep these days? Sleep patterns of Canadians. *Canadian Social Trends* (Statistics Canada, Catalogue 11-008) 2008; 85(Summer): 39-45.
- Tjepkema M. Insomnia. *Health Reports* 2005; 17(1): 9-25.
- Chaput JP, Janssen I. Sleep duration estimates of Canadian children and adolescents. *Journal of Sleep Research* 2016; 25(5): 541-8.
- Michaud I, Chaput JP. Are Canadian children and adolescents sleep deprived? *Public Health* 2016; 141: 126-9.
- Zdanys KF, Steffens DC. Sleep disturbances in the elderly. *Psychiatric Clinic of North America* 2015; 38: 723-41.
- Day B, Langlois R, Tremblay MS, Knoppers BM. Canadian Health Measures Survey: Ethical, legal and social issues. *Health Reports* 2007; 18(Suppl): 37-51.
- Statistics Canada. *Instructions for Combining Multiple Cycles of Canadian Health Measures Survey (CHMS) Data*. November 2014. Available at: http://www23.statcan.gc.ca/imdb-bmdi/document/5071_D6_T9_V1-eng.htm
- Statistics Canada. *Canadian Health Measures Survey (CHMS) Data User Guide: Cycle 1*. April 2011. Available at: http://www23.statcan.gc.ca/imdb-bmdi/document/5071_D2_T1_V1-eng.pdf
- Statistics Canada. *Canadian Health Measures Survey (CHMS) Data User Guide: Cycle 2*. November 2012. Available at: http://www23.statcan.gc.ca/imdb-bmdi/document/5071_D4_T9_V1-eng.htm
- Statistics Canada. *Canadian Health Measures Survey (CHMS) Data User Guide: Cycle 3*. November 2014. Available at: http://www23.statcan.gc.ca/imdb-bmdi/document/5071_D6_T9_V1-eng.htm
- Rao JNK, Wu CFJ, Yue K. Some recent work on resampling methods for complex surveys. *Survey Methodology* (Statistics Canada, Catalogue 12-001) 1992; 18: 209-17.
- Rust KF, Rao JNK. Variance estimation for complex surveys using replication techniques. *Statistical Methods in Medical Research* 1996; 5: 281-310.
- Arora T, Broglio E, Pushpakumar D, et al. An investigation into the strength of the association and agreement levels between subjective and objective sleep duration in adolescents. *PLoS One* 2013; 8: e72406.