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and Wendy Thompson

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# Sleep behaviours among Canadian adults: Findings from the 2020 Canadian Community Health Survey healthy living rapid response module

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## ABSTRACT

### Background

The Canadian 24-Hour Movement Guidelines for Adults, released in October 2020, recommend 7 to 9 hours of good-quality sleep for adults aged 18 to 64 and 7 to 8 hours for adults aged 65 and older, on a regular basis, with consistent sleep and wake times for health benefits. This study assesses the sleep behaviours of Canadian adults and how these behaviours align with the recommendations.

### Data and methods

This cross-sectional study uses nationally representative data from the 2020 Canadian Community Health Survey healthy living rapid response module (N = 9,248), collected from January to March 2020. Sleep behaviours were self-reported by respondents, and descriptive statistics were used to calculate means or percentages for sleep duration, guideline adherence, physical activity and screen time, sleep timing, and sleep variability in the full sample. This was done by age, sex, household education, household income adequacy and employment status.

### Results

Mean sleep duration was 7.9 hours for adults aged 18 to 64, with 77% meeting sleep duration recommendations, and 8.1 hours for adults aged 65 and older, with 55% meeting sleep duration recommendations. Among adults aged 18 to 64, 61% reported high sleep quality, compared with 71% among adults aged 65 and older. High sleep variability ( $\geq 30$ -minute difference between work and free days) and poor sleep-facilitating behaviours were prevalent. Adults who reported high sleep quality and high sleep variability were more likely to meet sleep duration recommendations.

### Interpretation

To maximize health benefits, continued efforts are needed to promote good sleep behaviours among Canadian adults. Device-based measures of sleep could improve surveillance and research.

### Keywords

sleep, sleeplessness, surveillance, prevalence, population health

## AUTHORS

Chinchin Wang ([chinchin.wang@phac-aspc.gc.ca](mailto:chinchin.wang@phac-aspc.gc.ca)), Karen C. Roberts ([karenc.roberts@phac-aspc.gc.ca](mailto:karenc.roberts@phac-aspc.gc.ca)) and Wendy Thompson ([wendy.thompson@phac-aspc.gc.ca](mailto:wendy.thompson@phac-aspc.gc.ca)) are with the Centre for Surveillance and Applied Research at the Public Health Agency of Canada, Ottawa, Ontario. Chinchin Wang is also with the Department of Epidemiology, Biostatistics and Occupational Health at McGill University, Montréal, Quebec, and the Centre for Clinical Epidemiology at the Lady Davis Institute of Medical Research, Montréal, Quebec. Rachel C. Colley ([rachel.colley@statcan.gc.ca](mailto:rachel.colley@statcan.gc.ca)) is with the Health Analysis Division at Statistics Canada, Ottawa, Ontario. Jean-Philippe Chaput ([jpchaput@cheo.on.ca](mailto:jpchaput@cheo.on.ca)) is with the Healthy Active Living and Obesity Research Group at the Children's Hospital of Eastern Ontario Research Institute, Ottawa, Ontario.

### ***What is already known on this subject?***

- Good sleep habits, which include adequate sleep duration, good sleep quality and sleep consistency, are associated with positive short-term and long-term health benefits.
- The Canadian 24-Hour Movement Guidelines recommend that adults aged 18 to 64 obtain 7 to 9 hours of good-quality sleep on a regular basis, with consistent sleep and wake times for health benefits. The sleep duration recommendation for adults aged 65 and older is 7 to 8 hours of sleep.

### ***What does this study add?***

- Three-quarters of Canadian adults aged 18 to 64 and half of Canadian adults aged 65 and older meet sleep duration recommendations.
- Two-thirds of Canadian adults report high sleep quality.
- Two-thirds of Canadian adults report high variability in sleep duration and wake-up time between work and free days.
- Two-thirds of Canadian adults use electronic devices within 30 minutes of falling asleep.
- High sleep quality and high sleep variability between work and free days are associated with meeting sleep duration recommendations.

Sleep is a necessary part of daily life, with both short- and long-term health consequences. Sleep impacts physiological processes, cognitive performance and mood.<sup>1</sup> Good sleep behaviours are associated with reduced risk of adverse health conditions, including mortality, cardiovascular disease, diabetes, mental and cognitive disorders, accidents, and injuries.<sup>2</sup>

Sleep duration, quality, variability and timing are each components of sleep health that have been linked with health outcomes.<sup>3</sup> The relationship between sleep duration and both physical and mental health has been widely researched and is regarded as a U-shaped association.<sup>2</sup> Among adults, 7 to 8 hours of sleep per night have been most favourably associated with positive health outcomes,<sup>2</sup> whereas shorter and longer sleep durations have been associated with increased risk of adverse health outcomes.<sup>2,4</sup> Sleep quality refers to efficiency in going to sleep and staying asleep, and also contributes to physical and mental health.<sup>5</sup> Variability in sleep timing between work and free days, and late sleep timing within the 24-hour day have been associated with adverse outcomes.<sup>6</sup> These behaviours can be affected by practices that facilitate sleep (often referred to as sleep hygiene),<sup>7</sup> including minimal electronic use before bed, minimal screen time and sufficient physical activity, among others.<sup>8</sup>

October 2020 marked the release of the Canadian 24-Hour Movement Guidelines for Adults aged 18 to 64 years, and 65 years and older, including the first official sleep recommendations for Canadian adults. These guidelines were developed by a consensus panel, including national organizations (Public Health Agency of Canada, Canadian Society for Exercise Physiology, Queen's University and

ParticipACTION), content experts, methodologists, stakeholders and end users. Further details are provided elsewhere.<sup>9</sup> The guidelines recommend 7 to 9 hours of good-quality sleep for adults aged 18 to 64, on a regular basis, with consistent sleep and wake times for health benefits. The recommendation for adults aged 65 and older is 7 to 8 hours of sleep.<sup>9</sup> These sleep recommendations are consistent with those of the National Sleep Foundation<sup>1</sup> and the American Academy of Sleep Medicine and the Sleep Research Society.<sup>10</sup>

The most recent nationally representative sleep data are from the 2014-to-2015 Canadian Health Measures Survey (CHMS). Adults reported an average sleep duration of 7.2 hours, with 25% reporting trouble going to sleep or staying asleep most or all of the time.<sup>11</sup> Prior data are from the 2007-to-2013 CHMS.<sup>12</sup> Among adults aged 18 to 64, 65% slept between 7 and 9 hours per night, with an average duration of 7.1 hours, while 54% of adults aged 65 to 79 slept between 7 and 8 hours per night, with an average duration of 7.2 hours. Half of respondents reported trouble going to sleep or staying asleep sometimes, most of the time or all the time.

This study provides an update on the sleep behaviours (duration, quality, work and free day variability, and timing) of Canadian adults and how they align with recommendations from the 24-Hour Movement Guidelines. It also examines the proportion of adults meeting sleep duration recommendations based on sociodemographic characteristics, sleep behaviours, physical activity and screen time. Data are from the 2020 Canadian Community Health Survey (CCHS) healthy living rapid response module, which are the most recent nationally representative sleep data for Canadian adults.

## Data and methods

### Data source

This study uses data from the 2020 CCHS, a cross-sectional and nationally representative survey. The CCHS covers Canadians aged 12 years and older, excluding people living on First Nations reserves and other Indigenous settlements, full-time members of the Canadian Forces, the institutionalized population, foster children, and people living in the health regions Région du Nunavik and Région des Terres-Cries-de-la-Baie-James. The 2020 CCHS included a healthy living rapid response module, funded by the Public Health Agency of Canada, to obtain reliable national estimates on sleep. This module excluded respondents living in the three territories and proxy respondents. Data were collected by electronic questionnaire with computer-assisted interviewing, either over the phone or in person. Data collection occurred between January and March 2020, and was halted because of the COVID-19 pandemic.

### Sample size and response rate

Of 23,811 households sampled for the 2020 CCHS within the provinces between January and March, 13,654 (57.0%) agreed to participate. Responses were obtained from 11,432 individuals (individual response rate: 48.0%). From the 10,517 individuals aged 18 and older who were eligible for the healthy living rapid response module, 9,248 were included in analyses. Excluded individuals had incomplete, missing or invalid sleep data ( $n = 1,135$ ) or were missing physical activity data ( $n = 134$ ).

## Measures

### Sleep duration

Participants were asked “In the past 7 days, what time did you usually fall asleep?” and “In the past 7 days, what time did you usually wake up?” on both “the days you worked / went to school” and “your days off / weekends.”<sup>13</sup> The full module can be accessed at [https://www23.statcan.gc.ca/imdb/p3Instr.pl?Function=assembleInstr&lang=en&Item\\_Id=1262718](https://www23.statcan.gc.ca/imdb/p3Instr.pl?Function=assembleInstr&lang=en&Item_Id=1262718). Sleep duration was calculated as a weighted average of the time between sleep onset and waking up on work or school days (assumed 5 days per week) and free days (assumed 2 days per week). Extreme outliers (<3 hours or >16 hours of sleep) were corrected if there was a clear error in reporting a.m. as p.m. or vice versa, and excluded otherwise. Outliers for 351 individuals were corrected, while 359 were excluded.

### Sleep duration recommendation adherence

As recommended by Ross et al. for national surveillance,<sup>9</sup> participants were classified as meeting the sleep recommendations of the 24-Hour Movement Guidelines if their

sleep duration was between 7 hours, 0 minutes and 9 hours, 59 minutes for those aged 18 to 64, and between 7 hours, 0 minutes and 8 hours, 59 minutes for those aged 65 and older.

### Sleep quality

Participants rated their overall sleep quality in the past 7 days as “excellent,” “good,” “fair,” or “poor.”<sup>13</sup> “Excellent” and “good” were classified as good-quality sleep, whereas “fair” and “poor” were classified as poor-quality sleep.

### Work and free day sleep variability

Sleep duration variability was defined as a  $\geq 30$ -minute difference in sleep duration between work or school days and free days (or weekdays and weekends if not working). Wake time variability was defined as a  $\geq 30$ -minute difference in wake time between work and free days. Variability in sleep onset time was defined as a  $\geq 30$ -minute difference in sleep time between work and free days. The 30-minute threshold was selected based on the distribution of data and other studies,<sup>14</sup> although other cutoffs (e.g., 1 hour) have also been used.<sup>15</sup>

### Sleep onset timing

Sleep onset timing was calculated as a weighted average of the sleep onset time on work or school days and free days. Participants were classified as having a moderate sleep onset time if it was between 8:00 p.m. and 12:00 a.m., and having an early or late sleep onset time if it was outside this range. These categories were selected by adding or subtracting 2 hours from the median sleep onset time of 10:00 p.m.

### Sleep-facilitating behaviours

Four behaviours that facilitate sleep were assessed.

*Electronic devices in the bedroom:* Participants were asked whether they had a television or other type of electronic device in their bedroom while sleeping, even if turned off.<sup>13</sup>

*Electronic media use before bed:* Participants were asked for the usual length of time between stopping use of electronics (e.g., television, phone, tablet, computer, video game system) and sleep onset, in the prior 7 days.<sup>13</sup> Participants were categorized as using electronic media before bed if they were used within 30 minutes before sleep, in line with other studies.<sup>16,17</sup>

*Physical activity recommendation:* To meet the physical activity recommendation within Canada’s 24-Hour Movement Guidelines, individuals must obtain  $\geq 150$  minutes of moderate-to-vigorous physical activity (MVPA) per week.<sup>9</sup> Previous recommendations specified that MVPA should be obtained in bouts of 10 minutes or more. While this stipulation was removed in the October 2020 update,<sup>9</sup> data were collected based on the former recommendation. Therefore, participants were asked for the amount of time they spent each day in the prior week doing physical activity where they sweated or breathed harder (i.e., MVPA), in bouts of 10 minutes or more.<sup>13</sup> Those

who accumulated  $\geq 150$  or more minutes of MVPA over the prior week in bouts of 10 minutes or more were classified as meeting the physical activity recommendation, whereas those who accumulated  $< 150$  minutes or did not participate in MVPA were classified as not meeting the recommendation.

**Screen time recommendation:** To meet the screen time recommendation within Canada’s 24-Hour Movement Guidelines, individuals must limit their recreational screen time to no more than 3 hours per day.<sup>9</sup> Participants were asked for the usual amount of time they spent per day watching television or a screen on any electronic device while sitting or lying down in 2-hour increments (“2 hours or less per day,” “more than 2 hours but less than 4 hours,” “4 hours to less than 6 hours,” etc.).<sup>13</sup> Individuals who answered “2 hours or less per day” or “more than 2 hours but less than 4 hours” were categorized as meeting sedentary behaviour recommendations, whereas those who reported greater amounts were classified as not meeting the recommendation.

**Sociodemographic characteristics**

Participants were characterized by age, sex, socioeconomic status defined by household education and household income adequacy, and employment status in the week prior to the survey. Age was categorized using a life cycle approach (18 to 34, 35 to 49, 50 to 64, or 65 and older), and as adult (18 to 64

or older adult (65 and older). Household education was defined as the highest level of education attained among all members of a participant’s household, categorized as “less than high school,” “high school graduate,” or “postsecondary graduate.” Household income adequacy was derived by adjusting total household income for household size and reported as quintiles based on a weighted distribution. Employment status was categorized as “employed,” “unemployed” and “retired.”

**Statistical analysis**

Descriptive statistics were used to calculate means, percentages and 95% confidence intervals (95% CIs) for sleep indicators overall and by sociodemographic characteristics. Means and percentages were calculated using survey weights to be representative of the 10 provinces. Bootstrap weights were used to calculate 95% CIs. Two-tailed hypothesis tests were used to assess differences in means and percentages between groups under a significance level of 0.05. Analyses were conducted in SAS 9.4 (SAS Institute, North Carolina) with SAS-callable SUDAAN version 11.

**Results**

Among Canadian adults aged 18 to 64, mean sleep duration was 7.9 hours per night, with 77% meeting sleep duration

**Table 1-1**  
**Sleep duration and adherence to sleep duration recommendations, overall and by education level and income level, presented overall and by age group and sex**

	18 years and older						18 to 64 years											
	Both sexes (n=9,248)			Males (n=4,159)			Females (n=5,089)			Both sexes (n=6,140)			Males (n=2,822)			Females (n=3,318)		
	Estimate	95% CI		Estimate	95% CI		Estimate	95% CI		Estimate	95% CI		Estimate	95% CI		Estimate	95% CI	
<b>Sleep duration (hours)</b>																		
<b>Overall</b>	8.0	7.9	8.0	7.8	7.8	7.9	8.1 <sup>‡</sup>	8.0	8.1	7.9	7.9	8.0	7.8	7.7	7.8	8.1 <sup>‡</sup>	8.0	8.1
<b>Household education</b>																		
Less than high school	8.2 <sup>§</sup>	8.1	8.4	8.1 <sup>§</sup>	7.8	8.3	8.4 <sup>§</sup>	8.2	8.5	8.0 <sup>§</sup>	7.8	8.3	7.8 <sup>§</sup>	7.5	8.1	8.3 <sup>§</sup>	8.1	8.6
High school graduate	8.1	8.0	8.2	8.0	7.8	8.1	8.2	8.1	8.4	8.1	8.0	8.2	7.9	7.8	8.1	8.2	8.1	8.4
Postsecondary graduate	7.9 <sup>***</sup>	7.8	7.9	7.7 <sup>†</sup>	7.7	7.8	8.0 <sup>***</sup>	7.9	8.1	7.8	7.8	7.9	7.7	7.6	7.8	8.0 <sup>†</sup>	7.9	8.1
<b>Household income adequacy quintile</b>																		
First quintile	8.3 <sup>§</sup>	8.1	8.4	8.1 <sup>§</sup>	7.8	8.4	8.4 <sup>§</sup>	8.2	8.6	8.3 <sup>§</sup>	8.1	8.5	8.2 <sup>§</sup>	7.9	8.4	8.4 <sup>§</sup>	8.2	8.6
Second quintile	8.1	8.0	8.3	8.0	7.8	8.2	8.2	8.1	8.4	8.1	7.9	8.2	7.8	7.6	8.1	8.2	8.0	8.4
Third quintile	8.0 <sup>†</sup>	7.9	8.1	7.8	7.6	8.0	8.1 <sup>†</sup>	8.0	8.3	7.9 <sup>†</sup>	7.8	8.0	7.7 <sup>†</sup>	7.5	7.9	8.1 <sup>†</sup>	7.9	8.3
Fourth quintile	7.9 <sup>***</sup>	7.8	8.0	7.7 <sup>†</sup>	7.6	7.9	8.0 <sup>***</sup>	7.8	8.1	7.9 <sup>***</sup>	7.7	7.9	7.6 <sup>†</sup>	7.5	7.8	7.9 <sup>***</sup>	7.8	8.1
Fifth quintile	7.9 <sup>***</sup>	7.8	7.9	7.8 <sup>†</sup>	7.7	7.9	8.0 <sup>***</sup>	7.9	8.1	7.8 <sup>***</sup>	7.8	7.9	7.8 <sup>†</sup>	7.6	7.9	8.0 <sup>***</sup>	7.9	8.1
<b>Employment status</b>																		
Employed	7.8 <sup>§</sup>	7.8	7.9	7.7 <sup>†</sup>	7.6	7.8	8.0 <sup>§</sup>	7.9	8.0	7.8 <sup>§</sup>	7.8	7.9	7.7 <sup>†</sup>	7.6	7.8	8.0 <sup>§</sup>	7.9	8.0
Unemployed	8.2 <sup>***</sup>	8.1	8.4	8.0 <sup>†</sup>	7.8	8.3	8.3 <sup>***</sup>	8.2	8.5	8.2 <sup>***</sup>	8.1	8.4	8.1 <sup>†</sup>	7.8	8.3	8.3 <sup>***</sup>	8.2	8.5
Retired	8.2 <sup>***</sup>	8.1	8.3	8.1 <sup>***</sup>	8.0	8.3	8.2 <sup>***</sup>	8.1	8.3	8.2 <sup>***</sup>	8.0	8.4	8.2 <sup>***</sup>	8.0	8.5	8.2	7.9	8.4
<b>Percentage of sample meeting the sleep recommendation (%)</b>																		
<b>Overall</b>	72.7	71.2	74.1	71.7	69.4	73.9	73.7 <sup>‡</sup>	71.7	75.5	77.3	75.6	78.9	75.1	72.5	77.6	79.4 <sup>‡</sup>	77.2	81.6
<b>Household education</b>																		
Less than high school	64.2 <sup>§</sup>	59.5	68.5	64.9 <sup>§</sup>	58.2	71.1	63.5 <sup>§</sup>	57.1	69.4	74.0 <sup>§</sup>	67.1	79.9	70.6 <sup>§</sup>	60.8	78.8	78.0 <sup>§</sup>	68.4	85.3
High school graduate	70.3 <sup>***</sup>	66.8	73.5	69.8	64.5	74.7	70.8 <sup>***</sup>	66.3	74.8	74.8	70.7	78.5	73.8	67.6	79.2	76.1	70.7	80.8
Postsecondary graduate	75.1 <sup>***</sup>	73.3	76.8	73.4 <sup>†</sup>	70.3	76.3	76.6 <sup>***</sup>	74.5	78.7	78.8	76.7	80.7	76.2	72.6	79.4	81.2	78.7	83.4
<b>Household income adequacy quintile</b>																		
First quintile	71.6 <sup>§</sup>	65.8	76.8	68.8 <sup>§</sup>	60.0	76.4	73.9 <sup>§</sup>	66.6	80.1	76.6 <sup>§</sup>	70.9	81.5	73.4 <sup>§</sup>	64.3	80.8	79.3 <sup>§</sup>	72.0	85.1
Second quintile	68.7	64.8	72.4	70.0	63.7	75.6	67.9	62.8	72.6	78.2	73.0	82.6	79.8	71.1	86.4	77.0	69.9	82.9
Third quintile	70.5 <sup>†</sup>	66.4	74.3	67.0 <sup>†</sup>	59.9	73.4	73.9	69.1	78.2	75.5 <sup>***</sup>	70.4	80.0	69.9 <sup>***</sup>	61.2	77.3	81.5	75.5	86.3
Fourth quintile	70.7 <sup>†</sup>	66.6	74.4	71.8	65.4	77.3	69.7 <sup>†</sup>	64.2	74.6	75.4 <sup>***</sup>	70.6	79.7	75.6 <sup>†</sup>	68.2	81.7	75.3 <sup>†</sup>	68.4	81.1
Fifth quintile	75.8 <sup>***</sup>	73.4	78.0	74.1 <sup>†</sup>	70.3	77.5	77.7 <sup>***</sup>	74.7	80.4	78.6 <sup>***</sup>	75.9	81.0	76.1 <sup>†</sup>	71.8	79.9	81.3 <sup>†</sup>	78.0	84.2
<b>Employment status</b>																		
Employed	78.0 <sup>§</sup>	76.1	79.8	76.0 <sup>§</sup>	73.1	78.6	80.2 <sup>§</sup>	77.6	82.6	78.6 <sup>§</sup>	76.7	80.4	76.3 <sup>§</sup>	73.3	79.0	81.1 <sup>§</sup>	78.4	83.5
Unemployed	70.1 <sup>***</sup>	65.0	74.8	66.0	57.4	73.7	73.0 <sup>***</sup>	66.9	78.4	70.8 <sup>***</sup>	65.5	75.6	66.1 <sup>†</sup>	57.3	74.0	74.3 <sup>***</sup>	67.9	79.8
Retired	59.1 <sup>***</sup>	56.4	61.8	61.0 <sup>***</sup>	56.6	65.2	57.6 <sup>***</sup>	53.9	61.2	77.8 <sup>***</sup>	71.9	82.8	79.9	70.4	86.8	76.3 <sup>†</sup>	68.0	82.9

<sup>\*</sup> significantly different from reference category (p < 0.05)  
<sup>\*\*\*</sup> significantly different from reference category (p < 0.001)  
<sup>†</sup> reference category  
<sup>‡</sup> significantly different from estimate for males of same age (p < 0.001)  
<sup>§</sup> significantly different from estimate for adults 18 to 64 years of same sex (p < 0.05)  
<sup>||</sup> significantly different from estimate for adults 18 to 64 years of same sex (p < 0.001)  
**Note:** CI = confidence interval.  
**Source:** 2020 Canadian Community Health Survey healthy living rapid response module.

**Table 1-2**  
**Sleep duration and adherence to sleep duration recommendations, overall and by education level and income level, presented overall and by age group and sex**

	65 years and older								
	Both sexes (n=3,108)			Males (n=1,337)			Females (n=1,771)		
	Estimate	95% CI		Estimate	95% CI		Estimate	95% CI	
	from	to	Estimate	from	to	Estimate	from	to	
<b>Sleep duration (hours)</b>									
<b>Overall</b>	8.1 **	8.0	8.2	8.1 **	7.9	8.2	8.2 †	8.1	8.3
<b>Household education</b>									
Less than high school	8.5 †	8.3	8.6	8.5 †	8.2	8.7	8.4 †	8.2	8.6
High school graduate	8.2 *	8.0	8.3	8.1 *	7.8	8.3	8.2	8.0	8.4
Postsecondary graduate	8.0 ***	7.9	8.1	7.9 ***	7.8	8.1	8.0 ***	7.9	8.2
<b>Household income adequacy quintile</b>									
First quintile	8.1 †	7.5	8.7	7.7 †	6.7	8.7	8.5 †	8.1	9.0
Second quintile	8.3	8.2	8.5	8.4	8.1	8.7	8.3	8.1	8.5
Third quintile	8.2	8.1	8.4	8.1	7.9	8.4	8.2	8.1	8.4
Fourth quintile	8.1	7.9	8.3	8.1	7.7	8.4	8.1	7.8	8.4
Fifth quintile	8.0	7.9	8.1	7.9	7.8	8.1	8.1	7.9	8.2
<b>Employment status</b>									
Employed	7.8 †	7.6	8.0	7.8 †	7.5	8.0	7.9 †	7.6	8.2
Unemployed	8.0	7.6	8.5	7.6	7.1	8.2	8.2	7.6	8.8
Retired	8.2 *	8.1	8.3	8.1 *	8.0	8.3	8.2 *	8.1	8.3
<b>Percentage of sample meeting the sleep recommendation (%)</b>									
<b>Overall</b>	55.2 **	52.5	57.9	57.5 **	53.3	61.6	53.3 **	49.6	56.9
<b>Household education</b>									
Less than high school	53.1 †	47.5	58.6	55.9 †	47.3	64.1	51.4 †	44.3	58.5
High school graduate	51.9 †	46.3	57.4	50.8	42.1	59.5	52.8	45.9	59.6
Postsecondary graduate	57.0 ***	53.2	60.7	60.4 ***	55.0	65.7	53.7 †	48.6	58.7
<b>Household income adequacy quintile</b>									
First quintile	39.0 †	27.3	52.1	41.1 †	22.7	62.5	37.0 †	23.0	53.5
Second quintile	52.3	46.6	58.0	51.9	42.8	60.9	52.6	45.4	59.8
Third quintile	53.4	47.7	59.0	54.9	46.7	62.9	52.4	44.6	60.0
Fourth quintile	52.4	46.2	58.5	54.4	44.8	63.8	50.9 †	43.0	58.7
Fifth quintile	62.3	57.5	66.9	64.8	58.0	71.0	59.5 †	52.6	66.0
<b>Employment status</b>									
Employed	63.4 †	53.8	72.0	67.1 †	53.4	78.4	59.5 †	45.4	72.2
Unemployed	48.2	32.9	63.9	62.5	39.7	80.9	41.9	24.2	62.0
Retired	54.0 *	51.0	56.9	56.0	51.4	60.5	52.3	48.3	56.2

\* significantly different from reference category (p < 0.05)  
 \*\*\* significantly different from reference category (p < 0.001)  
 † reference category  
 ‡ significantly different from estimate for males of same age (p < 0.001)  
 † significantly different from estimate for adults 18 to 64 years of same sex (p < 0.05)  
 \*\* significantly different from estimate for adults 18 to 64 years of same sex (p < 0.001)  
 Note: CI = confidence interval.  
 Source: 2020 Canadian Community Health Survey healthy living rapid response module.

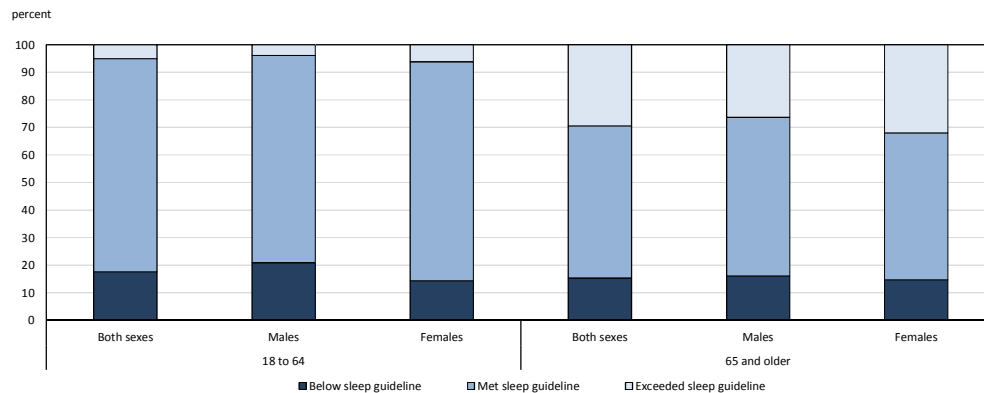
recommendations (Table 1). Among older adults, mean sleep duration was 8.1 hours per night, with 55% meeting sleep duration recommendations. The percentage of adults exceeding sleep duration recommendations was 5% for ages 18 to 64 and 29% for older adults, while the percentage of adults below the recommendations was 18% for ages 18 to 64 and 15% for older adults (Figure 1). Adults with the highest household education and income adequacy were more likely to meet sleep duration recommendations than those with the lowest, but had lower mean sleep duration. Adults with the lowest household education and income adequacy were more likely to exceed recommendations than those with the highest. Among adults aged 18 to 64, employed individuals had lower mean sleep duration than unemployed and retired individuals, while among older adults, employed individuals had lower mean sleep duration than retirees only. Sleep duration was lowest for adults aged 35 to 49. Sleep duration recommendation adherence was similar between 18- to 34-year-olds, 35- to 49-year-olds, and 50- to 64-year-olds (Figure 2a, b).

Among adults aged 18 to 64, 61% reported high sleep quality, compared with 71% of older adults (Table 2). The majority of those aged 18 to 64 had variable sleep (i.e., ≥30 minute difference in sleep duration, wake time and sleep onset time between work and free days), while the majority of adults aged

65 and older had low sleep variability. For those aged 18 to 64, 57% had a sleep onset time between 8:00 p.m. and 12:00 a.m., compared with 72% of older adults. Use of electronic media within 30 minutes of bedtime was reported by 68% of adults aged 18 to 64 and 60% of older adults. The presence of electronic devices in the bedroom while sleeping was reported by 71% of those aged 18 to 64 and 41% of older adults. Adults younger than 65 were more likely to meet physical activity recommendations but less likely to meet those for recreational screen time than older adults.

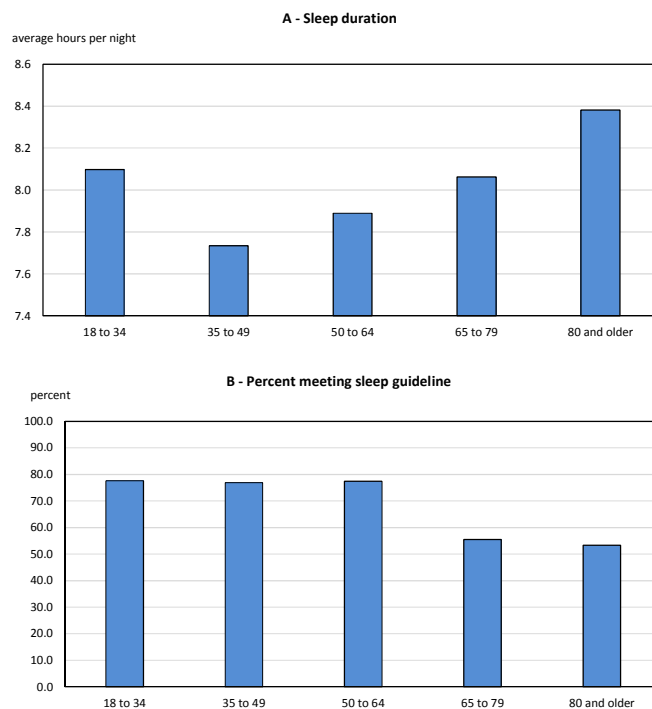
Adults and older adults who reported high sleep quality were more likely to meet sleep duration recommendations than those who reported low sleep quality (78% vs. 65%) (Table 3). Among those aged 18 to 64, individuals who had ≥30-minute differences in sleep and wake times between work and free days, with moderate sleep onset timing, and who met screen time recommendations were more likely to meet sleep duration recommendations. Among older adults, individuals who met physical activity recommendations were more likely to meet those for sleep duration. Adherence to sleep duration recommendations did not differ by electronic device use, nor by the presence of devices in the bedroom in either age group.

**Figure 1**  
Percentage of individuals below, meeting and exceeding sleep duration recommendations by age group and sex



Source: 2020 Canadian Community Health Survey healthy living rapid response module.

**Figure 2**  
Sleep duration and percentage of individuals meeting sleep duration recommendations by life-course age groups



Source: 2020 Canadian Community Health Survey (CCHS) Healthy Living Rapid Response Module.

## Discussion

### Sleep duration

The majority of Canadian adults obtained adequate sleep. While average sleep duration was longer for adults aged 65 and older compared with adults aged 18 to 64, the percentage meeting sleep duration recommendations was lower among older adults because many of them (30%) exceeded 8 hours of sleep. Long

sleep duration in older adults has been associated with poor sleep quality, poor general health and morbidity.<sup>1</sup> Excessive sleep may also signal the need for medical, neurological or psychiatric evaluation.<sup>1</sup> By contrast, adults aged 18 to 64 were more likely to be below the sleep duration recommendations than exceed them.

Sleep duration was lowest for Canadians aged 35 to 49, possibly attributable to increased work and family demands.<sup>18</sup> Employed individuals get less sleep than unemployed or retired individuals in both the current study and other studies.<sup>18</sup> However, the



percentage of adults meeting sleep duration recommendations did not differ for ages 35 to 49 compared with others because of a smaller percentage of over-sleepers.

Females reported slightly longer sleep durations than males and were more likely to meet related recommendations. This was consistent with findings from 2007 to 2013.<sup>12</sup> Females were less likely to meet recommendations among older adults because there were more over-sleepers in this group. Similar to previous findings,<sup>12</sup> those in the highest-income households and with the highest education were more likely to meet recommendations than those in the lowest-income households and with the lowest education. Mean sleep duration was higher among those with lower income and education, particularly in older adults, suggesting a higher proportion of over-sleepers in individuals of lower socioeconomic status.

Longer sleep durations were reported in this 2020 study, compared with national estimates from 2014 to 2015 and 2007 to 2013.<sup>11,12</sup> Mean sleep duration was 7.2 hours for all adults from 2014 to 2015, and 7.1 hours for adults and 7.2 hours for older adults from 2007 to 2013—compared with 7.9 hours for adults and 8.1 hours for older adults in 2020. However, the method of data collection differed between studies. In the analysis from 2007 to 2013 analysis, respondents reported their total hours of sleep per night, while in the present analysis, sleep duration was the difference between self-reported usual sleep onset time and wake time. The results of the present study are similar to those from the 2005 General Social Survey, which reported an average sleep duration of 8.2 hours for Canadians aged 15 and older, based on sleep and wake times recorded using 24-hour time-use diaries.<sup>19</sup>

### Sleep quality

About two-thirds of respondents reported excellent or good sleep quality. Consistent with findings from 2007 to 2013,<sup>12</sup>

high sleep quality was more common in older adults compared with younger adults, and among males compared with females. The percentage of adults reporting high sleep quality was higher in 2020 than during the 2007-to-2013 period (51% in adults and 50% in older adults from 2007 to 2013, compared with 61% and 71%, respectively, in 2020). However, sleep quality was assessed by asking respondents how often they had trouble going to sleep or staying asleep, rather than having respondents rate their overall sleep quality. The higher estimates in 2020 might be attributable to differences in methodology, rather than better sleep quality.

Poor sleep quality is associated with negative health outcomes and may be as important—if not more—than sleep duration in predicting health.<sup>20</sup> Sleep quality is impacted by sleep hygiene practices,<sup>7</sup> environmental factors, and physical and mental health.<sup>21-23</sup> Self-rated sleep quality is also affected by an individual’s beliefs and expectations about sleep, such as the optimal duration and time to sleep.<sup>5</sup> There was a clear association between sleep quality and sleep duration, with individuals who reported high sleep quality more likely to meet sleep duration recommendations than those reporting low sleep quality. This association was present across both age groups and sexes, but was more pronounced among adults aged 18 to 64. This finding is in line with those from the 2007-to-2013 CHMS.<sup>12</sup>

### Work and free day sleep variability

While half of adults aged 18 to 64 reported high variability in sleep onset time between work or school days and free days (or weekdays and weekends if not applicable), two-thirds of adults reported high variability in sleep duration and wake time. The discrepancy in sleep between work and free days is often referred to as “social jet lag.”<sup>24</sup> By contrast, older adults had low variability in sleep duration, sleep onset time and wake time, likely caused by minimal work commitments.<sup>25,26</sup>

Table 2-1  
Self-rated sleep quality, variability and hygiene factors, by age group and sex

	18 years and older						18 to 64 years											
	Both sexes (n=9,248)			Males (n=4,159)			Females (n=5,089)			Both sexes (n=6,140)			Males (n=2,822)			Females (n=3,318)		
	Estimate	95% CI		Estimate	95% CI		Estimate	95% CI		Estimate	95% CI		Estimate	95% CI		Estimate	95% CI	
Excellent or good self-rated sleep quality	63.1	61.2	64.9	65.8	62.8	68.7	60.5 <sup>†</sup>	58.0	62.9	60.9	58.7	63.1	63.7	60.0	67.1	58.2 <sup>†</sup>	55.3	61.1
< 30-minute difference in sleep duration between weekdays and weekends	42.8	41.1	44.4	42.0	39.5	44.5	43.5	41.3	45.7	34.7	32.7	36.7	34.1	31.2	37.2	35.2	32.5	38.0
< 30-minute difference in wake-up time between weekdays and weekends	40.8	39.2	42.5	38.7	36.2	41.2	42.8 <sup>†</sup>	40.7	44.9	31.1	29.1	33.2	29.0	26.1	32.1	33.1 <sup>†</sup>	30.6	35.7
< 30-minute difference in time to fall asleep between weekdays and weekends	55.1	53.4	56.7	51.5	49.0	53.9	58.4 <sup>††</sup>	56.1	60.7	47.3	45.3	49.4	43.5	40.6	46.5	51.1 <sup>††</sup>	48.2	54.0
Average sleep onset between 8:00 p.m. and 12:00 a.m.	59.8	58.1	61.5	55.1	52.5	57.6	64.3 <sup>††</sup>	62.0	66.4	56.7	54.6	58.7	50.8	47.8	53.7	62.4 <sup>††</sup>	59.7	65.0
Average sleep onset between 12:01 a.m. and 7:59 p.m.	40.2	38.5	41.9	44.9	42.4	47.5	35.7 <sup>††</sup>	33.6	38.0	43.3	41.3	45.4	49.2	46.3	52.2	37.6 <sup>††</sup>	35.0	40.3
Has an electronic device in their bedroom	64.6	63.0	66.2	65.3	62.9	67.6	64.0	61.9	66.2	70.8	68.8	72.7	71.1	68.2	73.7	70.5	67.7	73.1
Uses an electronic device within 30 minutes of falling asleep	66.2	64.5	67.9	67.5	64.9	69.9	65.0	62.8	67.2	67.7	65.7	69.7	68.7	65.7	71.6	66.8	64.1	69.4
Meets physical activity recommendation (150 minutes of MVPA per week)	55.1	53.4	56.8	60.2	57.6	62.7	50.3 <sup>††</sup>	48.0	52.6	58.8	56.7	60.9	63.4	60.3	66.4	54.4 <sup>††</sup>	51.6	57.2
Meets screen time recommendation (< 3 hours per day of leisure-time screen use)	77.5	75.8	79.1	73.9	71.2	76.4	80.8 <sup>††</sup>	78.8	82.7	72.8	70.7	74.9	69.0	65.8	72.1	76.5 <sup>††</sup>	74.0	78.9

<sup>†</sup> significantly different from estimate for males of same age (p < 0.05)  
<sup>††</sup> significantly different from estimate for males of same age (p < 0.001)  
<sup>‡</sup> significantly different from estimate for adults 18 to 64 years of same sex (p < 0.05)  
<sup>†††</sup> significantly different from estimate for adults 18 to 64 years of same sex (p < 0.001)

Notes: CI = confidence interval; MVPA = moderate-to-vigorous physical activity.  
 Source: 2020 Canadian Community Health Survey healthy living rapid response module.

**Table 2-2**  
Self-rated sleep quality, variability and hygiene factors, by age group and sex

	65 years and older																	
	Both sexes (n=3,108)						Males (n=1,337)						Females (n=1,771)					
	Estimate	95% CI		Estimate	95% CI		Estimate	95% CI		Estimate	95% CI		Estimate	95% CI				
		from	to		from	to		from	to		from	to						
Excellent or good self-rated sleep quality	71.2 <sup>††</sup>	68.6	73.7	74.7 <sup>††</sup>	70.9	78.1	68.3 <sup>1,††</sup>	64.7	71.8									
< 30-minute difference in sleep duration between weekdays and weekends	73.4 <sup>††</sup>	70.9	75.8	74.3 <sup>††</sup>	70.7	77.6	72.7 <sup>††</sup>	69.3	75.8									
< 30-minute difference in wake-up time between weekdays and weekends	77.6 <sup>††</sup>	75.3	79.8	78.5 <sup>††</sup>	75.2	81.4	76.9 <sup>††</sup>	73.5	79.9									
< 30-minute difference in time to fall asleep between weekdays and weekends	84.3 <sup>††</sup>	82.2	86.1	84.0 <sup>††</sup>	80.5	87.0	84.5 <sup>††</sup>	82.0	86.7									
Average sleep onset between 8:00 p.m. and 12:00 a.m.	71.7 <sup>††</sup>	69.0	74.2	72.7 <sup>††</sup>	68.8	76.2	70.8 <sup>††</sup>	67.1	74.3									
Average sleep onset between 12:01 a.m. and 7:59 p.m.	28.3 <sup>††</sup>	25.8	31.0	27.3 <sup>††</sup>	23.8	31.2	29.2 <sup>††</sup>	25.7	32.9									
Has an electronic device in their bedroom	41.4 <sup>††</sup>	38.9	44.0	41.5 <sup>††</sup>	37.7	45.4	41.3 <sup>††</sup>	37.9	44.8									
Uses an electronic device within 30 minutes of falling asleep	60.3 <sup>††</sup>	57.4	63.2	62.2 <sup>†</sup>	57.9	66.4	58.7 <sup>††</sup>	54.7	62.6									
Meets physical activity recommendation (150 minutes of MVPA per week)	41.0 <sup>††</sup>	38.1	44.0	47.1 <sup>††</sup>	42.7	51.6	35.9 <sup>††,††</sup>	32.5	39.4									
Meets screen time recommendation (< 3 hours per day of leisure-time screen use)	95.0 <sup>††</sup>	93.7	96.1	93.8 <sup>††</sup>	91.4	95.6	96.0 <sup>††</sup>	94.7	97.0									

<sup>1</sup> significantly different from estimate for males of same age (p < 0.05)  
<sup>†</sup> significantly different from estimate for males of same age (p < 0.001)  
<sup>††</sup> significantly different from estimate for adults 18 to 64 years of same sex (p < 0.05)  
<sup>†††</sup> significantly different from estimate for adults 18 to 64 years of same sex (p < 0.001)  
**Notes:** CI = confidence interval; MVPA = moderate-to-vigorous physical activity.  
**Source:** 2020 Canadian Community Health Survey healthy living rapid response module.

Adults aged 18 to 64 with low variability in sleep onset and wake time were somewhat less likely to meet sleep duration recommendations. There was no difference in the proportion of older adults meeting sleep duration recommendations by sleep variability. Working adults may compensate for short work-day sleep with long free-day or weekend sleep. This may not be a concern if individuals are still averaging between 7 and 9 hours of sleep, as free-day or weekend catch-up sleep has been associated with favourable health outcomes compared with short sleep durations on both work and free days.<sup>6,26</sup>

**Sleep onset timing**

Although there are no established recommendations for sleep timing, later sleep times have been associated with adverse health outcomes.<sup>6</sup> Most Canadians reported moderate sleep onset times, with 57% of adults aged 18 to 64 and 72% of older

adults falling asleep between 8:00 p.m. and 12:00 a.m. Adults with that range of sleep onset time were more likely to meet sleep duration guidelines than those outside this range, but not older adults. This is likely attributable to later sleepers in the 18-to-64 age group having shorter sleep durations because of work commitments.<sup>18</sup>

**Sleep-facilitating behaviours**

Although many factors contribute to sleep hygiene (e.g., alcohol and caffeine consumption, bedroom temperature, noise, relaxing period before bed),<sup>27</sup> the 2020 CCHS was limited to the measurement of a few sleep facilitating behaviours: electronic media use behaviours, physical activity and sedentary behaviour. Use of electronic media within 30 minutes of sleep time and the presence of electronic devices in the bedroom were commonly reported by Canadian adults. Although previous

**Table 3-1**  
Percentage of adults meeting the sleep duration guideline according to self-rated sleep quality and sleep hygiene practices

	18 years and older									18 to 64 years								
	Both sexes			Males			Females			Both sexes			Males			Females		
	Estimate	95% CI		Estimate	95% CI		Estimate	95% CI		Estimate	95% CI		Estimate	95% CI		Estimate	95% CI	
		from	to		from	to		from	to		from	to		from	to		from	to
Excellent or good sleep	77.6 <sup>§</sup>	76.0	79.1	76.8 <sup>§</sup>	74.2	79.2	78.4 <sup>§</sup>	76.3	80.3	83.5 <sup>§</sup>	81.6	85.3	81.7 <sup>§</sup>	78.6	84.4	85.5 <sup>§</sup>	82.9	87.7
Fair or poor sleep	64.6 <sup>***</sup>	61.8	67.4	61.9 <sup>***</sup>	56.9	66.6	66.9 <sup>***</sup>	63.3	70.2	67.9 <sup>***</sup>	64.6	71.1	63.7 <sup>***</sup>	58.1	68.9	71.5 <sup>***</sup>	67.4	75.3
<30-minute difference between weekday and weekend sleep duration	70.2 <sup>§</sup>	67.9	72.4	71.3 <sup>§</sup>	67.5	74.8	69.2 <sup>§</sup>	66.4	71.9	79.0 <sup>§</sup>	76.0	81.8	78.5 <sup>§</sup>	73.5	82.8	79.5 <sup>§</sup>	76.0	82.6
≥30-minute difference between weekday and weekend sleep duration	74.6 <sup>*</sup>	72.4	76.6	72.0	68.7	75.1	77.1 <sup>***</sup>	74.3	79.6	76.4	74.1	78.5	73.4	69.8	76.7	79.4	76.4	82.1
<30-minute difference between weekday and weekend wake-up time	66.0 <sup>§</sup>	63.6	68.3	66.4 <sup>§</sup>	62.6	70.1	65.6 <sup>§</sup>	62.5	68.6	73.8 <sup>§</sup>	70.3	77.0	72.6 <sup>§</sup>	66.9	77.6	74.8 <sup>§</sup>	70.6	78.6
≥30-minute difference between weekday and weekend wake-up time	77.3 <sup>***</sup>	75.3	79.3	75.0 <sup>*</sup>	71.8	77.9	79.7 <sup>***</sup>	77.0	82.1	78.9 <sup>*</sup>	76.8	80.9	76.2	72.8	79.2	81.7 <sup>*</sup>	78.9	84.3
<30-minute difference between weekday and weekend time of sleep onset	68.5 <sup>§</sup>	66.5	70.4	67.1 <sup>§</sup>	63.7	70.4	69.6 <sup>§</sup>	67.1	71.9	74.8 <sup>§</sup>	72.2	77.2	71.8 <sup>§</sup>	67.4	75.7	77.2 <sup>§</sup>	74.2	80.1
≥30-minute difference between weekday and weekend time of sleep onset	77.9 <sup>***</sup>	75.5	80.2	76.5 <sup>***</sup>	72.8	79.9	79.4 <sup>***</sup>	76.2	82.3	79.6 <sup>*</sup>	77.0	81.9	77.7	73.8	81.2	81.7 <sup>*</sup>	78.3	84.8
AAverage sleep onset between 8:00 p.m. and 12:00 a.m.	78.0 <sup>§</sup>	76.4	79.6	77.2 <sup>§</sup>	74.2	79.9	78.7 <sup>§</sup>	76.6	80.6	85.4 <sup>§</sup>	83.4	87.3	83.4 <sup>§</sup>	79.6	86.6	87.1 <sup>§</sup>	84.6	89.2
Average sleep onset between 12:01 a.m. and 7:59 p.m.	64.8 <sup>***</sup>	61.9	67.5	64.9 <sup>***</sup>	60.9	68.8	64.6 <sup>***</sup>	60.3	68.6	66.7 <sup>***</sup>	63.5	69.8	66.6 <sup>***</sup>	62.1	70.8	66.8 <sup>***</sup>	62.0	71.3
Electronic device in bedroom	73.2 <sup>§</sup>	71.3	75.1	71.7 <sup>§</sup>	68.7	74.6	74.7 <sup>§</sup>	72.1	77.1	76.1 <sup>§</sup>	74.1	78.1	74.1 <sup>§</sup>	70.7	77.1	78.2 <sup>§</sup>	75.4	80.7
No electronic devices in bedroom	71.7	69.1	74.2	71.5	67.4	75.2	71.9	68.7	75.0	80.1	76.6	83.1	77.6	72.3	82.1	82.4	78.1	86.1
Electronic use within 30 minutes of bed	73.3 <sup>§</sup>	71.4	75.1	71.4 <sup>§</sup>	68.3	74.3	75.2 <sup>§</sup>	72.7	77.5	77.2 <sup>§</sup>	75.0	79.2	74.5 <sup>§</sup>	70.9	77.7	79.9 <sup>§</sup>	77.1	82.4
Electronic use over 30 minutes before bed	71.9	69.3	74.4	72.2	67.7	76.2	71.6	68.4	74.7	77.8	74.6	80.7	76.3	70.8	81.0	79.2	75.2	82.6
Meets physical activity recommendation	75.7 <sup>§</sup>	73.7	77.6	74.8 <sup>§</sup>	71.7	77.7	76.8 <sup>§</sup>	74.0	79.3	78.6 <sup>§</sup>	76.3	80.7	77.1 <sup>§</sup>	73.5	80.3	80.3 <sup>§</sup>	77.2	83.0
Does not meet physical activity recommendation	69.0 <sup>***</sup>	66.7	71.2	66.9 <sup>*</sup>	63.0	70.6	70.5 <sup>*</sup>	67.7	73.2	75.5	72.5	78.3	71.7	66.8	76.3	78.5 <sup>*</sup>	74.8	81.7
Meets screen time recommendation	73.1 <sup>§</sup>	71.5	74.7	72.3 <sup>§</sup>	69.7	74.9	73.8 <sup>§</sup>	71.7	75.8	79.4 <sup>§</sup>	77.5	81.3	77.5 <sup>§</sup>	74.2	80.4	81.2 <sup>§</sup>	78.7	83.4
Does not meet screen time recommendation	71.3	67.5	74.8	69.8	64.4	74.8	73.2	68.2	77.7	71.6 <sup>***</sup>	67.6	75.2	69.9 <sup>*</sup>	64.2	75.0	73.8 <sup>*</sup>	68.6	78.5

\* significantly different from reference group (p < 0.05)  
\*\*\* significantly different from reference group (p < 0.001)  
<sup>§</sup> reference category

**Note:** CI = confidence interval.  
**Source:** 2020 Canadian Community Health Survey healthy living rapid response module.

**Table 3-2**  
**Percentage of adults meeting the sleep duration guideline according to self-rated sleep quality and sleep hygiene practices**

	65 years and older								
	Both sexes			Males			Females		
	Estimate	95% CI		Estimate	95% CI		Estimate	95% CI	
	from	to		from	to		from	to	
Excellent or good sleep	58.3 <sup>§</sup>	55.2	61.3	59.7 <sup>§</sup>	54.9	64.4	57.0 <sup>§</sup>	52.8	61.0
Fair or poor sleep	47.6 <sup>***</sup>	42.7	52.6	51.4	43.2	59.5	45.1 <sup>†</sup>	38.6	51.9
<30-minute difference between weekday and weekend sleep duration	54.4 <sup>§</sup>	51.2	57.6	57.6 <sup>§</sup>	52.6	62.4	51.7 <sup>§</sup>	47.5	55.9
≥30-minute difference between weekday and weekend sleep duration	57.5	52.1	62.6	57.4	48.9	65.5	57.5	50.6	64.1
<30-minute difference between weekday and weekend wake-up time	54.2 <sup>§</sup>	51.0	57.2	57.1 <sup>§</sup>	52.3	61.8	51.6 <sup>§</sup>	47.5	55.7
≥30-minute difference between weekday and weekend wake-up time	58.9	53.0	64.6	59.1	49.7	67.8	58.8	51.4	65.9
<30-minute difference between weekday and weekend time of sleep onset	55.0 <sup>§</sup>	52.0	58.0	57.2 <sup>§</sup>	52.6	61.8	53.2 <sup>§</sup>	49.2	57.1
≥30-minute difference between weekday and weekend time of sleep onset	56.3	49.2	63.0	59.1	47.6	69.7	53.8	45.1	62.2
Average sleep onset between 8:00 p.m. and 12:00 a.m.	55.8 <sup>§</sup>	52.8	58.8	59.4 <sup>§</sup>	54.7	63.9	52.8 <sup>§</sup>	49.0	56.6
Average sleep onset between 12:01 a.m. and 7:59 p.m.	53.7	48.2	59.1	52.6	44.5	60.6	54.5	46.4	62.4
Electronic device in bedroom	54.3 <sup>§</sup>	49.6	58.9	55.4 <sup>§</sup>	48.4	62.3	53.4 <sup>§</sup>	47.3	59.4
No electronic devices in bedroom	55.9	52.4	59.3	59.1	53.6	64.3	53.3	48.8	57.8
Electronic use within 30 minutes of bed	56.7 <sup>§</sup>	53.2	60.2	57.4 <sup>§</sup>	52.3	62.3	56.1 <sup>§</sup>	51.1	61.0
Electronic use over 30 minutes before bed	53.6	49.0	58.1	58.0	50.4	65.2	50.2	44.7	55.7
Meets physical activity recommendation	60.3 <sup>§</sup>	56.0	64.5	62.3 <sup>§</sup>	56.1	68.1	58.2 <sup>§</sup>	52.1	64.1
Does not meet physical activity recommendation	51.7 <sup>†</sup>	48.3	55.0	53.3 <sup>†</sup>	47.9	58.6	50.5 <sup>†</sup>	46.1	55.0
Meets screen time recommendation	54.7 <sup>§</sup>	51.9	57.5	56.8 <sup>§</sup>	52.5	61.0	53.0 <sup>§</sup>	49.3	56.7
Does not meet screen time recommendation	65.2	53.0	75.6	69.3	49.7	83.7	59.9	44.6	73.4

<sup>†</sup> significantly different from reference group (p < 0.05)

<sup>\*\*</sup> significantly different from reference group (p < 0.001)

<sup>§</sup> reference category

Note: CI = confidence interval.

Source: 2020 Canadian Community Health Survey healthy living rapid response module.

studies have found associations between the use of electronics in the bedroom and shorter sleep duration, lower sleep quality<sup>28,29</sup> and greater sleep variability,<sup>30</sup> there was no association between the use of electronics and meeting sleep duration recommendations in this study. It may be that individuals who did not use electronics engaged in other detrimental practices, such as mental activities, before sleeping.<sup>27</sup> Alternatively, individuals who used electronics before bed may have compensated for lower sleep quality with a longer duration in bed.

While exercising immediately before bedtime is considered detrimental to sleep,<sup>27</sup> regular exercise during the day is thought to have beneficial effects on sleep duration and quality, although the underlying mechanisms are unclear.<sup>31</sup> In this study, older adults who met physical activity recommendations were more likely to meet sleep duration recommendations, compared with those who did not meet physical activity recommendations. There was no association in adults aged 18 to 64. However, current evidence does not suggest that age moderates the benefits of physical activity on sleep.<sup>31</sup> Given the work or school demands of adults aged 18 to 64, they may have less time to allocate toward both sufficient sleep and physical activity, compared with older adults.

Previous studies have found associations between longer screen time and shorter sleep duration.<sup>32-34</sup> In this study, adults aged 18 to 64 who met recreational screen time recommendations were more likely to meet sleep duration recommendations than those who did not. No association was observed in older adults, although 5% did not meet sleep recommendations. While excessive screen time may lead to shorter sleep duration through biological mechanisms, it may also take time away from sleep.<sup>9</sup> Adults aged 18 to 64 may be less likely than older adults to have both excessive screen time and sufficient sleep because of work or school demands.

## Strengths

This was the first large, nationally representative study conducted to provide reliable estimates of sleep indicators in Canadian adults since 2014 to 2015. It is also the first to report the sleep health of Canadians since the release of the 24-Hour Movement Guidelines in October 2020. Estimates were reported not only for sleep duration, but also for sleep quality, variability, timing and facilitating behaviours. Additionally, associations between meeting sleep duration recommendations and sleep quality, variability, timing and several sleep-facilitating behaviours were assessed. The associations with sleep variability, timing and facilitating behaviours had not previously been explored on a national level.

## Limitations

Data for this study were self-reported and collected by questionnaire. The way questions about sleep are phrased can greatly impact estimates.<sup>35</sup> While sleep duration was assessed by asking respondents for their usual sleep and wake times on work or school days and free days in this study, as recommended,<sup>36</sup> respondents were asked for their usual hours of sleep per night in the 2007-to-2013 CHMS.<sup>12</sup> Sleep durations derived from these two methods may differ in accuracy,<sup>37</sup> therefore, direct comparisons cannot be made over time. Furthermore, data were not available to assess night-to-night variability in sleep, which has been associated with adverse outcomes independent of average sleep duration.<sup>38</sup> Device-based sleep measurements (e.g., actigraphy) provide more accurate estimates and can capture night-to-night variability,<sup>35</sup> although they are more expensive for an equivalent sample size and not comparable with most existing sleep estimates or public health guidelines that are based on self-reported sleep duration.

In addition, data were not available on naps, nor total 24-hour sleep time (as opposed to nighttime sleep). Napping is frequent in older adults, and common in younger and middle-aged adults as a way to compensate for short nighttime sleep duration.<sup>39</sup> It has been associated with both beneficial and adverse outcomes.<sup>39</sup>

Respondents were asked to rate their overall sleep quality, indicators of which include sleep efficiency (total sleep time compared with time in bed), sleep latency (time to sleep), overnight awakenings and time spent awake after sleep onset, among others.<sup>5</sup> Data on these individual indicators, as well as additional sleep hygiene factors,<sup>27</sup> are needed for a comprehensive understanding of sleep health.

Physical activity recommendation adherence was assessed using recommendations from 2011. They specified that 150 minutes of MVPA per week must be obtained in bouts of 10 minutes or more. The 24-Hour Movement Guidelines released in October 2020 removed the bout stipulation, so estimates from this study do not precisely reflect the current recommendations. Removal of the bout stipulation has had a considerable impact on the percentage of Canadians classified as meeting the MVPA recommendations,<sup>40</sup> and additional research will be required to determine how adherence to the new recommendations is associated with sleep health. In addition, screen time was assessed using a categorical response variable, and response options were not aligned with the 3-hour cutoff of the 24-Hour Movement Guidelines.

This was a cross-sectional study, preventing inferences on causality and the directionality between outcomes. For instance, while excessive screen time may impact sleep duration, shorter sleep duration might promote recreational screen time over other activities. Future studies should investigate the temporality between sleep and sleep-facilitating behaviours.

Finally, the data used in this study were collected prior to the COVID-19 pandemic. Recent surveys have suggested changes in the sleep habits of Canadians during the pandemic, including decreased sleep duration and quality.<sup>41</sup> Given the timing of this current study (January to March 2020), these results can be used as a benchmark for the sleep behaviours of Canadians before the pandemic. Efforts should be made to examine sleep health on a national level during the pandemic and after to estimate any long-term impacts on sleep behaviour.

## Conclusion

Three-quarters of Canadian adults meet the sleep duration recommendations of the 24-Hour Movement Guidelines. However, poor sleep quality and high sleep variability are common, particularly among adults aged 18 to 64. To maximize the health benefits of sleep, continued efforts are needed to promote proper sleep duration and to improve sleep quality, consistency and hygiene. Device-based measures of sleep would provide more accurate estimates for population-level surveillance and research on the relationship between sleep and health outcomes. These findings provide a benchmark for the sleep health of Canadians before the COVID-19 pandemic. Further surveillance and research are needed to assess the impact of the pandemic on sleep behaviour.

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