The Association between Sleep Duration and Obesity amongst Canadians aged 12 and over

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Abstract

Background. Obesity is a medical condition in which excess body fat has accumulated to the extent that it may trigger risk of chronic illness, reduce life expectancy, and affect quality of life. Body Mass Index (BMI), which relates the body's weight with height, has been widely used and accepted as a simple method to classify medical risk by weight status. Several variables are thought to be correlated with obesity in Canadian children, adolescents, and adults. The objective of this project was to investigate the effect of sleep duration, leptin levels, and ghrelin levels on the prevalence of obesity in Canada.

Methods. The number of hours spent sleeping per night and self-reported BMI data from the 2011-2012 Canadian Community Health Survey (CCHS) was analyzed. The CCHS covers approximately 98% of the Canadian population aged 12 and over.

Results. Data analysis indicated a negative correlation between BMI and number of hours spent sleeping for Canadians ages 12 and over. The hypothesis was accepted.

Discussion. A lack of sleep and later bed times are associated with a greater daily energy intake, lower leptin levels, and higher ghrelin levels, ultimately leading to obesity.

Introduction

Obesity is a medical condition in which excess body fat has accumulated to the extent that it may trigger risk of chronic illness, reduce life expectancy, and affect quality of life. Body Mass Index (BMI), which relates the body's weight with height, has been widely used and accepted as a simple method to classify medical risk by weight status. Several variables are thought to be correlated with obesity in Canadian children, adolescents, and adults.

It was hypothesized that a lack of sleep and later bed times are associated with a greater daily energy intake, lower leptin levels, and higher ghrelin levels, ultimately leading to obesity. It was predicted that the hypothesis could be accepted if the data analysis indicated a negative correlation between BMI and sleep duration.

Materials & Methods

To test for this correlation, the number of hours spent sleeping per night and self-reported BMI data from the 2011-2012 Canadian Community Health Survey (CCHS) were analyzed. The CCHS covers approximately 98% of the Canadian population aged 12 and over. Excluded from the sampling frame were individuals living on Indian Reserves, institutional residents, full-time members of the Canadian Forces, and residents of certain remote regions.

Univariate statistical analyses, such as Pearson correlations and mean comparisons, were then used to determine the correlation between BMI class and sleep duration.
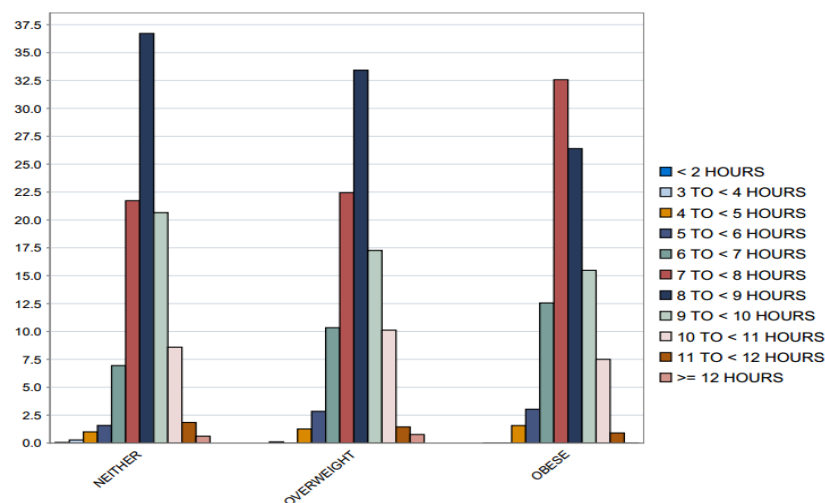

Figure 1: The relationship between fewer hours of sleep per day and the incidence of obesity in Canadians aged 12-17 years

Self-reported BMI class (12-17)	Mean	N	Std. Deviation
NEITHER	6.94	2589	1.341
OVERWEIGHT	6.92	564	1.430
OBESE	6.72	177	1.364
Total	6.93	3330	1.358

Table 1: 12-17 year old Canadians' average number of hours slept, according to their BMI class. As the BMI class increased, the average number of hours slept decreased.
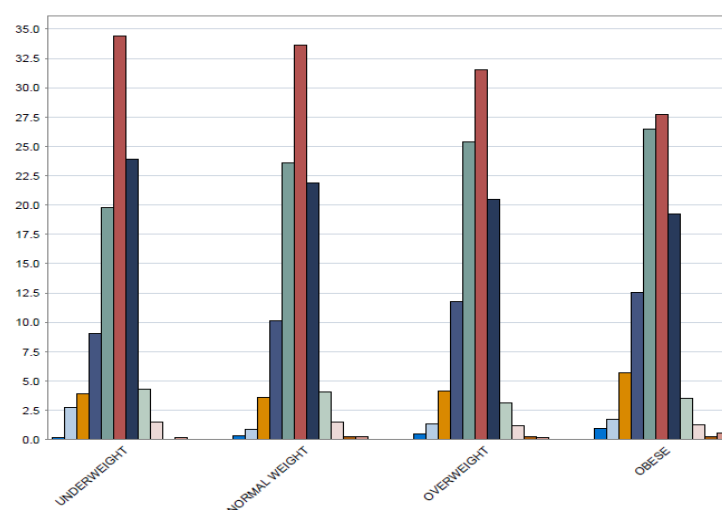

Figure 2: The relationship between fewer hours of sleep per day and the incidence of obesity in Canadians aged 18 years or older

Self-reported BMI class (18+)	Mean	N	Std. Deviation
NEITHER	5.82	975	1.511
OVERWEIGHT	5.80	16995	1.383
OBESE	5.70	13761	1.400
Total	5.58	8262	1.542

Table 2: 18+ year old Canadians' average number of hours slept, according to their BMI class. As the BMI class increased, the average number of hours slept decreased.

		Numbers of hours spent sleeping per night	Self-reported BMI class (12-17)
Number of hours spent sleeping per night	Pearson Correlation	1	-.031**
	Sig. (2-tailed)		.078
	N	45068	3330
Self-reported BMI class (12-17)	Pearson Correlation	-.031**	1
	Sig. (2-tailed)	.078	
	N	3330	9006

Table 3: For Canadians aged 12-17 years old, there is a negative correlation between the reported BMI class and the number of hours spent sleeping per night.
The Pearson correlation value is -0.31.

		Numbers of hours spent sleeping per night	Self-reported BMI class (18 +)
Number of hours spent sleeping per night	Pearson Correlation	1	-.059**
	Sig. (2-tailed)		.000
	N	45068	39993
Self-reported BMI class (18 +)	Pearson Correlation	-.059**	1
	Sig. (2-tailed)	.000	
	N	39993	107691

Table 4: For Canadians aged 18 years or older, there is a negative correlation between the reported BMI class and the number of hours spent sleeping per night.
The Pearson correlation value is -0.59.

Results & Discussion

Data analysis indicates that there is a negative correlation between BMI class and sleep duration. Therefore, a lack of sleep and later bed times are associated with a greater daily energy intake, lower leptin levels, and higher ghrelin levels, ultimately leading to obesity (see Figure 3).
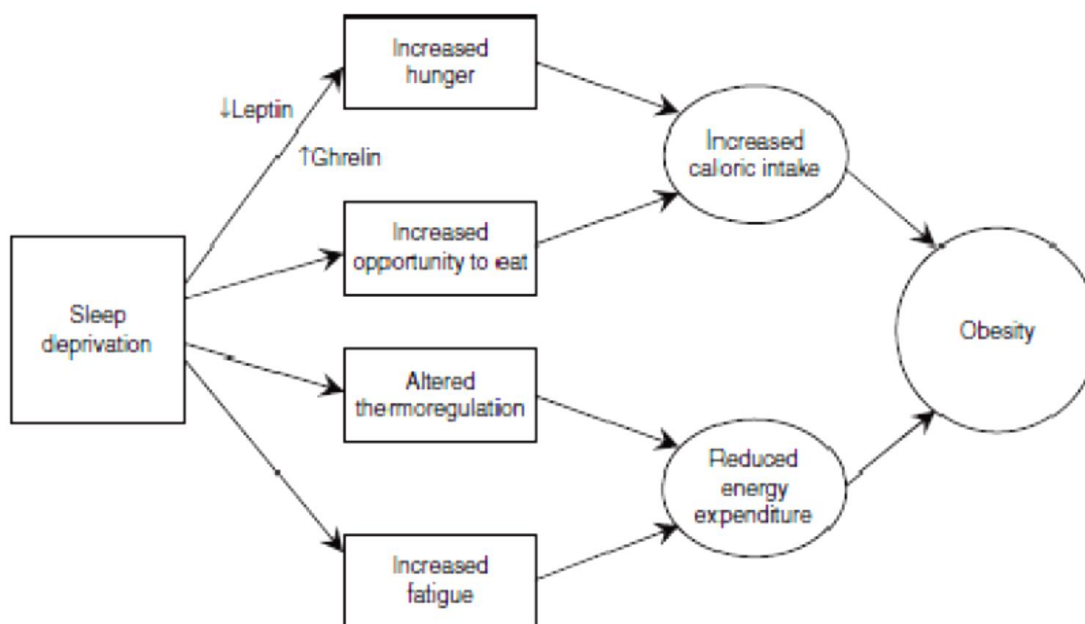
The hypothesis is accepted.

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Figure 3: Potential mechanisms by which sleep duration may predispose obesity (Patel et al. 2008)

References

Patel SR and Hu FB. (2008). Short Sleep Duration and Weight Gain: A Systematic Review.

   Obesity. **16**: 643-53.

Statistics Canada. (2011/2012). *Canadian Community Health Survey*. Canada.

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