

# The association between social cohesion and physical activity in Canada: a multilevel analysis

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# Agenda

1. Background
2. Objectives
3. Methods
4. Results
5. Implications

## Background – Physical Activity (PA)

- Refers to the expenditure of energy to produce bodily movements using skeletal muscles.<sup>1</sup>
- Regular engagement in PA is associated with numerous positive health outcomes.<sup>2</sup>
- Physical inactivity has been estimated to cause 3.2 million deaths globally every year, representing the fourth leading risk factor for death worldwide.<sup>3</sup>
- In Canada, only 15% of adults meet PA guidelines set out by the World Health Organization for optimal health.<sup>4</sup>

## Background – Social Cohesion

- Involvement in “building shared values and communities of interpretation, reducing disparities in wealth and income, and generally enabling people to have a sense that they are engaged in a common enterprise, facing shared challenges, and that they are members of the same community.”<sup>5</sup>
- Social cohesion may promote PA in several ways (e.g., strengthening social bonds, increasing the number of opportunities to engage in PA, reducing the prevalence of crime and other deterrents to PA).<sup>6-9</sup>

## Background – Multilevel Effects

- Social cohesion should be viewed as a multilevel influence because it may have distinct effects depending on whether it is acting at the individual level or community level
- Example 1: An individual resides in a socially cohesive community but feels left out
- Example 2: An individual is one of only a few individuals who are socially engaged in an overall non-cohesive community

# Objectives

1. Assess the association between individual-level and community-level social cohesion and PA among adults in Canada
2. Investigate weight status as a potential effect modifier

## Methods – Data

- The Canadian Community Health Survey (CCHS) is a nationally-representative survey that gathers information on disease and health conditions, general health, health care services, lifestyle and social conditions, mental health and well-being, and the prevention and detection of disease
- Confidential microdata files were accessed through the Statistics Canada Research Data Centre (RDC) at Western University
- The 2009-2010, 2011-2012, and 2013-2014 cycles of the CCHS were combined in this cross-sectional multilevel analysis (assumption of no period effect)

# Methods – Study Population

## Inclusion Criteria

- Between 18 and 64 years of age
- Sample size after applying inclusion criteria:  
252,697 respondents from 1,610 FSAs

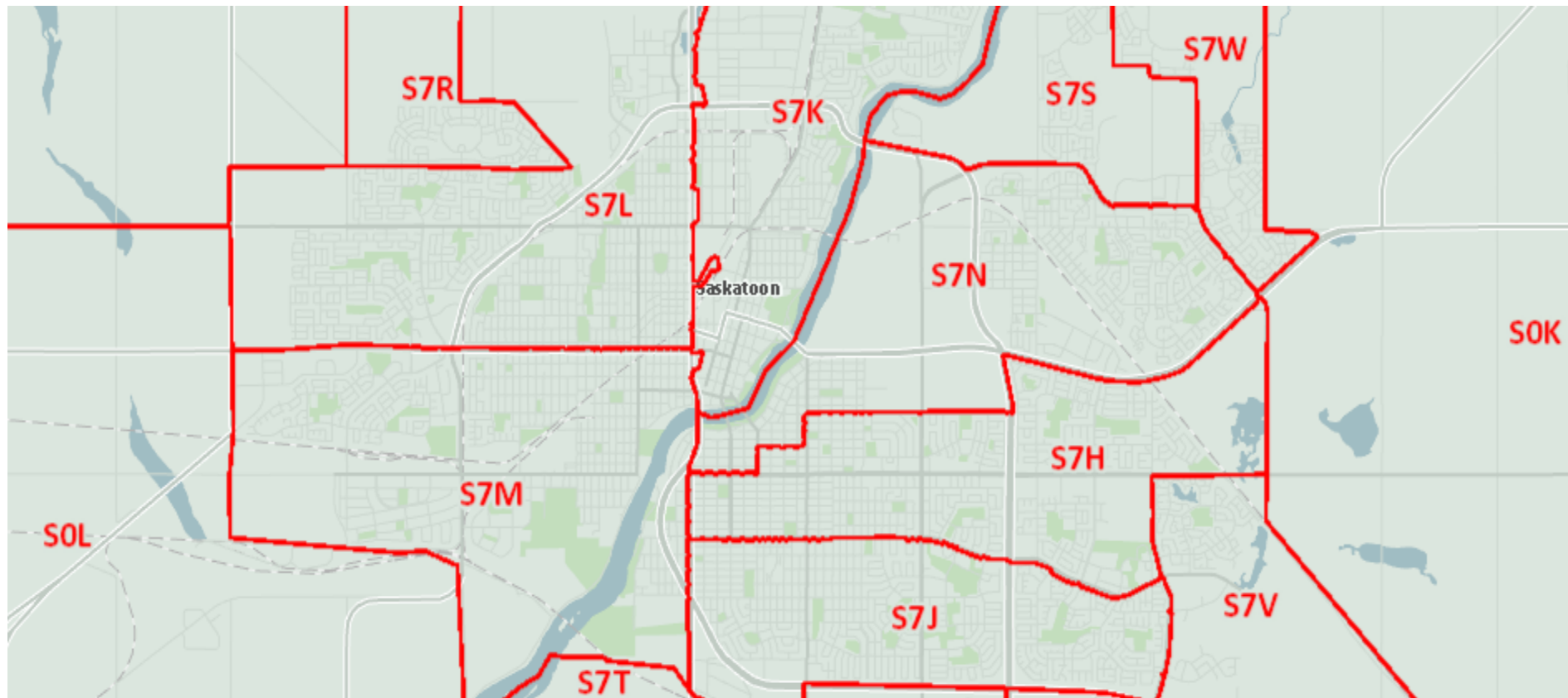
## Exclusion Criteria

- Identified as pregnant
- Resident of Yukon, NWT or Nunavut
- Resident of a FSA with fewer than 5 respondents
- Sample size after applying exclusion criteria:  
245,150 respondents from 1,570 FSAs



# Methods - Community

Definition of Community: Forward Sortation Area (FSA)



## Methods – Key Variables

Outcome: PA

- A derived variable representing a respondent's mean daily energy expenditure from all leisure activities in kcals/kg/day
- Scores were placed into deciles due to skewness

Level 1 Predictor: Individual-Level Social Cohesion

- Based on an question that asked respondents to rate their sense of belonging to the local community on a 4-point scale (from 'Very Strong' – to 'Very Weak')

Level 2 Predictor: Community-Level Social Cohesion

- Aggregated (mean) score for each FSA

## Methods – Statistical Analysis

21,126 respondents (9.1% of the final sample) had missing data for independent, dependent, or control variables

- Missing data were filled in using multiple imputation

Multilevel regression models with mixed effects were used to assess the association between social cohesion and PA

- Random Effects: Intercept and I\_Cohesion
- Fixed Effects: C\_Cohesion

A number of variables were used to account for compositional effects (sex, age, education, income, community type, BMI)

All analyses were performed using survey weights

# Results

## The association between social cohesion and physical activity in Canada

	Model 1 (Overall)	Model 2 (Interaction)
Intercept	2.310	2.310
$\beta$ Coefficients (95% CI)		
I_Cohesion	<b>0.357 (0.331, 0.382)</b>	<b>0.357 (0.331, 0.382)</b>
C_Cohesion	<b>0.784 (0.589, 0.978)</b>	<b>0.784 (0.590, 0.979)</b>
Age	-0.028 (-0.028, -0.027)	-0.025 (-0.026, -0.025)
Sex	-0.252 (-0.274, -0.230)	-0.310 (-0.333, -0.288)
Income	0.125 (0.120, 0.130)	0.126 (0.122, 0.131)
Education	0.087 (0.082, 0.093)	0.086 (0.080, 0.091)
Urban-Rural Status	-0.041 (-0.089, 0.007)	-0.045 (-0.093, 0.003)
Weight Status		<b>0.789 (0.406, 1.173)</b>
Weight Status*I_Cohesion		-0.023 (-0.051, 0.05)
Weight Status*C_Cohesion		<b>-0.410 (-0.552, -0.267)</b>

Notes: (1)  $\beta$  Coefficients significant at a p-value of 5% are bolded; ICC = 0.0401

Models: (1) Fully-adjusted model without interaction terms; (2) Fully-adjusted model with interaction terms between weight status and social cohesion

Abbreviations: I\_Cohesion (individual-level social cohesion); C\_Cohesion (community-level social cohesion)

## The association between social cohesion and physical activity in Canada

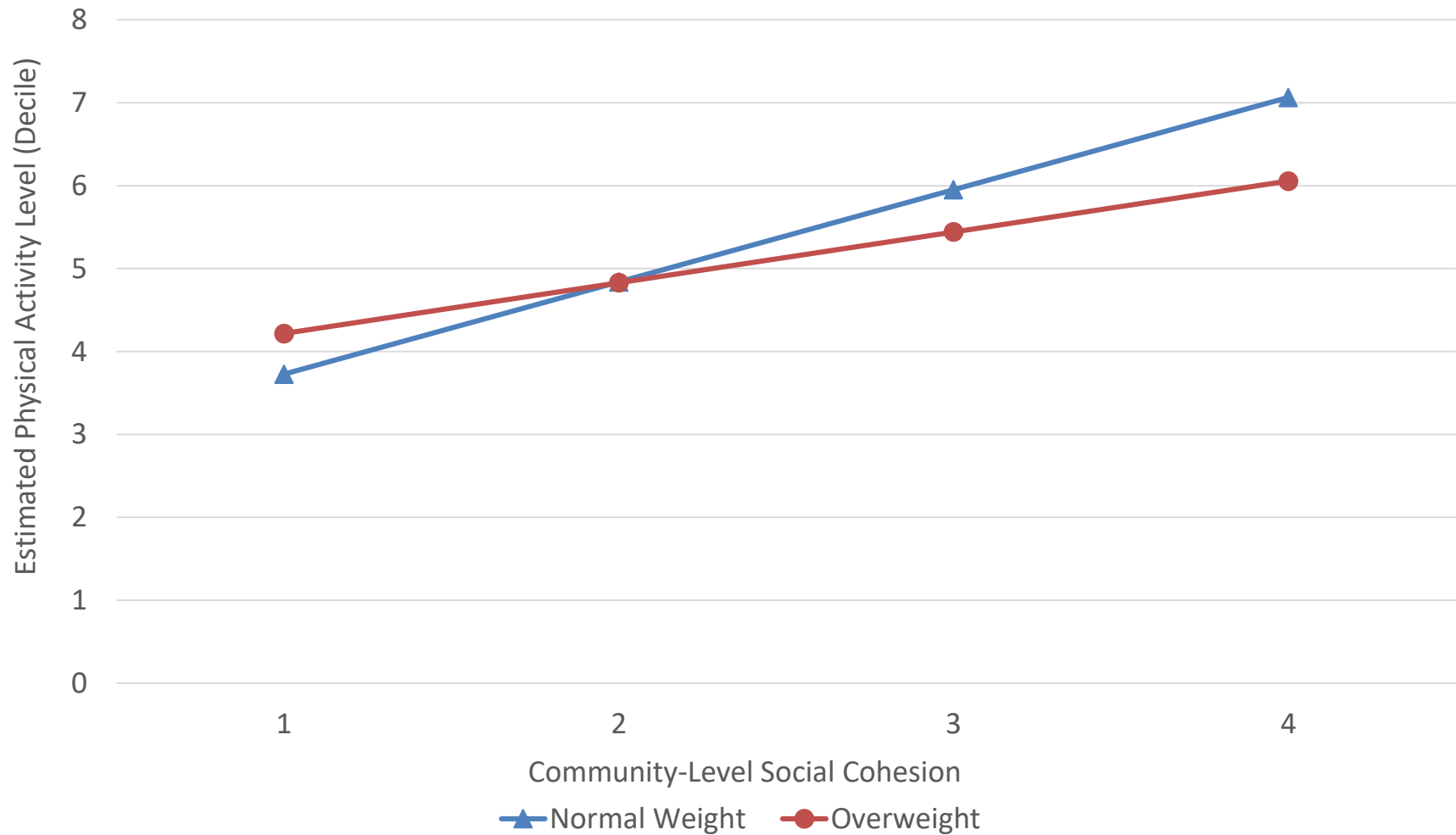
	Model 3 (Normal Weight)	Model 4 (Overweight)
Intercept	1.615	2.604
$\beta$ Coefficients (95% CI)		
I_Cohesion	<b>0.359 (0.324, 0.394)</b>	<b>0.353 (0.319, 0.388)</b>
C_Cohesion	<b>1.112 (0.876, 1.347)</b>	<b>0.613 (0.393, 0.834)</b>
Age	-0.021 (-0.023, -0.020)	-0.030 (-0.032, -0.029)
Sex	-0.210 (-0.244, -0.177)	-0.412 (-0.443, -0.381)
Income	<b>0.130 (0.123, 0.136)</b>	<b>0.122 (0.115, 0.129)</b>
Education	<b>0.071 (0.062, 0.079)</b>	<b>0.097 (0.089, 0.105)</b>
Urban-Rural Status	-0.097 (-0.172, -0.022)	-0.009 (-0.071, 0.053)

Notes: (1)  $\beta$  Coefficients significant at a p-value of 5% are bolded

Models: (3) Fully-adjusted model with normal weight respondents only (BMI < 25); (4) Fully-adjusted model with overweight respondents only (BMI  $\geq$  25)

Abbreviations: I\_Cohesion (individual-level social cohesion); C\_Cohesion (community-level social cohesion)

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**Note:** Estimates are based on a hypothetical scenario where two individuals (one normal weight and one overweight) are at the mean for all predictor variables in their FSA

# Implications

Both individual-level and community-level social cohesion may be independent promoters of PA.

- Although the association between community-level social cohesion and PA is stronger among normal weight adults, the association is still significant among overweight adults.
- Efforts to increase social cohesion could lead to improvements in PA behaviour and overall health regardless of weight status.



# Limitations

- Crude measure of social cohesion
- Single measure of social cohesion for both levels
- Self-reported physical activity data
- Lack of insight into temporality due to the use of cross-sectional data

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