

Health Promotion and Chronic Disease Prevention in Canada

Research, Policy and Practice

Volume 41 • Number 4 • April 2021

Inside this issue

Original quantitative research

- 119** Weight control intentions and mental health among Canadian adolescents: a gender-based analysis of students in the COMPASS study

Original qualitative research

- 131** Children's perceptions of a Centrally Procured School Food Program in southwestern Ontario, Canada

Release notice

- 138** Cancer in Young People in Canada Data Tool: latest incidence rates and case counts

Announcement

- 139** Call for papers – 2021 special issue: Tobacco and vaping prevention and control in Canada

- 140** Other PHAC publications

Indexed in Index Medicus/MEDLINE, DOAJ, SciSearch® and Journal Citation Reports/Science Edition



Public Health
Agency of Canada

Agence de la santé
publique du Canada

Canada

Editorial team

Anne-Marie Ugnat, PhD
Publisher

Robert Geneau, PhD
Editor-in-Chief

Minh T. Do, PhD
Associate Scientific Editor

Scott Leatherdale, PhD
Associate Scientific Editor

Gavin McCormack, PhD
Associate Scientific Editor

Barry Pless, OC, MD, FRCPC
Associate Scientific Editor

Kelly Skinner, PhD
Associate Scientific Editor

Alexander Tsertsvadze, MD, PhD
Associate Scientific Editor

Paul Villeneuve, PhD
Associate Scientific Editor

Neel Rancourt, BA
Managing Editor

Sylvain Desmarais, BA, BEd
Production Editor

Susanne Moehlenbeck
Assistant Editor

Chanelle Ayoub, BSc
Junior Editor

Nicholas Cheta, BHSc
Junior Editor

Joanna Odrowaz, BSc
Freelance Copyeditor

Anna Olivier, PhD
Freelance Copyeditor

Dawn Slawecki, BA
Freelance Copyeditor

Editorial Board

Caroline Bergeron, DrPH
Public Health Agency of Canada

Lisa Bourque Bearskin, PhD
Thompson Rivers University

Martin Chartier, DMD
Public Health Agency of Canada

Erica Di Ruggiero, PhD
University of Toronto

Charlotte Kent, PhD
Centers for Disease Control and Prevention

Jean-Claude Moubarac, PhD
Université de Montréal

Howard Morrison, PhD
Public Health Agency of Canada

Candace Nykiforuk, PhD
University of Alberta

Jennifer O'Loughlin, PhD
Université de Montréal

Scott Patten, MD, PhD, FRCPC
University of Calgary

Richard Stanwick, MD, FRCPC, FAAP
Island Health

Mark Tremblay, PhD
Children's Hospital of Eastern Ontario Research Institute

Joslyn Trowbridge, MPP
University of Toronto

To promote and protect the health of Canadians through leadership, partnership, innovation and action in public health.
— Public Health Agency of Canada

Published by authority of the Minister of Health.

© Her Majesty the Queen in Right of Canada, represented by the Minister of Health, 2021

ISSN 2368-738X

Pub. 200279

PHAC.HPCDP.journal-revue.PSPMC.ASPC@canada.ca

Également disponible en français sous le titre : *Promotion de la santé et prévention des maladies chroniques au Canada : Recherche, politiques et pratiques*

Submission guidelines and information on article types are available at:

<https://www.canada.ca/en/public-health/services/reports-publications/health-promotion-chronic-disease-prevention-canada-research-policy-practice/information-authors.html>

Original quantitative research

Weight control intentions and mental health among Canadian adolescents: a gender-based analysis of students in the COMPASS study

Natalie Doan, MSc (1); Isabella Romano, BSc (1); Alexandra Butler, MSc (1); Rachel E. Laxer, PhD (2); Karen A. Patte, PhD (3); Scott T. Leatherdale, PhD (1)

This article has been peer reviewed.

 [Tweet this article](#)

Abstract

Introduction: Little is known about gender differences in associations between weight control intentions and mental health in adolescents. Our objective was to examine these associations in a large sample of adolescent girls and boys.

Methods: Using data from Year 6 (2017–18) of the COMPASS study ($n = 57\,324$), we performed a series of multivariable linear regressions to examine whether weight control intentions (gain, lose, stay the same, no intention) were associated with depression, anxiety and self-concept, while adjusting for relevant covariates including body mass index. Models were stratified by self-reported gender.

Results: Compared to those with no intentions, girls who intended to lose weight reported higher symptoms of depression ($\beta = 0.52, p < 0.001$) and anxiety ($\beta = 0.41, p < 0.001$) and poorer self-concept ($\beta = 2.06, p < 0.001$). Girls who intended to gain weight also reported higher symptoms of depression ($\beta = 0.54, p < 0.001$), anxiety ($\beta = 0.50, p < 0.001$) and self-concept ($\beta = 1.25, p < 0.001$). Boys who intended to lose weight reported greater symptoms of depression ($\beta = 0.26, p < 0.001$) and anxiety ($\beta = 0.33, p < 0.001$) and poor self-concept ($\beta = 1.10, p < 0.001$). In boys, weight-gain intentions were associated with greater symptoms of anxiety ($\beta = 0.17, p < 0.05$), but not depression or self-concept.

Conclusion: Intentions to gain or lose weight were associated with symptoms of mental disorder and poor self-concept in our large sample of adolescents, and these relationships differed in boys and girls. These findings have important implications for school-based programs promoting healthy weight and body image.

Keywords: *gender, weight control, mental health, depression, anxiety, self-concept, girls, boys*

Highlights

- This research examined the relationship between mental health and weight control intentions in adolescent girls and boys using data from the COMPASS system—the largest school-based study of its kind.
- Compared to adolescents who did not intend to change their weight, those who intended to lose weight had poorer mental health, independent of body mass index.
- Girls who intended to gain weight reported higher anxiety and depression symptoms and lower self-concept, but intentions to gain weight were associated only with higher anxiety in boys.
- These findings support the importance of incorporating weight-neutral approaches in health promotion efforts, especially in school-based settings.

critical time for the onset of depression, anxiety and eating disturbances.⁴⁻⁸

Body image is influenced by exposure to messages about body ideals, through interacting with family and friends and observing portrayals in the media.^{3,8-10} Some may feel pressured to conform to socially prescribed body ideals that often represent unrealistic and unattainable body weights and shapes.^{10,11} Internalizing normative body

Introduction

Adolescence (i.e. ages approximately 12 to 18 years¹) represents an important stage of maturation, characterized by substantial developmental and social changes. During this time, adolescents become increasingly aware of changes to their body weight and sociocultural body ideals.¹

This can contribute to the rise of negative body image—a person's confidence in their appearance—and weight dissatisfaction.¹⁻⁴

An unhealthy body image, characterized by skewed and negative perceptions, may play a role in the development of adverse behaviours and psychological harm.⁵ This is especially true during adolescence, a

Author references:

1. School of Public Health and Health Systems, University of Waterloo, Waterloo, Ontario, Canada
2. Public Health Ontario, Toronto, Ontario, Canada
3. Department of Health Sciences, Brock University, St. Catharines, Ontario, Canada

Correspondence: Isabella Romano; 200 University Avenue West, Waterloo, ON N2L 3G1; E-mail: iromano@uwaterloo.ca

ideals demonstrates an important psychological process underpinning unhealthy body image and body dissatisfaction.¹²

Some adolescents with body dissatisfaction intend to lose or gain weight.^{13,14} Those who do may be at greater risk for developing unhealthy and extreme weight-control behaviours.¹⁵ Others may have emotional problems as a consequence of poor body image. For example, research demonstrates that the psychological sequelae of overweight and obesity correlate more strongly with perceived weight than actual body mass index (BMI).¹⁶⁻¹⁸ Poor body image, body dissatisfaction and distorted weight perceptions can contribute to the etiology of significant psychological concerns^{19,20}, including mental disorder and subclinical symptoms of social anxiety^{21,22} and depression²³⁻²⁶ as well as poor self-concept and esteem.^{27,28} Self-concept refers to conscious beliefs an individual has about themselves.²⁹ This multidimensional construct includes self-perceived academic and physical competencies, physical appearance, honesty, relationships and self-esteem.³⁰ High levels of daily conflict³¹, mental disorder and body dissatisfaction have been linked to poor self-concept.^{32,33}

It is important to consider how social identities, such as gender, may influence body dissatisfaction and weight control intentions. For example, girls tend to overestimate their weight³⁴ and report feeling pressured to lose weight³⁵, while boys report feeling pressured to gain muscularity and size while staying lean.³⁶⁻³⁸ These pressures and perceptions may contribute to profound mental health impacts in both males and females.³⁹ However, existing research on weight control intentions and mental health is limited, and measures largely focus on female-oriented characterizations of body ideals and weight-related behaviours. Thus, our understanding of the mental health implications that boys experience may be inadequate.

The objective of this study was to examine the gendered associations between weight control intentions and symptoms of depression, anxiety and self-concept in a large sample of adolescent boys and girls in Canada.

Methods

COMPASS study design

We used student-level cross-sectional data from Year 6 (2017–18) of the COMPASS

(Cannabis, Obesity, Mental health, Physical activity, Alcohol, Smoking, Sedentary behaviour) study, a large, 9-year (2012–2021) prospective study that collects health behaviour data once a year from a rolling cohort of Canadian secondary school students.⁴⁰

Active-information passive-permission consent protocols are used to recruit full school samples of students to complete the COMPASS student questionnaire during class time. The University of Waterloo Office of Research Ethics (ORE #30118) and participating school boards approved all the procedures. Additional details about COMPASS study procedures are available in print⁴⁰ and online (www.compass.uwaterloo.ca). The current study represents a secondary analysis of existing COMPASS data.

Study sample

A total of 57324 Grade 9 to 12 students from across 122 schools in Alberta, British Columbia, Ontario and Quebec participated in COMPASS Year 6. We excluded participants with missing data for all covariates other than BMI ($n = 1816$; 3.2%). Our complete-case analytic sample included 45019 participants, after removal of cases with missing data in the dependant (i.e. depression, anxiety, self-concept) and independent (i.e. weight control intentions) categories ($n = 10489$; 18.9%).

Measures

Weight control intentions

A measure of students' weight control intentions served as the dependent variable of interest. In response to the question "Which of the following are you trying to do about your weight?" the students could choose one of these options: "lose weight," "gain weight," "stay the same weight" or "I am not trying to do anything about my weight." We operationalized students' weight control intentions as none (the reference category [*ref.*]), maintain, lose or gain.

Depression, anxiety and self-concept

To assess the mental health of students in our present study, we chose measures of depression, anxiety and self-concept that have demonstrated strong psychometric properties for use in general adolescent populations.^{41,42}

To assess self-reported symptoms of depression, the COMPASS student questionnaire included the Centre for Epidemiological Studies Depression Scale (Revised)-10 (CESD-R-10).⁴³ Using a 4-point Likert scale (where 1 corresponds to "none or less than 1 day" and 4 to "5 to 7 days"), students indicated the frequency with which they experienced somatic, affective and anhedonia symptoms during the past 7 days. Examples of symptoms included feeling sad, hopeless, unmotivated and lonely. Possible sum scores ranged from 0 to 30, with higher scores indicating more severe symptoms. The internal consistency of the CESD-R-10 was acceptable (Cronbach $\alpha = 0.77$).

To capture self-reported symptoms of anxiety, the COMPASS student questionnaire included the Generalized Anxiety Disorder 7-item Scale (GAD-7).⁴⁴ Students reported how often in the past 2 weeks symptoms (e.g. uncontrollable worrying, restlessness) bothered them. They recorded the frequency using a 4-point Likert scale (where 1 corresponds to "not at all" and 4 to "nearly every day"). Higher sum scores (from 0 to 21) indicated a greater presence of generalized anxiety symptoms. Internal consistency of the GAD-7 was high ($\alpha = 0.91$).

Self-concept was assessed using items from the *SDQ II Manual: Self Description Questionnaire II*.⁴⁵ On a 5-point Likert scale (where 1 corresponds to "true" and 5 to "false"), students indicated the answer that best describing themselves in response to five items: "in general, I like the way I am"; "overall, I have a lot to be proud of"; "a lot of things about me are good"; "when I do something, I do it well"; and "I like the way I look." These responses were summed to represent a global measure of self-concept (from 0 to 25). Higher scores indicated poorer self-concept; internal consistency was high ($\alpha = 0.90$).

Covariates

We included weight-related variables in all models to adjust for potentially confounding effects. Students reported the number of hours per day they usually spent engaging in moderate-to-vigorous physical activity (MVPA), recreational screen time (5 items: television, video games, surfing the internet, talking on the phone, texting/messaging) and sleep. Behaviours were dichotomized according to whether they met the daily recommendations of the Canadian Society for Exercise Physiology (CSEP) 24-Hour Movement Guidelines

(≥1 hour MVPA, ≤2 hours recreational screen time, 8–10 hours of sleep).⁴⁶ Students also indicated whether they ate breakfast daily. Skipping breakfast and meeting the movement guidelines were treated as binary (i.e. yes vs. no [ref.]).

Students indicated their grade (9 [ref.], 10, 11, 12), race/ethnicity (categorized as racialized [Black, Indigenous, Asian, Latin American/Hispanic, Other, Mixed], non-racialized [White] [ref.]), height and weight. Consistent with the World Health Organization Child Growth Standards, we calculated and categorized students' age- and sex-adjusted BMI into underweight, healthy weight, overweight and obesity.⁴⁷ Given the prevalence of missing responses, which may not be random, we categorized missing responses to height, weight, age and sex (used to compute BMI) as "not reported."^{48,49} Measures used to assess MVPA⁵⁰, screen time⁵¹ and BMI⁵² have been validated in this age group.

Analyses

All analyses were conducted using statistical package SAS version 9.4 (SAS Institute Inc., Cary, NC, USA).⁵³ We compared adolescents in weight-control intention and gender categories using (1) chi-square tests for demographics, movement, breakfast skipping and BMI category; and (2) ANOVA or *t*-tests for depression, anxiety and self-concept. We estimated three sets of models using multivariable linear regression to examine associations between weight control intentions and self-reported symptoms of depression, anxiety and self-concept scores. We tested the multiplicative interaction term of gender by weight control intentions (deemed statistically significant at $p < 0.05$) to determine whether stratification of our models by gender was appropriate. Sociodemographic (grade, race/ethnicity) and weight-related variables (MVPA, screen time, sleep, breakfast skipping, BMI) were included in each model to adjust for their potentially confounding effects on the associations between students' weight control intentions and mental health. To account for comorbidity between depression and anxiety, models for CESD-R-10 were further adjusted for GAD-7 scores, and vice versa. Unadjusted and adjusted standardized beta estimates (β) were reported alongside 95% confidence limits.

We calculated the intraclass correlation coefficient (ICC) describing the extent of

school-level variability between weight control intention and each of CESD-R-10, GAD-7 and self-concept. Roughly 1% of within-school variation was detected for each dependent variable ($ICC_{GAD-7} = 0.014$; $ICC_{CESD-R-10} = 0.018$; $ICC_{Self-concept} = 0.011$), so we did not adjust for clustering for computational efficiency.

Results

Comparing students with missing and complete data

We estimated the odds of missing responses across dependant and independent variables using a series of multivariable linear regression models (see Table 1 for missing data analysis results). Compared to boys, girls had lower odds of omitted responses for all measures of depression, anxiety, self-concept and weight control intentions. In general, the odds of missingness for any of the dependant or independent variables were lower for students in higher grades than for those in grade 9. The students had higher odds of missing depression, anxiety and self-concept scores if they reported being racialized or underweight. Students who did not report their height or weight were approximately 1.5 to 2 times more likely to also have missing scores for depression, anxiety and self-concept and more likely to not have reported any weight control intentions.

Sample characteristics

Over one-third (36%) of the students reported currently trying to lose weight, while 16% reported trying to gain weight and 20% reported trying to maintain their weight. Mean (SD) scores for CESD-R-10, GAD-7 and self-concept were 8.9 (6.1), 6.5 (5.7) and 10.9 (4.6), respectively. Nearly half met the guidelines for MVPA (42%) and sleep (41%), while 5% met guidelines for screen time. Over half (55%) reported skipping breakfast.

About one-quarter of the students (27%) were in grade 9, 28% in grade 10, 27% in grade 11 and 18% in grade 12. Half (51%) identified as girls and 28% with a racialized ethnic identity.

Table 2 shows differences in self-reported weight control intention categories by sample characteristics and mental health measures. Table 3 shows differences in self-reported sociodemographic characteristics, weight control intention categories

and mental health measures between boys and girls.

Gender-stratified associations between weight control intentions and depression, anxiety and self-concept

We stratified models by gender (girls and boys) because multiplicative interaction effects between gender and weight control intentions were significant ($p < 0.05$, results not shown). Table 4 shows results from multivariable linear regression models estimating the change in CESD-R-10, GAD-7 and self-concept scores at every weight control intention level for girls and boys; adjusted estimates are described below.

Adolescent girls who intended to maintain their weight reported lower symptoms of depression ($\beta = -0.21$, $p < 0.01$) and greater symptoms of anxiety ($\beta = 0.22$, $p < 0.01$) than adolescent girls without weight control intentions. Girls who intended to lose weight reported greater symptoms of depression ($\beta = 0.52$, $p < 0.001$) and anxiety ($\beta = 0.41$, $p < 0.001$) and poorer self-concept ($\beta = 2.06$, $p < 0.001$), while girls who intended to gain weight also reported greater symptoms of depression ($\beta = 0.54$, $p < 0.001$) and anxiety ($\beta = 0.50$, $p < 0.001$) and poorer self-concept ($\beta = 1.25$, $p < 0.001$). Adolescent boys who intended to maintain weight reported fewer symptoms of depression ($\beta = -0.15$, $p < 0.05$), slightly greater anxiety ($\beta = 0.17$, $p < 0.05$) and higher self-concept ($\beta = -0.33$, $p < 0.001$) than boys with no weight control intentions. Like girls, boys who intended to lose weight reported greater symptoms of depression ($\beta = 0.26$, $p < 0.001$) and anxiety ($\beta = 0.33$, $p < 0.001$) and poor self-concept ($\beta = 1.10$, $p < 0.001$). However, weight-gain intentions were not associated with any differences in self-reported depression or self-concept compared to boys without weight control intentions; rather, boys who intended to gain weight had greater symptoms of anxiety ($\beta = 0.17$, $p < 0.05$).

Discussion

The purpose of our present study was to examine the associations between weight control intentions and symptoms of depression, anxiety and self-concept in a large sample of adolescent girls and boys in Canada. More than half of respondents in

TABLE 1
Logistic regression models estimating the odds of missing data for measures of depression, anxiety, self-concept and weight control intentions in adolescent girls and boys

Measure	aOR (95% CI)			
	Model I	Model II	Model III	Model IV
Gender				
Boys (<i>ref.</i>)	1.00	1.00	1.00	1.00
Girls	0.85 (0.81–0.89)***	0.85 (0.79–0.91)	0.58 (0.52–0.63)***	0.64 (0.54–0.76)***
Grade				
9 (<i>ref.</i>)	1.00	1.00	1.00	1.00
10	0.86 (0.81–0.92)***	0.95 (0.87–1.03)	0.82 (0.73–0.92)**	0.87 (0.70–1.07)
11	0.77 (0.72–0.82)***	0.88 (0.80–0.96)**	0.79 (0.70–0.89)**	0.77 (0.62–0.97)*
12	0.77 (0.72–0.83)***	0.91 (0.82–1.00)	0.85 (0.74–0.97)*	0.67 (0.52–0.88)**
Race/ethnicity				
Non-racialized (<i>ref.</i>)	1.00	1.00	1.00	1.00
Racialized	1.37 (1.30–1.44)***	1.46 (1.36–1.57)***	1.57 (1.43–1.72)***	1.05 (0.88–1.25)
BMI category				
Underweight	1.21 (1.01–1.45)*	1.31 (1.03–1.66)*	1.52 (1.10–2.07)**	1.41 (0.77–2.60)
Normal (<i>ref.</i>)	1.00	1.00	1.00	1.00
Overweight	1.06 (0.98–1.15)	0.91 (0.82–1.02)	1.07 (0.92–1.24)	0.95 (0.71–1.28)
Obesity	1.00 (0.90–1.15)	1.06 (0.91–1.22)	1.22 (1.00–1.48)*	1.23 (0.86–1.76)
Not reported	1.43 (1.35–1.52)***	1.60 (1.48–1.72)***	1.89 (1.71–2.10)***	2.13 (1.77–2.56)***

Source: Year 6 (2017–18) COMPASS Student Questionnaire

Abbreviations: aOR, adjusted odds ratio; BMI, body mass index; CESD-R-10, Centre for Epidemiological Studies Depression Scale (Revised)-10; CI, confidence interval; GAD-7, Generalized Anxiety Disorder 7-item Scale; *ref.*, reference category.

Notes: Model I estimates the log odds of missing data in depression symptom (CESD-R-10) scores (*ref.* = not missing); Model II estimates the log odds of missing data in anxiety symptom (GAD-7) scores (*ref.* = not missing); Model III estimates the log odds of missing data in self-concept sum scores (*ref.* = not missing); Model IV estimates the log odds of missing data in weight control intentions (*ref.* = not missing). All estimates are adjusted for MVPA, screen time, sleep and breakfast skipping.

* $p < 0.05$.

** $p < 0.01$.

*** $p < 0.001$.

this study reported that they were trying to gain or lose weight. Our findings demonstrate an association between weight control intentions and mental health, while controlling for BMI and other covariates.

In our study, intention to lose weight was associated with higher symptoms of depression and anxiety and poorer self-concept in boys and girls. These associations may be explained, in part, by psychological distress triggered by unsuccessful weight loss attempts.⁵⁴ In adults, attempts to lose weight are common but largely ineffective.^{55–57} As body weight is seen as a controllable and individual responsibility, difficulty losing weight may be misattributed to personal faults rather than the ineffectiveness of diets and behavioural weight-loss interventions. Evidence supports strong links between weight preoccupation and body dissatisfaction, disordered eating and weight-based discrimination, which are associated with poor psychosocial well-being.^{58–60}

Obesity prevention efforts have traditionally included weight-focussed messages that can negatively affect adolescents.^{61–64} It is imperative to move beyond weight-focussed indicators (e.g. weight status) and messaging, and emphasize the importance of engaging in healthy behaviours (e.g. eating behaviours, physical activity) in health promotion efforts.^{59,61–64}

Stratified analyses revealed gender differences in the observed outcomes. Intentions to gain weight were associated with more symptoms of depression and anxiety and lower self-concept in girls. Symptoms of depression and anxiety were also increased in boys who intended to gain weight, but to a lesser extent. While some research demonstrates that body dissatisfaction and negative body image are more common in girls than in boys^{65–67}, Pope et al. suggest that rates of body dissatisfaction in boys may be comparable to these rates in girls.⁶⁸ In adolescent boys, body dissatisfaction tends to manifest as a

greater emphasis on weight gain via increased muscle mass, rather than as weight loss.⁶⁹ Manipulation behaviours used to enhance muscularity have been associated with adverse psychological consequences in adolescence.^{70–72} Our findings of symptoms of higher anxiety in boys with weight-gain intentions corroborate this evidence. However, it remains unclear why boys' weight-gain intentions were not also associated with depressive symptoms or poor self-concept. This may be related to developmental differences, with pubertal timing in boys tending to lag behind that of girls, and pubertal changes bringing boys closer to sociocultural ideals of muscularity.⁷³ Girls, on the other hand, tend to report higher body dissatisfaction and poor self-image and depression after the onset of puberty.^{73,74} Findings may therefore differ across developmental age and in early versus late developers, factors we were unable to assess in this study.

Our findings for weight maintenance intentions were mixed. In our sample, girls and boys who intended to maintain their weight reported lower symptoms of depression but greater symptoms of anxiety. This suggests that intending to maintain weight is not ubiquitously related to mental disorder symptoms, as appears to be the case for intending to lose or gain weight. Our measures do not reflect actual engagement in weight-control behaviours. The effect of active weight-maintenance behaviours on mental health warrants additional research, especially in contrast to adolescents without particular intentions. Intending to maintain weight was associated with greater self-concept in boys, indicating that those who intend to maintain their weight may be satisfied with their physical and social beliefs about themselves. This was not evident among girls in our sample, echoing the literature that shows that adolescent girls are disproportionately affected by socio-cultural norms to do with body weight and shape.⁶⁷ Future research is needed on the gendered experience of weight maintenance and control intentions and mental health.

Implications for findings

This research furthers evidence that adolescence represents an important period for the development of body image, self-concept and mental health. Considering that bodily changes occur alongside heightened

TABLE 2
Differences in weight control intentions by sample characteristics and measures of depression, anxiety and self-concept (N = 45 019)

Measure	Self-reported weight control intentions				p value
	None	Maintain	Lose	Gain	
Grade, n (%)					
9 (<i>ref.</i>)	3719 (30.1)	2527 (27.9)	4117 (25.1)	1647 (22.7)	< 0.0001
10	3580 (29.0)	2578 (28.5)	4437 (28.1)	2011 (27.8)	
11	3183 (25.8)	2541 (28.1)	4459 (27.2)	2111 (29.1)	
12 ^a	1867 (15.1)	1399 (15.5)	3365 (20.6)	1478 (20.4)	
Gender, n (%)					
Boys (<i>ref.</i>)	5750 (46.6)	4833 (53.4)	11 055 (67.5)	1302 (18.0)	< 0.0001
Girls	6599 (53.4)	4212 (46.6)	5323 (32.5)	5945 (82.0)	
Race/ethnicity, n (%)					
Non-racialized (<i>ref.</i>)	9404 (76.2)	6872 (76.0)	11 195 (68.4)	4907 (67.7)	< 0.0001
Racialized	2945 (23.8)	2173 (24.0)	5183 (31.6)	2340 (32.3)	
BMI category, n (%)					
Underweight	262 (2.1)	125 (1.4)	76 (0.5)	294 (4.1)	< 0.0001
Normal (<i>ref.</i>)	7601 (61.5)	5980 (66.1)	6903 (42.1)	5270 (72.7)	
Overweight	1033 (8.4)	918 (10.1)	3286 (20.1)	372 (5.1)	
Obesity	369 (3.0)	342 (3.8)	1873 (11.4)	120 (1.7)	
Not reported	3084 (25.0)	1680 (18.6)	4240 (25.9)	1191 (16.4)	
Meets MVPA guidelines, n (%)^b					
No (<i>ref.</i>)	7814 (63.3)	5271 (58.3)	9494 (58.0)	3420 (47.2)	< 0.0001
Yes	4535 (36.7)	3774 (41.7)	6884 (42.0)	3827 (52.8)	
Meets screen time guidelines, n (%)^b					
No (<i>ref.</i>)	11 543 (93.5)	8462 (93.5)	15 680 (95.7)	6938 (95.7)	< 0.0001
Yes	806 (6.5)	583 (6.5)	698 (4.3)	309 (4.3)	
Meets sleep guidelines, n (%)^b					
No (<i>ref.</i>)	6861 (55.6)	4912 (54.3)	10 748 (65.6)	4115 (56.8)	< 0.0001
Yes	5488 (44.4)	4133 (45.7)	5630 (34.4)	3132 (43.2)	
Skipping breakfast, n (%)					
No (<i>ref.</i>)	6096 (49.4)	4690 (51.8)	5887 (35.9)	3634 (50.1)	< 0.0001
Yes	6253 (50.6)	4355 (48.2)	10 491 (64.1)	3613 (49.9)	
Depression symptoms (CESD-R-10)					
Mean score (SD)	8.0 (5.8)	7.9 (5.5)	10.5 (6.4)	8.2 (5.7)	< 0.0001
Anxiety symptoms (GAD-7)					
Mean score (SD)	5.6 (5.4)	5.9 (5.3)	8.0 (6.0)	5.6 (5.5)	< 0.0001
Self-concept^c					
Mean score (SD)	10.2 (4.3)	9.9 (4.0)	12.5 (4.8)	10.0 (4.4)	< 0.0001
Total (%)	12 349 (27.4)	9045 (20.1)	16 378 (36.4)	7247 (16.1)	

Source: Year 6 (2017–18) COMPASS Student Questionnaire.

Abbreviations: BMI, body mass index; CESD-R-10, Centre for Epidemiological Studies Depression Scale (Revised)-10; GAD-7, Generalized Anxiety Disorder 7-item Scale; MVPA, moderate-to-vigorous physical activity; *ref.*, reference category; SD, standard deviation.

^a There is no Grade 12 in Quebec.

^b Refers to whether students met the Canadian Society for Exercise Physiology (CSEP) 24-Hour Movement Guidelines recommendations of ≥1 hour MVPA, ≤2 hours recreational screen time and 8–10 hours of sleep per day.⁴⁶

^c Assessed using items from the *SDQ II Manual: Self Description Questionnaire II*.⁴⁵ Higher scores indicate poorer self-concept.

TABLE 3
Differences between adolescent girls and boys (N = 45 019) in sociodemographic characteristics, weight control intentions and measures of depression, anxiety and self-concept

Measure	Girls	Boys	p value
Grade, n (%)			
9 (<i>ref.</i>)	6136 (26.7)	5874 (26.6)	0.843
10	6426 (28.0)	6180 (28.0)	
11	6282 (27.4)	6012 (27.2)	
12 ^a	4096 (17.9)	4013 (18.2)	
Race/ethnicity, n (%)			
Non-racialized (<i>ref.</i>)	16 806 (73.3)	15 572 (70.5)	< 0.0001
Racialized	6134 (26.7)	6507 (29.5)	
BMI category, n (%)			
Underweight	309 (1.4)	448 (2.0)	< 0.0001
Normal (<i>ref.</i>)	13 861 (60.4)	11 893 (53.9)	
Overweight	2484 (10.8)	3125 (14.2)	
Obesity	983 (4.3)	1721 (7.8)	
Not reported	5303 (23.1)	4892 (22.2)	
Meets MVPA guidelines, n (%)^b			
No (<i>ref.</i>)	14 800 (64.5)	11 199 (50.7)	< 0.0001
Yes	8140 (35.5)	10 880 (49.3)	
Meets screen time guidelines, n (%)^b			
No (<i>ref.</i>)	21 571 (94.0)	21 052 (95.4)	< 0.0001
Yes	1369 (6.0)	1027 (4.6)	
Meets sleep guidelines, n (%)^b			
No (<i>ref.</i>)	14 122 (61.6)	12 514 (56.7)	< 0.0001
Yes	8818 (38.4)	9565 (43.3)	
Breakfast skipping, n (%)			
No (<i>ref.</i>)	9366 (40.8)	10 941 (49.5)	< 0.0001
Yes	13 574 (59.2)	11 138 (50.5)	
Weight control intentions, n (%)			
None (<i>ref.</i>)	5750 (25.1)	6599 (29.9)	< 0.0001
Maintain	4833 (21.1)	4212 (19.1)	
Lose	11 055 (48.2)	5323 (24.1)	
Gain	1302 (5.6)	5945 (26.9)	
Depression symptoms (CESD-R-10)			
Mean score (SD)	10.2 (6.4)	7.6 (5.4)	< 0.0001
Anxiety symptoms (GAD-7)			
Mean score (SD)	8.2 (5.9)	4.8 (5.0)	< 0.0001
Self-concept^c			
Mean score (SD)	11.7 (4.6)	9.8 (4.2)	< 0.0001
Total (%)	22 940 (51.0)	22 079 (49.0)	

Source: Year 6 (2017–18) COMPASS Student Questionnaire.

Abbreviations: BMI, body mass index; CESD-R-10, Centre for Epidemiological Studies Depression Scale (Revised)-10; GAD-7, Generalized Anxiety Disorder 7-item Scale; MVPA, moderate-to-vigorous physical activity; *ref.*, reference category; SD, standard deviation.

^a There is no Grade 12 in Quebec.

^b Refers to whether students met the Canadian Society for Exercise Physiology (CSEP) 24-Hour Movement Guidelines recommendations of ≥1 hour MVPA, ≤2 hours recreational screen time and 8–10 hours of sleep per day.⁴⁶

^c Assessed using items from the *SDQ II Manual: Self Description Questionnaire II*.⁴⁵ Higher scores indicate poorer self-concept.

social pressures and greater exposure to sociocultural ideals in secondary school, our findings suggest it may be beneficial to target school-based adolescent populations in promoting healthy weight control and positive body image. Further research is needed to examine the temporal and potential bidirectional relationships between weight control intentions and mental health in adolescent girls and boys, as depression and anxiety may play a role in body weight and health behaviours.^{75,76}

Also needed is additional research examining the gendered associations between weight control intentions and mental health in adolescents. For instance, discerning why intentions to gain weight were associated with poor mental health in girls, more so than boys, would help design interventions that have an impact. Much of the existing research on weight control intentions focusses on self-esteem and adolescents' evaluation of their self-worth,⁷⁷ constructs that may not adequately capture adolescents' view of themselves across the multiple domains encompassed by self-concept (e.g. academic, social, emotional, physical).^{78,79}

Given the high number of students who reported attempting to control their weight through weight loss, despite our controlling for BMI, it is important to mitigate adolescents' exposure to factors contributing to unnecessary weight-related intentions. Public health interventions in multiple environments^{80,81} can address these factors equitably, for example, by including educational components directed toward adolescent groups or the adults they regularly interact with (e.g. parents, teachers and coaches).⁸² Dissonance-based and media literacy programs have demonstrated positive results in reducing body dissatisfaction among adolescents.^{83,84}

Also worth considering is situating interventions in environments that adolescents frequent (e.g. schools, recreational facilities)^{85,86} as well as broader-level policies and regulations. Policy interventions that restrict adolescents' exposure to weight-focussed advertisements on popular social media and photo sharing platforms may be beneficial.⁸⁷

Lastly, a weight-neutral approach towards health promotion should be adopted instead of using weight as an indicator of better health.⁶¹ Obesity prevention efforts

TABLE 4
Multivariable linear regression models estimating symptoms of depression, anxiety and self-concept, in adolescent girls (n = 22 940) and boys (n = 22 079)

Weight control intentions	β (95% CL)					
	Model I		Model II		Model III	
	Unadjusted	Adjusted ^a	Unadjusted	Adjusted ^a	Unadjusted	Adjusted ^a
Girls						
None (<i>ref.</i>)	0.00	0.00	0.00	0.00	0.00	0.00
Maintain	-0.30 (-0.46, -0.14)***	-0.21 (-0.37, -0.06)**	0.25 (0.11, 0.40)***	0.22 (0.08, 0.37)**	-0.25 (-0.43, -0.08)**	-0.12 (-0.29, 0.05)
Lose	0.75 (0.62, 0.88)***	0.52 (0.39, 0.66)***	0.42 (0.30, 0.54)***	0.41 (0.28, 0.54)***	2.46 (2.31, 2.61)***	2.06 (1.92, 2.21)***
Gain	0.66 (0.40, 0.91)***	0.54 (0.29, 0.79)***	0.45 (0.22, 0.68)***	0.50 (0.27, 0.73)***	1.36 (1.08, 1.63)***	1.25 (0.98, 1.51)***
Boys						
None (<i>ref.</i>)	0.00	0.00	0.00	0.00	0.00	0.00
Maintain	-0.20 (-0.34, -0.05)**	-0.15 (-0.29, -0.01)*	0.17 (0.03, 0.30)*	0.17 (0.04, 0.31)*	-0.48 (-0.65, -0.32)***	-0.33 (-0.49, -0.17)***
Lose	0.41 (0.28, 0.55)***	0.26 (0.12, 0.40)***	0.31 (0.19, 0.44)***	0.33 (0.20, 0.47)***	1.39 (1.24, 1.54)***	1.10 (0.94, 1.26)***
Gain	0.08 (-0.05, 0.21)	0.08 (-0.05, 0.21)	0.15 (0.24, 0.27)*	0.17 (0.01, 0.26)*	-0.29 (-0.44, -0.14)***	-0.11 (-0.26, 0.12)

Abbreviations: BMI, body mass index; CESD-R-10, Centre for Epidemiological Studies Depression Scale (Revised)-10; CL, confidence limit; GAD-7, Generalized Anxiety Disorder 7-item Scale; MVPA, moderate-to-vigorous physical activity; *ref.*, reference category.

Note: Model I estimates depression symptom (CESD-R-10) scores; Model II estimates anxiety symptom (GAD-7) scores; Model III estimates self-concept (higher scores indicate poorer self-concept). Model I controls for GAD-7 and Model II controls for CESD-R-10.

^a Estimates are adjusted for grade, race/ethnicity, BMI category, MVPA, screen time, sleep and skipping breakfast.

* $p < 0.05$.

** $p < 0.01$.

*** $p < 0.001$.

should be examined and modified to emphasize the importance of indicators of health beyond weight status⁶¹⁻⁶³, including healthy behaviours and mental health.

Strengths and limitations

Despite the confidentiality of the process students use to complete the COMPASS Student Questionnaire,⁴⁰ students may have been reluctant to disclose weight-related information or any symptoms of depression and anxiety. However, active-information, passive-consent data collection protocols and anonymity in the COMPASS study promote robust self-report.⁸⁸ It should be noted that measures of depression and anxiety are not diagnostic; rather, they are indicative of the presence of self-reported symptoms of depression and anxiety in large adolescent populations.^{34,89,90}

Some measures employed in the analyses may limit the interpretation of the findings. Our binary gender measure, combined with instructions given to students to not respond to items if they chose, may have resulted in the exclusion of students who self-identified as gender non-conforming or non-binary and who are disproportionately at risk for disordered eating.⁹¹ Future research should explore

the relationships between weight control intentions and mental health using more comprehensive measures of gender identity. Given the measures used and the primarily non-racialized sample, we were also unable to explore effects by ethnic identity; future studies employing inter-sectional analyses in this domain are warranted.

Our measure of weight control intentions did not differentiate between attempts to control lean versus fat mass; as such, findings can only be interpreted to represent an intention to either maintain or manipulate one's weight in the direction of loss or gain. Moreover, it should be noted that for some, intentions to gain weight may not necessarily be problematic as adolescents are still growing.

Due to the COMPASS study's convenience sampling procedure, our data are not nationally representative and the findings might not be generalizable to the entire adolescent population in Canada. However, convenience sampling helps achieve a desirable sample size that permits adequate power to detect the presence of a significant association, if present.⁸⁸ To help mitigate the risk of bias as a function of our complete case analysis, we included

students with unreported BMI as a separate category given the evidence that weight-related data are often not missing at random.^{48,92} Finally, these data were cross-sectional. While causality cannot be inferred, our findings fill a critical gap in the existing literature and can be used to guide future research clarifying temporality of the relationships between weight control intentions and mental health and their mechanisms. This can be achieved using prospective COMPASS study data.

Conclusion

Intentions to change weight were associated with mental health in a large sample of adolescent boys and girls in Canada. For both boys and girls, weight-loss intentions were associated with higher symptoms of depression and anxiety and lower self-concept, while weight-gain intentions were associated with poorer mental health in girls than in boys. Girls and boys who intended to maintain their weight represent a distinct group, warranting further investigation into how weight maintenance behaviours are associated with mental health. Future research is needed to better understand the gendered experience of weight control intentions and improve our understanding of strategies

that can mitigate their negative influence on the mental health of adolescents.

Acknowledgements

The COMPASS study has been supported by a bridge grant from the Canadian Institutes of Health Research (CIHR) Institute of Nutrition, Metabolism and Diabetes (INMD) through the “Obesity—Interventions to Prevent or Treat” priority funding awards (OOP-110788; awarded to STL); an operating grant from the CIHR Institute of Population and Public Health (IPPH) (MOP-114875; awarded to STL); a CIHR project grant (PJT-148562; awarded to STL); a CIHR bridge grant (PJT-149092; awarded to KP/STL); a CIHR project grant (PJT-159693; awarded to KP); and by a research funding arrangement with Health Canada (1617-HQ-000012; contract awarded to STL). The COMPASS-Quebec project also receives funding from the Ministère de la Santé et des Services sociaux of the province of Quebec, and the Direction régionale de santé publique du CIUSSS de la Capitale-Nationale.

The funding sources had no role in the study design; in the collection, analysis and interpretation of data; in the writing of the manuscript; or in the decision to submit the article for publication.

Conflicts of interest

The authors declare that they have no conflicts of interest.

Authors' contributions and statement

ND, IR, AB and REL designed the study and drafted the manuscript. IR analyzed and interpreted the data. KAP conceptualized the COMPASS Mental Health Module, drafted components of the manuscript and revised the manuscript for critical content. STL conceptualized the COMPASS host study, led the acquisition of data and revised the manuscript for critical content. Everyone who contributed significantly to the work described in this manuscript has been listed above.

The content and views expressed in this article are those of the authors and do not necessarily reflect those of the Government of Canada.

References

1. Voelker DK, Reel JJ, Greenleaf C. Weight status and body image perceptions in adolescents: current perspectives. *Adolesc Health Med Ther*. 2015;6:149-58. <https://doi.org/10.2147/AHMT.S68344>
2. Cash TF, Phillips KA, Santos MT, Hrabosky JI. Measuring “negative body image”: validation of the Body Image Disturbance Questionnaire in a nonclinical population. *Body Image*. 2004;1(4):363-72. <https://doi.org/10.1016/j.bodyim.2004.10.001>
3. Cafri G, Yamamiya Y, Brannick M, Thompson JK. The influence of socio-cultural factors on body image: a meta-analysis. *Clin Psychol (New York)*. 2005;12(4):421-33. <https://doi.org/10.1093/clipsy.bpi053>
4. Butcher JN, Kendall PC. ‘Introduction to childhood and adolescent psychopathology’ in *APA handbook of psychopathology: child and adolescent psychopathology*. Washington (DC): American Psychological Association; 2018:3-14. <https://doi.org/10.1037/0000065-001>
5. Jones DC, Vigfusdottir TH, Lee Y. Body image and the appearance culture among adolescent girls and boys: an examination of friend conversations, peer criticism, appearance magazines, and the internalization of appearance ideals. *J Adolesc Res*. 2004;19(3):323-39. <https://doi.org/10.1177/0743558403258847>
6. Patten SB, Wang JL, Williams JV, Currie S, Beck CA, Maxwell CJ, El-Guebaly N. Descriptive epidemiology of major depression in Canada. *Can J Psychiatry*. 2006;51(2):84-90. <https://doi.org/10.1177/070674370605100204>
7. Lijster JM, Dierckx B, Utens EM, et al. The age of onset of anxiety disorders. *Can J Psychiatry*. 2017;62(4):237-46. <https://doi.org/10.1177/0706743716640757>
8. Balantekin KN, Birch LL, Savage JS. Family, friend, and media factors are associated with patterns of weight-control behavior among adolescent girls. *Eat Weight Disord*. 2018;23(2):215-23. <https://doi.org/10.1007/s40519-016-0359-4>
9. Knauss C, Paxton SJ, Alsaker FD. Relationships amongst body dissatisfaction, internalisation of the media body ideal and perceived pressure from media in adolescent girls and boys. *Body Image*. 2007;4(4):353-60. <https://doi.org/10.1016/j.bodyim.2007.06.007>
10. Fitzsimmons-Craft EE, Harney MB, Koehler LG, Danzi LE, Riddell MK, Bardone-Cone AM. Explaining the relation between thin ideal internalization and body dissatisfaction among college women: the roles of social comparison and body surveillance. *Body Image*. 2012;9(1):43-9. <https://doi.org/10.1016/j.bodyim.2011.09.002>
11. Mendes V, Araújo J, Lopes C, Ramos E. Determinants of weight loss dieting among adolescents: a longitudinal analysis. *J Adolesc Health*. 2014;54(3):360-3. <https://doi.org/10.1016/j.jadohealth.2013.12.003>
12. Lawler M, Nixon E. Body dissatisfaction among adolescent boys and girls: the effects of body mass, peer appearance culture and internalization of appearance ideals. *J Youth Adolesc*. 2011;40(1):59-71. <https://doi.org/10.1007/s10964-009-9500-2>
13. Roy M, Gauvin L. Associations between different forms of body dissatisfaction and the use of weight-related behaviors among a representative population-based sample of adolescents. *Eat Weight Disord*. 2013;18(1):61-73. <https://doi.org/10.1007/s40519-013-0007-1>
14. Raffoul A, Leatherdale ST, Kirkpatrick SI. Weight management, weight perceptions, and health-compromising behaviours among adolescent girls in the COMPASS Study. *J Prim Prevent*. 2018;39(4):345-60. <https://doi.org/10.1007/s10935-018-0512-0>
15. Johnson F, Wardle J. Dietary restraint, body dissatisfaction, and psychological distress: a prospective analysis. *J Abnorm Psychol*. 2005;114(1):119-25. <https://doi.org/10.1037/0021-843X.114.1.119>

16. ter Bogt TF, van Dorsselaer SA, Monshouwer K, Verdurmen JE, Engels RC, Vollebergh WA. Body mass index and body weight perception as risk factors for internalizing and externalizing problem behavior among adolescents. *J Adolesc Health*. 2006;39(1):27-34. <https://doi.org/10.1016/j.jadohealth.2005.09.007>
17. Roberts RE, Duong HT. Perceived weight, not obesity, increases risk for major depression among adolescents. *J Psychiatr Res*. 2013;47:1110-17. <https://doi.org/10.1016/j.jpsychires.2013.03.019>
18. Minor T, Ali MM, Rizo JA. Body weight and suicidal behavior in adolescent females: the role of self-perceptions. *J Ment Health Policy Econ*. 2016;19(1):21-31.
19. Cash TF, Green GK. Body weight and body image among college women: Perception, cognition, and affect. *J Pers Assess*. 1986;50(2):290-301. https://doi.org/10.1207/s15327752jpa5002_15
20. Whitaker A, Davies M, Shaffer D, et al. The struggle to be thin: a survey of anorexic and bulimic symptoms in a non-referred adolescent population. *Psychol Med*. 1989;19(1):143-63. <https://doi.org/10.1017/S0033291700011107>
21. Vannucci A, Ohannessian CM. Body image dissatisfaction and anxiety trajectories during adolescence. *J Clin Child Adolesc Psychol*. 2018;47(5):785-95. <https://doi.org/10.1080/15374416.2017.1390755>
22. Abdollahi A, Abu Talib M, Reza Vakili Mobarakeh M, Momtaz V, Kavian Mobarake R. Body-esteem mediates the relationship between self-esteem and social anxiety: The moderating roles of weight and gender. *Child Care Pract*. 2016;22(3):296-308. <https://doi.org/10.1080/13575279.2015.1054787>
23. Paxton SJ, Neumark-Sztainer D, Hannan PJ, Eisenberg ME. Body dissatisfaction prospectively predicts depressive mood and low self-esteem in adolescent girls and boys. *J Clin Child Adolesc Psychol*. 2006;35(4):539-49. https://doi.org/10.1207/s15374424jccp3504_5
24. Duchesne AP, Dion J, Lalonde D, et al. Body dissatisfaction and psychological distress in adolescents: Is self-esteem a mediator? *J Health Psychol*. 2017;22(12):1563-9. <https://doi.org/10.1177/1359105316631196>
25. Morken IS, Røysamb E, Nilsen W, Karevold EB. Body dissatisfaction and depressive symptoms on the threshold to adolescence: examining gender differences in depressive symptoms and the impact of social support. *J Early Adolesc*. 2019;39(6):814-38. <https://doi.org/10.1177/0272431618791280>
26. Choi E, Choi I. The associations between body dissatisfaction, body figure, self-esteem, and depressed mood in adolescents in the United States and Korea: a moderated mediation analysis. *J Adolesc*. 2016;53:249-59. <https://doi.org/10.1016/j.adolescence.2016.10.007>
27. Ajmal A. The impact of body image on self-esteem in adolescents. *CCPR*. 2019;1(1):44-54. <https://doi.org/10.32350/ccpr.11.04>
28. Perrin EM, Boone-Heinonen J, Field AE, Coyne-Beasley T, Gordon-Larsen P. Perception of overweight and self-esteem during adolescence. *Int J Eat Disord*. 2010;43(5):447-54. <https://doi.org/10.1002/eat.20710>
29. Campbell JD. Self-esteem and clarity of the self-concept. *J Pers Soc Psychol*. 1990;59(3):538-49. <https://doi.org/10.1037/0022-3514.59.3.538>
30. Marsh HW, Shavelson R. Self-concept: its multifaceted, hierarchical structure. *Educ Psychol*. 1985;20(3):107-23. https://doi.org/10.1207/s15326985ep2003_1
31. Lawler JR, Lennings CJ. Adolescent self concept, family type and conflict: an empirical investigation. *Aust J Marriage Fam*. 1992;13(2):70-7. <https://doi.org/10.1080/1034652X.1992.11004448>
32. Vartanian LR, Hopkinson MM. Social connectedness, conformity, and internalization of societal standards of attractiveness. *Body Image*. 2010;7(1):86-9. <https://doi.org/10.1016/j.bodyim.2009.10.001>
33. Strauman TJ, Glenberg AM. Self-concept and body-image disturbance: which self-beliefs predict body size overestimation? *Cognit Ther Res*. 1994;18(2):105-25. <https://doi.org/10.1007/BF02357219>
34. Patte KA, Bredin C, Henderson J, et al. Development of a mental health module for the COMPASS system: improving youth mental health trajectories. Part 1: Draft Development and Design. 2017; 4, 2. Waterloo, Ontario: University of Waterloo. Available at: <https://uwaterloo.ca/compass-system/development-mental-health-module-compass-system-improving>
35. Rice K, Prichard I, Tiggemann M, Slater A. Exposure to Barbie: effects on thin-ideal internalisation, body esteem, and body dissatisfaction among young girls. *Body Image*. 2016;19:142-9. <https://doi.org/10.1016/j.bodyim.2016.09.005>
36. De Jesus AY, Ricciardelli LA, Frisén A, et al. Media internalization and conformity to traditional masculine norms in relation to body image concerns among men. *Eat Behav*. 2015;18:137-42. <https://doi.org/10.1016/j.eatbeh.2015.04.004>
37. Smolak L, Murnen SK, Thompson JK. Sociocultural influences and muscle building in adolescent boys. *Men Masc*. 2005;6(4):227-39. <https://doi.org/10.1037/1524-9220.6.4.227>
38. McCabe MP, Ricciardelli LA, Banfield S. Body image, strategies to change muscles and weight, and puberty: do they impact on positive and negative affect among adolescent boys and girls? *Eat Behav*. 2001;2(2):129-49. [https://doi.org/10.1016/S1471-0153\(01\)00025-3](https://doi.org/10.1016/S1471-0153(01)00025-3)
39. Ivarsson T, Svalander P, Litlere O, Nevenon L. Weight concerns, body image, depression and anxiety in Swedish adolescents. *Eat Behav*. 2006;7(2):161-75. <https://doi.org/10.1016/j.eatbeh.2005.08.005>
40. Leatherdale ST, Brown KS, Carson V, et al. The COMPASS Study: A longitudinal hierarchical research platform for evaluating natural experiments related to changes in school-level programs, policies and built environment resources. *BMC Public Health*. 2014;14:331. <https://doi.org/10.1186/1471-2458-14-331>

41. Löwe B, Decker O, Müller S, et al. Validation and standardization of the Generalized Anxiety Disorder Screener (GAD-7) in the general population. *Med Care*. 2008;46(3):266-74. <https://doi.org/10.1097/MLR.0b013e318160d093>
42. Mossman SA, Luft MJ, Schroeder HK, et al. The Generalized Anxiety Disorder 7-item scale in adolescents with generalized anxiety disorder: signal detection and validation. *Ann Clin Psychiatry*. 2017;29(4):227-34A.
43. Van Dam NT, Earleywine M. Validation of the Center for Epidemiologic Studies Depression Scale-Revised (CESD-R): pragmatic depression assessment in the general population. *Psychiatry Res*. 2011;186(1):128-32. <https://doi.org/10.1016/j.psychres.2010.08.018>
44. Spitzer RL, Kroenke K, Williams JB, Löwe B. A brief measure for assessing generalized anxiety disorder: the GAD-7. *Arch Intern Med* 2006;166(10):1092-7. <https://doi.org/10.1001/archinte.166.10.1092>
45. Marsh HW. SDQ II manual: self description questionnaire – II. Campbelltown (NSW): University of Western Sydney; 1990.
46. Tremblay MS, Carson V, Chaput J-P. Introduction to the Canadian 24-Hour Movement Guidelines for Children and Youth: an integration of physical activity, sedentary behaviour, and sleep. *Appl Physiol Nutr Metab*. 2016;41(6):iii-iv. <https://doi.org/10.1139/apnm-2016-0203>
47. WHO Multicentre Growth Reference Study Group. WHO child growth standards: length/height-for-age, weight-for-age, weight-for-length, weight-for-height and body mass index-for-age: methods and development. Geneva (CH): World Health Organization; 2006.
48. Aceves-Martins M, Whitehead R, Inchley J, Giralto M, Currie C, Solà R. Self-reported weight and predictors of missing responses in youth. *Nutrition*. 2018;53:54-8. <https://doi.org/10.1016/j.nut.2018.01.003>
49. Arbour-Nicitopoulos KP, Faulkner GE, Leatherdale ST. Learning from non-reported data: interpreting missing Body Mass Index values in young children. *Meas Phys Educ Exerc Sci*. 2010;14:241-51. <https://doi.org/10.1080/1091367X.2010.520243>
50. Wong S, Leatherdale ST, Manske S. Reliability and validity of a school-based physical activity questionnaire. *Med Sci Sports Exerc*. 2006;38:1593-600. <https://doi.org/10.1249/01.mss.0000227539.58916.35>
51. Leatherdale ST, Laxer RE, Faulkner G. Reliability and validity of the physical activity and sedentary behaviour measures in the COMPASS study. COMPASS Technical Report Series. 2014;2(1). Waterloo (ON): University of Waterloo. Available at: <https://uwaterloo.ca/compass-system/publications/reliability-and-validity-physical-activity-and-sedentary>
52. Leatherdale ST, Laxer RE. Reliability and validity of the weight status and dietary intake measures in the COMPASS questionnaire: are the self-reported measures of body mass index (BMI) and Canada's Food Guide servings robust? *Int J Behav Nutr Phys Act*. 2013;10(1):42. <https://doi.org/10.1186/1479-5868-10-42>
53. SAS Institute Inc. SAS® 9.4 Statements: Reference. Cary (NC): SAS Institute Inc; 2013.
54. Heatherton TF, Polivy J. Chronic dieting and eating disorders: a spiral model. In: Crowther JH, Tennenbaum DL, Hobfoll SE, Stephens MA, editors. *The etiology of bulimia nervosa*. Milton Park (UK): Taylor & Francis; 2013. pp. 149-72.
55. Mann T, Tomiyama AJ, Westling E, Lew AM, Samuels B, Chatman J. Medicare's search for effective obesity treatments: diets are not the answer. *Am Psychol*. 2007;62(3):220-33. <https://doi.org/10.1037/0003-066X.62.3.220>
56. NIH Technology Assessment Conference Panel. Methods for voluntary weight loss and control. *Ann Intern Med*. 1992;116(11):942-9. <https://doi.org/10.7326/0003-4819-116-11-942>
57. Aphramor L. Is a weight-centred health framework salutogenic? Some thoughts on unhinging certain dietary ideologies. *Soc Theory Health*. 2005;3(4):315-40. <https://doi.org/10.1057/palgrave.sth.8700059>
58. Brown AW, Allison DB. Unintended consequences of obesity-targeted health policy. *Virtual Mentor*. 2013;15(4):339-46. <https://doi.org/10.1001/virtualmentor.2013.15.4.pfor2-1304>
59. Ramos Salas X. The ineffectiveness and unintended consequences of the public health war on obesity. *Can J Public Health*. 2015;106(2):e79-81. <https://doi.org/10.17269/cjph.106.4757>
60. Byrne S, Niederdeppe J. Unintended consequences of obesity prevention messages. In: Cawley J, editor. *The Oxford handbook of the social science of obesity*. New York (NY): Oxford University Press; 2011.
61. Nutter S, Russell-Mayhew S, Alberga AS, et al. Positioning of weight bias: moving towards social justice. *J Obes*. 2016;2016:e3753650. <https://doi.org/10.1155/2016/3753650>
62. Bacon L, Aphramor L. Weight science: evaluating the evidence for a paradigm shift. *Nutr J*. 2011;10(1):9. <https://doi.org/10.1186/1475-2891-10-9>
63. McHugh MC, Kasardo AE. Anti-fat prejudice: the role of psychology in explication, education and eradication. *Sex Roles*. 2012;66(9-10):617-27. <https://doi.org/10.1007/s11199-011-0099-x>
64. Humphrey L, Clifford D, Morris MN. Health at every size college course reduces dieting behaviors and improves intuitive eating, body esteem, and anti-fat attitudes. *J Nutr Educ Behav*. 2015;47(4):354-60.e1. <https://doi.org/10.1016/j.jneb.2015.01.008>
65. Polce-Lynch M, Myers BJ, Kliewer W, Kilmartin C. Adolescent self-esteem and gender: Exploring relations to sexual harassment, body image, media influence, and emotional expression. *J Youth Adolesc*. 2001;30(2):225-44. <https://doi.org/10.1023/A:1010397809136>

66. Rosenblum GD, Lewis M. The relations among body image, physical attractiveness, and body mass in adolescence. *Child Dev.* 1999;70(1):50-64. <https://doi.org/10.1111/1467-8624.00005>
67. Jiménez Flores P, Jiménez Cruz A, Bacardi Gascón M. Body-image dissatisfaction in children and adolescents: a systematic review. *Nutr Hosp.* 2017; 34(2):479-89. <https://doi.org/10.20960/nh.455>
68. Pope H, Pope HG, Phillips KA, Olivardia R. *The Adonis complex: the secret crisis of male body obsession.* New York (NY): Simon & Schuster; 2000.
69. Frank R, Claumann GS, Felden ÉP, Silva DA, Pelegrini A. Body weight perception and body weight control behaviors in adolescents. *J Pediatr (Rio J).* 2018;94(1):40-7. <https://doi.org/10.1016/j.jped.2017.03.008>
70. Cafri G, Strauss J, Thompson JK. Male body image: satisfaction and its relationship to well-being using the somatomorphic matrix. *Int J Mens Health.* 2002;1(2):215-31. <https://doi.org/10.3149/jmh.0102.215>
71. Cafri G, Thompson JK, Ricciardelli L, McCabe M, Smolak L, Yesalis C. Pursuit of the muscular ideal: physical and psychological consequences and putative risk factors. *Clin Psychol Rev.* 2005;25(2):215-39. <https://doi.org/10.1016/j.cpr.2004.09.003>
72. Irving LM, Wall M, Neumark-Sztainer D, Story M. Steroid use among adolescents: findings from Project EAT. *J Adolesc Health.* 2002;30(4):243-52. [https://doi.org/10.1016/S1054-139X\(01\)00414-1](https://doi.org/10.1016/S1054-139X(01)00414-1)
73. McCabe M, Ricciardelli L. A longitudinal study of pubertal timing and extreme body change behaviors among adolescent boys and girls. *Adolescence.* 2004;39(153):145-66.
74. Swarr AE, Richards MH. Longitudinal effects' pubertal development, perceptions of pubertal timing parental relations on eating problems. *Dev Psychol.* 1996;32:639-46. <https://doi.org/10.1037/0012-1649.32.4.636>
75. Cohen JH, Kristal AR, Neumark-Sztainer D, Rock CL, Neuhauser ML. Psychological distress is associated with unhealthful dietary practices. *J Am Diet Assoc.* 2002;102(5):699-703. [https://doi.org/10.1016/S0002-8223\(02\)90159-8](https://doi.org/10.1016/S0002-8223(02)90159-8)
76. Johnson F, Wardle J. Dietary restraint, body dissatisfaction, and psychological distress: a prospective analysis. *J Abnorm Psychol.* 2005;114(1):119-25. <https://doi.org/10.1037/0021-843X.114.1.119>
77. Rosenberg M. *Society and the adolescent self-image.* Princeton (NJ): Princeton University Press; 2015.
78. Shavelson RJ, Hubner JJ, Stanton GC. Self-concept: validation of construct interpretations. *Rev Educ Res.* 1976; 46(3):407-41. <https://doi.org/10.3102/00346543046003407>
79. Marsh HW, Shavelson R. Self-concept: its multifaceted, hierarchical structure. *Educ Psychol.* 1985;20(3):107-23. https://doi.org/10.1207/s15326985ep2003_1
80. Dahlgren G, Whitehead M. Policies and strategies to promote social equity in health. Background document to WHO – Strategy paper for Europe. Stockholm (SE): Institute for Futures Studies; 1991.
81. Bauer G, Davies JK, Pelikan J. The EUHPID Health Development Model for the classification of public health indicators. *Health Promot Int.* 2006; 21(2):153-9. <https://doi.org/10.1093/heapro/dak002>
82. Karmali S, Ng V, Battram D, et al. Coaching and/or education intervention for parents with overweight/obesity and their children: study protocol of a single-centre randomized controlled trial. *BMC Public Health.* 2019;19(1):345. <https://doi.org/10.1186/s12889-019-6640-5>
83. Stice E, Marti CN, Rohde P, Shaw H. Testing mediators hypothesized to account for the effects of a dissonance-based eating disorder prevention program over longer term follow-up. *J Consult Clin Psychol.* 2011;79(3):398-405. <https://doi.org/10.1037/a0023321>
84. Stice E, Rhode P, Shaw H, Marti CN. Efficacy trial of a selective prevention program targeting both eating disorder symptoms and unhealthy weight gain among female college students. *J Consult Clin Psychol.* 2012;80(1):164-70. <https://doi.org/10.1037/a0026484>
85. Maes L, Lievens J. Can the school make a difference? A multilevel analysis of adolescent risk and health behaviour. *Soc Sci Med.* 2003;56(3):517-29. [https://doi.org/10.1016/S0277-9536\(02\)00052-7](https://doi.org/10.1016/S0277-9536(02)00052-7)
86. Currie C, Zanotti C, Morgan A, et al. Social determinants of health and well-being among young people. *Health Behaviour in School-aged Children (HBSC) study: international report from the 2009/2010 survey.* Copenhagen (DK): WHO Regional Office for Europe; 2011:271.
87. Borzekowski DL, Bayer AM. Body image and media use among adolescents. *Adolesc Med Clin.* 2005;16(2):289-313. <https://doi.org/10.1016/j.admecli.2005.02.010>
88. Thompson-Haile A, Bredin C, Leatherdale ST. Rationale for using active-information passive-consent permission protocol in COMPASS. COMPASS Technical Report Series. 2013;1(6). Waterloo, Ontario: University of Waterloo. Available at: <https://uwaterloo.ca/compass-system/publications/rationale-using-active-information-passive-consent>
89. Tran TD, Kaligis F, Wiguna T, et al. Screening for depressive and anxiety disorders among adolescents in Indonesia: formal validation of the centre for epidemiologic studies depression scale – revised and the Kessler psychological distress scale. *J Affect Disord.* 2019;246:189-94. <https://doi.org/10.1016/j.jad.2018.12.042>
90. Tiirikainen K, Haravuori H, Ranta K, Kaltiala-Heino R, Marttunen M. Psychometric properties of the 7-item Generalized Anxiety Disorder Scale (GAD-7) in a large representative sample of Finnish adolescents. *Psychiatry Res.* 2019;272:30-5. <https://doi.org/10.1016/j.psychres.2018.12.004>

-
91. McClain Z, Peebles R. Body image and eating disorders among lesbian, gay, bisexual, and transgender youth. *Pediatr Clin North Am.* 2016;63(6): 1079-90. <https://doi.org/10.1016/j.pcl.2016.07.008>
 92. Pedersen AB, Mikkelsen EM, Cronin-Fenton D, et al. Missing data and multiple imputation in clinical epidemiological research. *Clin Epidemiol.* 2017;9:157-66. <https://doi.org/10.2147/CLEP.S129785>

Original qualitative research

Children's perceptions of a Centrally Procured School Food Program in southwestern Ontario, Canada

Paige Colley, PhD (1); Linda Miller, PhD (1); Jamie A. Seabrook, PhD (1, 2); Sarah J. Woodruff, PhD (3); Jason Gilliland, PhD (1)

This article has been peer reviewed.

 Tweet this article

Abstract

Introduction: This qualitative study investigates children's perceptions of the influences of a Centrally Procured School Food Program on their dietary behaviours and their recommendations on how to improve the program.

Methods: The observations of 208 students aged 9 to 14 years (Grades 5–8) at 21 elementary schools were collected through focus groups in 2017/18. The larger intervention consisted of a 10-week program offering daily snacks (i.e. fruit, vegetables, whole grains, dairy, meat alternatives) for elementary school children in southwestern Ontario, Canada.

Results: The participants' overall impressions of the program were positive. They noted reduced hunger, increased energy and improved nutrition. Many children felt that the program changed their dietary patterns at home as well as at school, particularly in terms of eating more fruit and vegetables. The snack program also enabled children to try healthy foods.

Conclusion: Most participants considered the program to be beneficial in promoting healthy eating. Participants recommended adding educational activities, expanding the variety of foods and increasing child involvement in selecting and preparing foods.

Keywords: nutrition, child health, food program, dietary behaviour, elementary school

Highlights

- A Centrally Procured School Food Program with daily snacks (i.e. fruit, vegetables, whole grains, dairy, meat alternatives) offers a promising way of improving child nutrition.
- Elementary school children participating in this program in southwestern Ontario, Canada, described eating more fruit and vegetables, being willing to try new foods, improving their eating habits at school and at home, and generally having feelings of health and well-being.
- Child participants offered useful insights into improving this school food program, such as integrating educational initiatives and providing a greater variety/frequency of healthy foods.

Introduction

Public health professionals have become increasingly concerned about the quality of children's diets.¹ A meagre 10% of Canadian children aged between 6 and 12 years eat five or more servings of fruit and vegetables daily.² Regular—and excess—consumption of foods that lack essential nutrients is associated with adverse health consequences.³ Rates of obesity have reached epidemic proportions, with nearly one-third of Canadian children overweight or obese.⁴ Obesity can lead to a lifetime of health complications including type 2 diabetes, cardiovascular disease and psychosocial problems.⁵ These trends reflect an

important health issue that warrants immediate attention, given that childhood dietary patterns of low-nutritional quality often persist into adulthood.⁶

School nutrition programs have been identified as an effective way to promote healthy eating.^{7,8} A recent systematic review found that multicomponent food-provision interventions in Canadian elementary schools positively influenced children's intake of nutrient-dense foods.⁹ Elementary schools may be more successful than secondary schools for school nutrition programming as there are typically no or fewer foods for sale and stiffer restrictions around eating outside of school.

While school nutrition programming may yield positive health benefits, experimental studies evaluating elementary school food programming in Canada are limited.⁹ To our knowledge, there has only been one qualitative study investigating children's perceptions of and experiences with elementary school food programs nationally.¹⁰ This presents a critical and timely opportunity to solicit the views and opinions of children receiving these initiatives.

The purpose of this qualitative research study was to investigate children's perceptions of the Ontario Student Nutrition Program's (OSNP) novel Centrally Procured

Author references:

1. Western University, London, Ontario, Canada
2. Brescia University College, London, Ontario, Canada
3. University of Windsor, Windsor, Ontario, Canada

Correspondence: Jason Gilliland, Social Science Centre, 2333 Western University, 1151 Richmond Street, London, ON N6A 3K7; Tel: 519-661-2111 ext. 81239; Email: jgillila@uwo.ca

School Food Program (CPSFP). The CPSFP was piloted in 30 elementary schools in southwestern Ontario in 2017/2018. This qualitative study is part of a larger evaluation of the program.

The OSNP offers a network of funding and support for elementary schools across the province to provide nutritious breakfasts, snacks or meals for students. Program funding is funnelled through the Government of Ontario Ministry of Children and Youth Services and allocated to 15 lead agencies across the province. The lead agency for the OSNP, Southwest Region is the Victorian Order of Nurses.

The Victorian Order of Nurses implemented the CPSFP in southwestern Ontario to improve the nutritional quality of food being offered through existing school food programs and to establish local food procurement strategies. After the pilot evaluation in 2017/2018, the CPSFP has become one of the largest free school food programs in Canada, supplying primarily locally sourced food.

Participating schools receive weekly deliveries of fresh fruit, vegetables, dairy products, whole grains and meat alternatives to nourish thousands of elementary school children daily. By offering a dietitian-approved menu, the CPSFP provides high-nutrient snacks that follow the nutritional guidelines proposed by the Ministry of Children and Youth Services.¹¹ This school-based initiative also incorporates centralized food procurement strategies to source a higher proportion of program food (at least 20%) from local farmers.

This study contributes to existing Canadian school nutrition literature by evaluating children's perceptions of and suggestions for the CPSFP. The research objectives were to investigate: (1) children's perceptions of the influences of the CPSFP on their diet and eating behaviours; and (2) factors contributing to or detracting from program success, including future program development recommendations.

Methods

This study used a child-centred research design guided by an epistemological stance that research is *with* children, rather than *on* children.¹² The research approach used qualitative methods that value children's voices and experiences, rather than assuming

that adult program administrators can speak for all children.¹³ The data collection and analysis processes were supported by the moderator's educational training and experience in engaging with children to facilitate an open, respectful conversation. We facilitated focus groups to create a receptive and constructive dialogue among child participants to gather perceptions of and suggestions for the nutrition program.

This study incorporated focus groups at participating elementary schools involved with the CPSFP as a 10-week intervention. Ethics approval was granted by the Non-Medical Research Ethics Board of Western University (NMREB #: 108549). The two publicly funded, English-speaking school boards in the region and the principals of 30 elementary schools approved the study.

Although the CPSFP was offered to all children from kindergarten to Grade 8, this evaluation study targeted those in Grades 5 to 8 only. Research of surveys and focus groups has shown that by this age children can effectively express their perspectives on and recommendations for improving their situation in and around school.^{14,15} The research team facilitated classroom presentations in each school for children in Grades 5 to 8 to explain the research process and to answer any questions. Following these presentations, a letter of information and parental/guardian consent and child assent forms were sent home (the school had already informed parents/guardians about the CPSFP). Signed parental/guardian consent and child assent were required to participate in the larger study, which included parent/guardian surveys, pre- and post-program surveys of children, direct observations during snack times and focus groups with children, school staff, program coordinators and food providers.

In this paper, we examine data from the focus groups with children. Parental/guardian consent and child assent included permission to audio record and transcribe verbatim all focus group material. Participants were told that anonymized direct quotations may be used for the purpose of this research.

We used a cluster randomized sampling strategy to invite the 30 schools engaged in the 10-week CPSFP research evaluation to participate in the focus groups. Out of

the 30 schools, 21 agreed to participate in the follow-up focus groups. All children in Grades 5 to 8 (aged 9–14 years) were invited to participate ($n = 3432$) and 647 of the invited children had parental/guardian consent. From a list of students who had received parental/guardian consent, school principals selected 4 to 12 children in each school through a randomized numbered approach, yielding a sample of 208 children who assented and participated in the focus groups. We conducted 38 focus groups, each made up of four to six children, across 21 schools during the 2017/18 school years.

Sociodemographic characteristics of the focus group participants for this qualitative study were obtained from youth and parent/guardian surveys as part of the larger evaluation of the CPSFP.

A trained doctoral research candidate moderated each focus group, and each included a research assistant who took notes and audio recorded the discussions. Several members of an interdisciplinary team comprising child health researchers and educators developed a semi-structured interview guide (available from the authors on request).

The questions posed by the moderator during the focus groups facilitated the children's discussions about their perceptions of the CPSFP, specifically any observed impacts on their diets. Each focus group lasted between 20 and 60 minutes, with most 30 minutes long. The focus groups were held in each school's resource room, library, classroom or gym. All the focus groups were conducted in English, audio recorded, transcribed verbatim and double-checked for accuracy.

We used thematic analysis to identify patterns within the data. An inductive approach to coding was used to analyze specific participant responses and form broader conclusions. Independent coders followed Braun and Clarke's systematic process for thematic analysis, which involved familiarizing oneself with the data, generating initial codes, searching for, mapping and defining themes, and producing a final analysis.¹⁶ We used NVivo qualitative software version 12 (QSR International Pty Ltd., Melbourne, Australia) to organize and review the transcripts from each school.

Several protocols were integrated to maintain rigour in the analysis. The focus group moderator created the initial codes to make sure significant content was represented accurately in conjunction with what was observed and heard within the focus groups. A secondary coder, an external research assistant who was neither involved in the development nor present in the focus groups, conducted an independent review of the secondary code of the data to mitigate any internal bias.

The two researchers, working independently, identified a high degree of similarity between the general codes. Any missing or contradictory codes were resolved by discussion with the principal investigator until consensus was reached. Critical reflexivity was integrated into the analysis by considering the ways in which personal assumptions, values and actions may have influenced interpretation of the data. An aim of the study was to align with child-centred principles and actively present the analysis using the voices and ideologies of children.

Results

A total of 208 students participated in focus groups, resulting in sufficient data to reach saturation. The mean age (SD) of the participants was 11.2 (1.2) years, with 64.4% self-identifying as female. Most participants resided in small towns or rural settings (75%). The median household income was between \$80 000 and \$89 999. Themes that emerged during the data analysis process were organized into two key domains: children’s perceptions of the influences of the CPSFP on their dietary behaviours, and recommendations to improve the CPSFP (see Table 1).

TABLE 1
Key domains and themes from the analysis of focus group data

Perceived influences of the CPSFP on children’s dietary behaviours	Recommendations to improve the CPSFP
<ul style="list-style-type: none"> • Encourages proper nutrition • Provides energy • Reduces hunger • Some positive impacts on eating patterns at school and home • Greater consumption of fruit and vegetables • Reduced intake of unhealthy snacks • Willingness to try different foods 	<ul style="list-style-type: none"> • Adding utensils and tools • Portioning food • Improving food safety and hygiene • Adding educational initiatives • Gathering student feedback on food preferences • Greater child involvement in food preparation • Adding a greater variety of foods

Abbreviation: CPSFP, Centrally Procured School Food Program.

Perceived influences of the Centrally Procured School Food Program on children’s dietary behaviours

The overall CPSFP program was well-received by most children. Their impressions of the program and its influence on their nutrition were largely positive:

“I think it gives an opportunity for a lot of students to not be hungry.” Female, Grade 7

“It fuels the rest of our day, the snack program, because they have all the stuff that gets our energy going.” Male, Grade 6

“This [program]... keeps kids’ nutrition up.” Male, Grade 6

Many participants described how the program reduced hunger, promoted energy and encouraged proper nutrition during the school day.

Children frequently reported that they were hungry in the morning prior to receiving the CPSFP. Hunger was often attributed to not having eaten breakfast before the start of the school day.

“Some people, like, don’t have time to eat breakfast in the morning, so it’s good to get to school and then like have something there that you [...] eat.” Female, Grade 8

Nearly all of the participants wanted the snacks from the program multiple times throughout the day to curb hunger.

“I would have [the snack program] during the whole day so I wouldn’t be hungry.” Female, Grade 7

Participants noted that the snacks were quickly eaten, with few or no items remaining. The amount of the food eaten often depended on the item, preferences for select foods and general hunger levels.

“There’s barely any [food] left.” Male, Grade 8

“Sometimes they put, like, all the favourite foods, and then it’s all gone really quick.” Male, Grade 5

Most participants indicated that they wanted more snacks, in particular the foods they liked.

Many children felt that the program had positively influenced their eating patterns at school and at home. Participants described eating more fruit and vegetables, and reducing their intake of unhealthy snacks, since participating in the program.

“I started packing my lunch a lot differently. A lot of the times I have no junk food in my lunch and more fruit and vegetables.” Male, Grade 5

A few participants, however, indicated that the program did not change their eating patterns, as they thought they already had a healthy diet.

Many children described how the program encouraged them to try various foods that they had not eaten before.

“There’s a lot of different food that I’ve never had before in the snack program, so that kind of encouraged me to eat different foods.” Female, Grade 6

“If I try something at school and then I really like it, then I’ll go home and want it, so then my parents buy it for me and I’ll eat that.” Female, Grade 8

The children noticed that access and exposure to healthy food items may have influenced their willingness to try and consume diverse foods. They also noticed how they influenced their parents/guardians’ purchasing patterns since participating in the program.

Recommendations to improve the Centrally Procured School Food Program

A central theme emerged surrounding program implementation practices. Children recommended adding utensils to help eat foods provided, coolers or ice packs to keep items cold and containers to portion food. For example,

“They should [...] put the same, equal amount of grams in every cup.” Male, Grade 5

Portioning food into recommended serving sizes was frequently suggested.

Some participants expressed concerns about food safety and hygiene practices, or possible contamination by other children touching food products.

“Sometimes people don’t eat because, like, other people put their dirty hand[s] into it.” Female, Grade 6

A few participants suggested supplying hand sanitizer, gloves or food tongs or encouraging hand-washing practices among children.

Participants recommended more educational initiatives, such as healthy eating messaging and announcements, cooking classes, field trips, school gardening and games, to enhance their knowledge and motivation to maintain a healthy diet. For example,

“If school is to prepare you for life, then they should probably have a cooking class. Because you can’t just go to fast food restaurants or dining all your life.” Male, Grade 8

“We should take a trip to learn about agriculture.” Female, Grade 8

“I think we should do, like, [...] a 7-day challenge to see which class will eat the most vegetables.” Male, Grade 8

“We should have, like, a ‘Watermelon Wednesday.’” Male, Grade 8

Most participants enjoyed the foods offered in the CPSFP; however, some children said they wanted to be involved with selecting food items. For example, children recommended conducting a survey

in each school to gather children’s food preferences.

“I was thinking maybe we could do, like, a survey to see what kind of food people like.” Female, Grade 5

The children encouraged getting feedback on the food items provided and offering greater quantities of preferred foods, particularly to reduce any food waste. In addition, participants proposed adding novel food items (i.e. meat products, a salad bar, tropical or exotic fruit, dips to enhance flavour).

Weekly deliveries of food items were often prepared by school staff members, parent volunteers and, in some cases, children. Some participants wanted to be more involved with the preparation and delivery of snacks.

“They should, like, take five or six students down to help them prepare, like, what they should have for the next day.” Female, Grade 6

Many recognized the time and labour needed to maintain the snack program and participants wanted to help.

Discussion

This study used focus groups to explore children’s perceptions of the effect of the CPSFP on their dietary behaviours. Current research exploring elementary school nutrition programs in Canada is limited.^{8,9} One qualitative study recognized how potentially significant the Northern Fruit and Vegetable Program is in promoting fruit and vegetable consumption among economically disadvantaged children.¹⁰ The CPSFP evaluation had similar findings; however, participants from all schools described positive impacts on nutrition, independent of household socioeconomic status. The CPSFP was offered to all children in participating schools, to try to improve child nutrition across the region.

Findings from this qualitative analysis indicated that many children believed that the CPSFP positively influenced their eating patterns and reduced hunger. Several participants reported that they did not eat breakfast before school. A recent study found that, on average, 1 in 10 Canadian children do not eat breakfast every day.¹⁷

Eating a nutritious morning meal is critical to replenishing essential nutrients needed to maintain energy levels throughout the day.¹⁷ Participants believed that the morning snacks improved nutrition, reduced hunger and increased their energy levels. Previous research has indicated the benefits of school food programs as an effective way to address hunger.¹⁸

An important finding from the focus groups was that children believed the CPSFP changed their eating patterns at school and at home. The CPSFP helped children sample and eat more fruit and vegetables, and as a result, some children believed that they were eating fewer unhealthy snacks. Previous experimental studies involving school food programs also demonstrated increases in children’s intake of fruit and vegetables.^{19,20} These improved dietary patterns sometimes transcended into the home, with some children persuading their parents to purchase the healthy foods that they ate through the school food program. Recent experimental evaluations of school nutrition programs in Canada had similar findings.⁹ The school food programs increased children’s preference for high-nutrient foods such as fruit and vegetables,^{21,22} as well as their attitudes and willingness to try a variety of foods.^{8,23,24}

This qualitative study offers contextually rich data to further our understanding of the positive dietary impacts associated with school nutrition programs. Given the nutritional benefits evidenced by this evaluation, coupled with what is known about school nutrition programs,^{9,21} the CPSFP could be an exemplary model for a universal school food program in Canada.

The focus group findings highlighted several factors contributing to or detracting from program success, including future program development recommendations. Participants often presented challenges delivering the snack program. Some of these issues may be attributed to a lack of resources and support systems (e.g. financial, human) to effectively deliver the program. Process evaluation research on school nutrition programming has identified similar challenges²⁵⁻²⁷ and recommends establishing guidelines to effectively facilitate nutrition programming in schools.²⁷⁻²⁹ School nutrition policies may be one avenue to provide a comprehensive framework by which schools can plan and implement

nutrition practices, including the integration of food programs, that reflect current nutrition guidelines.³⁰

Study participants wanted to be more involved with selecting food items through the program. Increasing autonomy by selecting and preparing food has been shown to improve preferences and willingness to try foods.³⁰ Children suggested integrating educational initiatives, such as food-related themes, games and experiential learning into the program. Multi-component interventions partnering food provision with education have been shown to effectively enhance child nutrition.^{9,31} Programs with experiential learning (e.g. school garden, cooking and food preparation activities) have been identified as the most effective strategy to encourage fruit and vegetable intake and improve nutritional knowledge.³²

Strengths and limitations

Information shared among the focus group participants may have been influenced by peers. The focus groups were conducted by university student researchers in an elementary school setting, naturally creating a power imbalance between the children and moderator. This relational dynamic could have affected what participants chose to share; however, the moderator minimized any potential social desirability bias by avoiding leading questions.

Although selection of students for focus groups was randomized by school principals, it may still be that the group of students who assented to participate over-represented children who were more interested in the CPSFP. In addition, this study might be context-specific to geographical location and influenced by participants' sociodemographic characteristics. It may be beneficial to investigate these factors in relation to school nutrition programming in future research.

The target population for this study was elementary school children. Their ability to articulate pragmatic recommendations to improve the program might be limited. Nevertheless, children are the primary recipients of the program and key informants in providing feedback related to program impacts and opportunities for improvement.

Findings from this study provide valuable data that may be relevant, applicable and useful for various nutrition programs in Canada.

Conclusion

The CPSFP is a promising approach to improving nutrition in elementary schools. The program offers healthy, primarily locally-sourced snacks that were well-received by most participants. It increased participants' consumption of fruit and vegetables and willingness to try new foods, and improved eating habits and general feelings of health and well-being. The child participants provided useful insights into improving the program, such as incorporating educational initiatives and increasing the frequency with which snacks were provided and the variety of foods.

This qualitative evaluation offers rich, data-driven research to support the development and sustainability of nutrition programming regionally and beyond. Additional research on centralized food procurement practices in alternative contexts and regions of Canada will help to determine its success in reducing child hunger, increasing energy and improving nutrition. This research also helps in supporting the development of comprehensive nutrition policies that increase accessibility to centrally procured food-provision practices in elementary schools in Canada.

Acknowledgements

The authors thank the students and families who participated in this study, along with the teachers and principals who helped facilitate study implementation in their schools. We also thank our collaborators from Brescia University College, Danielle Battram, Paula Dworatzek and Colleen O'Connor, for their help developing the larger project, and the many research assistants and volunteers from the Human Environments Analysis Laboratory of Western University who assisted with data collection and data entry. We are particularly grateful to our community partners from the Ontario Student Nutrition Program (OSNP), Southwest Region, particularly Stephanie Segave, for giving us the opportunity to evaluate the Centrally Procured School Food Program.

This study was funded by the 2016 Seeding Food Innovation Grant: George

Weston Limited and Loblaw Companies Limited. Additionally, graduate student funding was provided by the Children's Health Research Institute (2016/17), Government of Ontario (2018/19) and Western University (2016–20). The funders did not have any role in the study design, data collection and analysis, writing or publication.

Conflicts of interest

None.

Authors' contributions and statement

PC contributed to methodology and was responsible for investigation (focus groups), data curation, formal analysis and writing (original draft; revising and editing). JAS contributed to methodology, funding acquisition, supervision, and writing (review and editing). SW contributed to methodology, funding acquisition and writing (review and editing). LM contributed to writing (review and editing). JG was responsible for study conceptualization, methodology, funding acquisition, supervision, project administration, and writing (review and editing).

The content and views expressed in this article are those of the authors and do not necessarily reflect those of the Government of Canada.

References

1. Health Canada. Do Canadian children meet their nutrition requirements through food intake alone? [Internet]. Ottawa (ON): Health Canada; 2012 [cited 2020 Sep 11]. Available from: <https://www.canada.ca/en/health-canada/services/food-nutrition/food-nutrition-surveillance/health-nutrition-surveys/canadian-community-health-survey-cchs/canadian-children-meet-their-nutrient-requirements-through-food-intake-alone-health-canada-2012.html>
2. Minaker L, Hammond D. Low frequency of fruit and vegetable consumption among Canadian youth: findings from the 2012/2013 youth smoking survey. *J Sch Health*. 2016; 86(2):135-42. <https://doi.org/10.1111/josh.12359>

3. Kearney J. Food consumption trends and drivers. *Philos Trans R Soc Lond B Biol Sci.* 2010;365(1554):2793-807. <https://doi.org/10.1098/rstb.2010.0149>
4. Peirson L, Fitzpatrick-Lewis D, Morrison K, et al. Prevention of overweight and obesity in children and youth: a systematic review and meta-analysis. *CMAJ Open.* 2015;3(1):E23-33. <https://doi.org/10.9778/cmajo.20140053>
5. Daniels SR, Arnett DK, Eckel RH, et al. Overweight in children and adolescents: pathophysiology, consequences, prevention, and treatment. *Circulation.* 2005;111(15):1999-2012. <https://doi.org/10.1161/01.CIR.0000161369.71722.10>
6. Winpenny EM, Penney TL, Corder K, White M, van Sluijs EM. Change in diet in the period from adolescent to early adulthood: a systematic scoping review of longitudinal studies. *Int J Behav Nutr Phys Act.* 2017;14:60. <https://doi.org/10.1186/s12966-017-0518-7>
7. Fung C, Kuhle S, Lu C, et al. From “best practice” to “next practice”: the effectiveness of school-based health promotion in improving healthy eating and physical activity and preventing childhood obesity. *Int J Behav Nutr Phys Act.* 2012;9(1):27. <https://doi.org/10.1186/1479-5868-9-27>
8. He M, Beynon C, Sangster Bouck M, et al. Impact evaluation of the Northern Fruit and Vegetable Pilot Programme - a cluster-randomised controlled trial. *Public Health Nutr.* 2009;12(11):2199-208. <https://doi.org/10.1017/S1368980009005801>
9. Colley P, Meyer B, Seabrook J, Gilliland J. The impact of Canadian school nutrition programs on children’s nutritional knowledge, dietary behaviors, and food intake: a systematic review. *Can J Diet Pract Res.* 2019;80(2):79-86. <https://doi.org/10.3148/cjdpr-2018-037>
10. He M, Beynon CE, Gritke JL, et al. Children’s perceptions of the Northern Fruit and Vegetable Program in Ontario, Canada. *J Nutr Educ Behav.* 2012;44(6):592-6. <https://doi.org/10.1016/j.jneb.2010.09.014>
11. Ministry of Children and Youth Services. Ontario’s Student Nutrition Program guidelines [Internet]. Toronto (ON): Government of Ontario; 2018 [cited 2020 Sep 11]. Available from: https://studentnutritionontario.ca/wp-content/uploads/2018/03/2018_SNP_Program_Guidelines_ENG.pdf
12. Matthews H. The geography of children: some ethical and methodological considerations for project and dissertation work. *J Geogr Higher Educ.* 2010;22(3):311-24. <https://doi.org/10.1080/03098269885723>
13. Morgan M, Gibbs S, Maxwell K, Britten N. Hearing children’s voices: methodological issues in conducting focus groups with children aged 7–11 years. *Qual Res.* 2002;2(1):5-20. <https://doi.org/10.1177/1468794102002001636>
14. Tucker P, Irwin J, Gilliland J, He M. Adolescents’ perspectives of home, school and neighborhood environmental influences on physical activity and dietary behaviours. *Child Youth Environ.* 2008;18(2):12-35.
15. Wilson K, Coen S, Piaskoski A, Gilliland JA. Children’s perspectives on neighborhood barriers and enablers to active school travel: a participatory mapping study. *Can Geogr.* 2019;63(1):112-28. <https://doi.org/10.1111/cag.12488>
16. Braun V, Victoria C. Using thematic analysis in psychology using thematic analysis in psychology. *Qual Res Psychol.* 2008;3(2):77-101. <https://doi.org/10.1191/1478088706qp063oa>
17. Barr SI, DiFrancesco L, Fulgoni VL 3rd. Breakfast consumption is positively associated with nutrient adequacy in Canadian children and adolescents. *Br J Nutr.* 2014;112(8):1373-83. <https://doi.org/10.1017/S0007114514002190>
18. Everitt T, Engler-Stringer R, Martin W. Determining promising practices for Canadian School Food Programs: a scoping review. *J Hunger Environ Nutr.* 2020. <https://doi.org/10.1080/19320248.2020.1823925>
19. Veugelers PJ, Fitzgerald AL. Effectiveness of school programs in preventing childhood obesity: a multilevel comparison. *Am J Public Health.* 2005;95(3):432-5. <https://doi.org/10.2105/AJPH.2004.045898>
20. Skinner K, Hanning RM, Metatawabin J, Martin ID, Tsuji LJ. Impact of a school snack program on the dietary intake of grade six to ten First Nation students living in a remote community in northern Ontario, Canada. *Rural Remote Health.* 2012;12:2122.
21. Hanbazaza MA, Triador L, Ball GD, et al. The impact of school gardening on Cree children’s knowledge and attitudes toward vegetables and fruit. *Can J Diet Pract Res.* 2015;76(3):133-9. <https://doi.org/10.3148/cjdpr-2015-007>
22. Woodruff SJ. Fruit and vegetable intake and preferences associated with the northern fruit and vegetable program (2014-2016). *Can J Diet Pract Res.* 2019;80(2):72-8. <https://doi.org/10.3148/cjdpr-2018-042>
23. Bisset SL, Potvin L, Daniel M, Paquette M. Assessing the impact of the primary school-based nutrition intervention Petits cuisiniers—parents en réseaux. *Can J Public Health.* 2008;99(2):107-13. <https://doi.org/10.1007/BF03405455>
24. Taylor J, Binns D, Smith H, Gallant J, Crozier P. Evaluation of a fruit & vegetable pilot program for elementary school children in Prince Edward Island. Final report. Charlottetown (PE): Prince Edward Island: Healthy Eating Alliance; 2003.
25. Day ME, Strange KS, McKay HA, et al. Action schools! BC—healthy eating: effects of a whole-school model to modifying eating behaviours of elementary school children. *Can J Public Health.* 2008;99(4):328-31. <https://doi.org/10.1007/BF03403766>
26. Gates M, Hanning RM, Gates A, McCarthy DD, Tsuji LJ. Assessing the impact of pilot school snack programs on milk and alternatives intake in 2 remote First Nation communities in Northern Ontario, Canada. *J Sch Health.* 2013;83(2):69-76. <https://doi.org/10.1111/josh.12000>
27. Ismail MR, Seabrook JA, Gilliland JA. Process evaluation of fruit and vegetables distribution interventions in school-based settings: a systematic review. *Prev Med Rep.* 2021;101281. <https://doi.org/10.1016/j.pmedr.2020.101281>

-
28. Godin KM, Kirkpatrick SI, Hanning RM, Stapleton J, Leatherdale ST. Examining guidelines for school-based breakfast programs in Canada: a systematic review of the grey literature. *Can J Diet Pract Res.* 2017;78(2): 92-100. <https://doi.org/10.3148/cjdpr-2016-037>
 29. McKenna M. Policy options to support healthy eating in schools. *Can J Public Health.* 2010;101(Suppl 2):S14-7. <https://doi.org/10.1007/BF03405619>
 30. DeCosta P, Moller P, Frost MB, Olsen A. Changing children's eating behaviour - a review of experimental research. *Appetite.* 2017;113:327-57. <https://doi.org/10.1016/j.appet.2017.03.004>
 31. Woodruff SJ, Beckford C, Segave S. Fruit and vegetable lesson plan pilot intervention for grade 5 students from Southwestern Ontario. *Int J Environ Res Public Health.* 2020; 17(22):8422. <https://doi.org/10.3390/ijerph17228422>
 32. Dudley DA, Cotton WG, Peralta LR. Teaching approaches and strategies that promote healthy eating in primary school children: a systematic review and meta-analysis. *Int J Behav Nutr Phys Act.* 2015;12(1):28. <https://doi.org/10.1186/s12966-015-0182-8>

Release notice

Cancer in Young People in Canada Data Tool: latest incidence rates and case counts

Lin Xie, MSc; Prinon Rahman, MSc; Meghan Laverty, MSc; Manal Salibi, MPH; Mylène Frechette, MSc; Jaskiran Kaur, MSc; Sulaf Elkhalfifa, MSc; Owen Wesley Smith-Lépine, DCS; Tony Bebawy, DCS; Scott Van Millingen, BSc; Jay Onysko, MA

 [Tweet this article](#)

The Public Health Agency of Canada (PHAC) is pleased to announce the release of the latest incidence rates and case counts in the Cancer in Young People in Canada (CYP-C) Data Tool. The interactive CYP-C Data Tool, located on the Public Health Infobase website, includes data for children up to 14 years of age diagnosed with cancer.

The CYP-C Data Tool includes an “Incident Cases” tab, which provides the latest numbers of cases, age-standardized incidence rates and crude incidence rates for different cancer types in children, data up to 2019 from the CYP-C database and up to 2017 from the Canadian Cancer Registry. These statistics can be stratified by cancer type, period of diagnosis, sex, age, geography and data source.

The data tool also includes a “Survival & Relapse Risk” tab, which presents overall survival, event-free survival and relapse risk statistics for different cancer types in children, data up to 2016. Users can stratify these statistics by cancer type, period of diagnosis, sex, age and disease severity.

The CYP-C program’s surveillance and research database is available to researchers seeking to improve cancer diagnosis, treatment and outcomes. The “Publications and Data Access” tab of the data tool contains information on how to apply for access.

CYP-C is a collaboration of the PHAC, all 17 pediatric oncology centres in Canada, the C¹⁷ Council and the Canadian Partnership Against Cancer.

Author reference:

Public Health Agency of Canada, Ottawa, Ontario, Canada

Call for papers – 2021 special issue

Tobacco and vaping prevention and control in Canada

 [Tweet this article](#)

Submission deadline extended!

Editors: Jennifer O’Loughlin (University of Montreal), Thierry Gagné (University College London) and Robert Geneau (Editor-in-Chief, *Health Promotion and Chronic Disease Prevention in Canada* Journal, Public Health Agency of Canada)

It is estimated that more than 45 000 Canadians die from a tobacco-related disease each year,¹ making tobacco use the leading preventable cause of premature death in Canada.² In recent years, the growing use of vaping products, especially among youth, has also raised significant public health concerns. There is emerging evidence that vaping products are not without risks for individual users, with more research needed to determine the long-term risks. The electronic cigarette market, if left to expand without an appropriate mix of regulations in place, could also threaten the “Tobacco Endgame.”^{3,4} Tobacco and vaping control policies are now largely intertwined.

Canada continues to implement comprehensive tobacco control policies and programs as part of its commitment to reach a national target of less than 5% tobacco use by 2035.⁵ Regulations on vaping products have also been introduced in recent years at the federal level and across several provinces and territories, with one of the clear aims being to curb the use of vaping products among youth.

The objective of this special issue is to disseminate current and emerging scientific evidence on tobacco and vaping-related epidemiology, prevention and control, with a focus on youth. To this effect, *Health Promotion and Chronic Disease Prevention in Canada: Research, Policy and Practice* seeks relevant topical research articles that present new findings or synthesize existing evidence on:

- Policies, interventions and regulations related to tobacco and/or vaping initiation, use and consumption, and cessation, including tobacco and vaping-related policy gaps and implementation challenges;
- Health inequalities in tobacco/vaping use and related harms; and
- Associations between the use of vaping products, smoking cessation and harm reduction behaviours in both smokers and non-smokers.

International submissions will be considered if they include Canadian data, results (e.g. as part of global comparisons) and/or evidence-based discussion of implications for public health in Canada.

Consult the journal’s website for information on invited article types and detailed submission guidelines for authors. Kindly refer to this call for papers in your cover letter. All manuscript submissions, pre-submission inquiries and questions about suitability or scope should be directed to PHAC.HPCDP.Journal-Revue.PSPMC.ASPC@canada.ca.

Submission Deadline: April 30th, 2021.

References

1. Health Canada. Canada’s tobacco strategy [Internet]. Ottawa (ON): Health Canada; [modified 2020 Jan 10; cited 2020 Nov 20]. Available from: <https://www.canada.ca/en/health-canada/services/publications/healthy-living/canada-tobacco-strategy.html>
2. Health Canada. Consultation on the future of tobacco control in Canada: what we heard. Ottawa (ON): Health Canada; 2017. Available from: <https://www.canada.ca/en/health-canada/services/publications/healthy-living/consultation-future-tobacco-control-what-we-heard.html>
3. McDaniel PA, Smith EA, Malone RE. The tobacco endgame: a qualitative review and synthesis. *Tob Control*. 2016;25:594-604. <https://doi.org/10.1136/tobaccocontrol-2015-052356>
4. The Tobacco Endgame Cabinet. Getting to less than 5% by 2035: the 2019 Tobacco Endgame report. Ottawa (ON): The Canadian Lung Association; 2019. Available from: <https://www.lung.ca/sites/default/files/EndGameReport-final.pdf>
5. Health Canada. Overview of Canada’s tobacco strategy. Ottawa (ON): Health Canada; 2018. Available from: <https://www.canada.ca/en/health-canada/services/publications/healthy-living/canada-tobacco-strategy/overview-canada-tobacco-strategy.html>

Other PHAC publications

Researchers from the Public Health Agency of Canada also contribute to work published in other journals. Look for the following articles published in 2020 and 2021:

Colley RC, Clarke J, Doyon CY, [...] **Lang JJ**, et al. Do fit parents have fit kids? *Health Rep.* 2021;32(1):3-12. <https://www.doi.org/10.25318/82-003-x202100100001-eng>

Gates A, Pillay J, Reynolds D, **Stirling R**, **Traversy G**, et al. Screening for the prevention and early detection of cervical cancer: protocol for systematic reviews to inform Canadian recommendations. *Syst Rev.* 2021;10(1):2. <https://doi.org/10.1186/s13643-020-01538-9>

Pillay J, Riva JJ, **Tessier LA**, [...] **Mitchelmore BR**, **Rolland-Harris E**, et al. Fall prevention interventions for older community-dwelling adults: systematic reviews on benefits, harms, and patient values and preferences. *Syst Rev.* 2021;10(1):18. <https://doi.org/10.1186/s13643-020-01572-7>

Pottie K, Magwood O, **Rahman P**, [...] **Jaramillo Garcia A**, [...] **Doull M**, et al. Validating the “feasibility, acceptability, cost, and equity” instrument using stakeholder perceptions of feasibility, acceptability, cost, and equity in guideline implementation. *J Clin Epidemiol.* 2020;131:133-40. <https://doi.org/10.1016/j.jclinepi.2020.11.018>

Tomkinson GR, Kaster T, Dooley FL, [...] **Lang JJ**, et al. Temporal trends in the standing broad jump performance of 10,940,801 children and adolescents between 1960 and 2017. *Sports Med.* 2021;51(3):531-48. <https://doi.org/10.1007/s40279-020-01394-6>

