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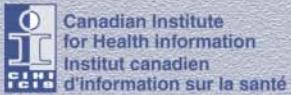
How healthy are Canadians?

2003 ANNUAL REPORT



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Statistics Canada
Health Statistics Division

Health Reports

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- not available for any reference period
- .. not available for specific reference period
- ... not applicable
- P preliminary figures
- R revised figures
- X suppressed to meet the confidentiality requirements of the *Statistics Act*
- E use with caution
- F too unreliable to be published

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Growing up Healthy?

Editor-in-Chief
Christine Wright

Contributors
Gisèle Carrière
Susan Dahinten
Dafna Kohen
Kathleen Moss
Jungwee Park
Claudio E. Pérez
Stéphane Tremblay

Editors
Mary Sue Devereaux
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Production and Composition
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Administration
Donna Eastman

Since 1999, Statistics Canada and the Canadian Institute for Health Information (CIHI) have reported collaboratively on health issues in Canada—Statistics Canada on the health of the population, and CIHI on the performance of the health care system. The Statistics Canada series of reports, *How Healthy Are Canadians?*, addresses a different theme each year. The first report focused on health status and the use of health care services over the life cycle. The second edition looked at health differences between men and women, and the third, health in communities.

The title of this fourth edition is *Growing up Healthy?*, which suggests the rationale for a focus on children. In an affluent Western country, our children should be “growing up healthy.” Indeed, international comparisons indicate that by the measures traditionally used to assess population health, Canadian children are thriving. Childhood infectious diseases are well controlled, and Canadian students perform strongly in international tests of math, science and reading. Yet when asked about how they perceive their health, a surprisingly large proportion of young people convey a less positive view. This report is intended to examine the conditions that impede, as well as those that enhance, children’s potential to “grow up healthy.”

The analyses are based on data from three Statistics Canada surveys: the National Population Health Survey, the Canadian Community Health Survey, and the National Longitudinal Survey of Children and Youth. Recent cross-sectional data from these

surveys offer a timely picture of Canadian children and youth. And data collected from youngsters who are being followed over time provide the opportunity to explore longer-term relationships—between characteristics in the mid-1990s and subsequent physical and mental health outcomes.

The first article sets the tone of *Growing up Healthy?* The analysis in “Factors related to adolescents’ self-perceived health” identifies issues other than illness that are linked to less favourable ratings of health. For example, the roles of obesity, smoking, physical inactivity and heavy drinking are examined. The articles that follow delve deeper, to consider factors that relate to more specific aspects of children’s and adolescents’ health in the short- and longer-term.

Healthy children are naturally lively and active. But increasingly, children spend their leisure time sitting—engrossed in video games, computer-based pursuits and television viewing. “Children who become active” focuses on conditions linked to children’s becoming physically active. A variety of influences are considered, including time spent watching TV, as well as hours of physical education classes offered at school.

Reflecting the shift in children’s activities toward sedentary pastimes, excess weight among children and teens is now so prevalent that it is popularly regarded as an “epidemic.” “Parent and child factors associated with youth obesity” investigates behaviours, circumstances and parental

characteristics that relate to obesity in adolescents. Differences between boys and girls, which may reflect gender-specific social pressures and responses to such pressures, are also explored.

The gender gap emerges as an important issue in “Adolescent self-concept and health into adulthood,” which studies links between self-worth and sense of control in adolescence, and mental and physical health over the next several years. Health outcomes in young adulthood are analyzed in relation to positive and negative self-concept in adolescence, and differences between the sexes are highlighted.

The final article, “Witnessing violence—aggression and anxiety in young children,” calls attention yet again to the importance of the context in which children grow up. This article focuses on children who were aged 4 to 7 in 1994, and examines levels of aggression and anxiety in relation to their exposure to violence at home. The evidence that emerges of the short- and longer-term effects on their behaviour and emotions is compelling.

These analyses of nationally representative data touch on important issues related to the health of our children. A complex blend of personal and societal factors influence their emotional and physical well-being. As these articles indicate, family nurturing, school environment and socio-economic opportunity each have a role in the formative experiences that determine whether our children are “growing up healthy.” ■

About Statistics Canada

Statistics Canada is authorized under the Statistics Act to collect, analyze and publish statistics relating to the social, economic and general activities and condition of Canadians. The Health Statistics Division’s primary objective is to provide statistical information and analyses about the health of the population, determinants of health, and the scope and utilization of Canada’s health care sector.

About the Canadian Institute for Health Information

CIHI is a national, not-for-profit organization with a mandate to coordinate the development and maintenance of an integrated approach to health care information. The Institute provides information that is needed to establish health care policies and to manage the health care system effectively.

Supplement to Volume 14

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About Health Reports

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Factors related to adolescents' self-perceived health

- Almost 30% of adolescents failed to rate their health as very good or excellent.
- At ages 15 to 17, girls are less likely than boys to report very good or excellent health.
- Obesity, daily smoking, inactivity and episodic heavy drinking are each associated with less favourable self-perceived health among adolescents.

Abstract

Objectives

This analysis examines self-perceived health among Canadian adolescents aged 12 to 17, and factors associated with ratings of very good/excellent health.

Data source

The data are from cycle 1.1 of the 2000/01 Canadian Community Health Survey (CCHS), conducted by Statistics Canada. The sample consisted of 12,715 adolescents aged 12 to 17.

Analytical techniques

Cross-tabulations were used to estimate the prevalence of various characteristics and health behaviours for the 12-to-14 and 15-to-17 age groups. Multiple logistic regression was used to model associations between very good/excellent self-reported health and selected characteristics.

Main results

In 2000/01, nearly 30% of 12- to 17-year-olds rated their health as poor, fair or good. At ages 15 to 17, girls were less likely than boys to report very good/excellent health and were more likely to have a chronic condition and to have experienced depression in the past year. When other factors were taken into account, the odds of reporting very good/excellent health were significantly lower for teens who were daily smokers, episodic heavy drinkers, physically inactive during leisure time, infrequent consumers of fruit and vegetables, or obese, compared with teens who did not have these characteristics.

Key words

adolescent behaviour, obesity, nutrition, smoking, alcohol consumption, exercise, lifestyle, health status indicators

Authors

Stéphane Tremblay (613-951-4765; Stephane.Tremblay@statcan.ca) and Dafna Kohen are with the Health Analysis and Measurement Group at Statistics Canada, Ottawa, Ontario, K1A 0T6. Susan Dahinten is with the School of Nursing at the University of British Columbia.

Stéphane Tremblay, Susan Dahinten and Dafna Kohen

Compared with older age groups, mortality and morbidity rates are relatively low among Canadian adolescents, yet a surprisingly large percentage of young people describe their health as no better than "good".¹⁻³ In 2000/01, close to 30% of 12- to 17-year-olds rated their health as poor, fair or good. Thus, at an age when very good or excellent health might be expected, this was not the case for one out of three adolescents.

Self-perceived health has been shown to be a reliable and valid indicator of physical and mental functioning,⁴⁻⁶ and even to be predictive of mortality.⁷ Considerable research has examined factors associated with self-perceived health, but most studies have focused on adults or the elderly; far less is known about self-perceived health during adolescence.

Based on data from the 2000/01 Canadian Community Health Survey (CCHS), this article describes levels of self-perceived health among younger (12 to 14) and older

Definitions

The Canadian Community Health Survey (CCHS) asked respondents, "In general would you say your health is excellent, very good, good, fair or poor?" For this analysis, adolescents were divided into two groups: those who reported very good or excellent health, and those who did not.

Two age groups were defined: 12 to 14, and 15 to 17.

Physical health was measured by the presence of diagnosed *chronic conditions*, excluding allergies. Respondents were asked if they had long-term conditions that had lasted or were expected to last six months or more and that had been diagnosed by a health professional. A checklist of conditions was read to respondents, and the following were considered in this analysis: asthma, fibromyalgia, arthritis/rheumatism, back problems excluding fibromyalgia and arthritis/rheumatism, high blood pressure, migraine, chronic bronchitis or emphysema, diabetes, epilepsy, heart disease, cancer, stomach or intestinal ulcers, stroke, urinary incontinence, bowel disorders, thyroid condition, chronic fatigue syndrome, chemical sensitivities, and any other long-term condition.

The CCHS measures a *major depressive episode (MDE)* with a subset of questions from the *Composite International Diagnostic Interview*.⁸ These questions cover a cluster of symptoms for depressive disorder, which are listed in the *Diagnostic and Statistical Manual of Mental Disorders (DSM-III-R)*.⁹ Responses to these questions were scored and transformed into a probability estimate of a diagnosis of major depressive episode. If the estimate was 0.9 or more (that is, 90% certainty of a positive diagnosis), the respondent was classified as having had a depressive episode in the past year.

Household income groups were based on the number of people in the household and total household income from all sources in the 12 months before the 2000/01 interview:

Household income group	People in household	Total household income
Lowest	1 or 2	Less than \$15,000
	3 or 4	Less than \$20,000
	5 or more	Less than \$30,000
Lower-middle	1 or 2	\$15,000 to \$29,999
	3 or 4	\$20,000 to \$39,999
	5 or more	\$30,000 to \$59,999
Upper-middle	1 or 2	\$30,000 to \$59,999
	3 or 4	\$40,000 to \$79,999
	5 or more	\$60,000 to \$79,999
Highest	1 or 2	\$60,000 or more
	3 or more	\$80,000 or more

Household education was based on the highest level of attainment of any household member. Households in which at least one member had a postsecondary diploma or degree were classified as having *postsecondary graduation*.

Respondents were classified as *daily smokers* if they indicated that they smoked cigarettes daily.

Episodic heavy drinking was determined by asking respondents the number of times they had consumed five or more alcoholic drinks on one occasion in the past 12 months. Those who reported doing

so at least once a month over the previous year were classified as *episodic heavy drinkers*.

Leisure time activity level was determined from information about the frequency and duration of respondents' participation in a variety of physical activities during leisure time. For each reported activity, energy expenditure (EE) was calculated by multiplying the number of times a respondent engaged in the activity over a 12-month period (a 3-month recall period multiplied by 4) by the average duration in minutes and the energy cost of the activity (kilocalories expended per kilogram of weight per hour of activity). To calculate daily energy expenditure for the activity, the yearly estimate was divided by 365. This calculation was repeated for all leisure-time activities reported, and the resulting estimates were summed to yield average daily EE. Adolescents whose leisure-time EE was below 1.5 kcal/kg/day were defined as inactive.

The frequency of *fruit and vegetable consumption* was assessed by asking: "Think about all the foods you eat, both meals and snacks, at home and away from home.

- How often do you usually drink fruit juices such as orange, grapefruit or tomato? (for example, once a day, three times a week, twice a month)
- Not counting juice, how often do you usually eat fruit?
- How often do you usually eat green salad?
- How often do you usually eat potatoes, not including french fries, fried potatoes or potato chips?
- How often do you usually eat carrots?
- Not counting carrots, potatoes or salad, how many servings of other vegetables do you usually eat?"

Two categories were established: less than twice daily and at least twice a day.

Body mass index, or BMI, is calculated by dividing weight in kilograms by height in metres squared. Adolescents were classified as *obese* according to the age- and sex-specific BMI cut-offs defined by Cole et al.¹⁰

Obese is BMI greater than or equal to:		
	Boys	Girls
Age (years)		
12.0	26.02	26.67
12.5	26.43	27.24
13.0	26.84	27.76
13.5	27.25	28.20
14.0	27.63	28.57
14.5	27.98	28.87
15.0	28.30	29.11
15.5	28.60	29.29
16.0	28.88	29.43
16.5	29.14	29.56
17.0	29.41	29.69
17.5	29.70	29.84
18+	30.00	30.00

Mid-year age points were assigned to all reported years of age (for example, 13.5 for 13-year-olds). Based on these cut-offs, a 13-year-old girl who was 152.2 cm (5 feet) tall would be considered *obese* if she weighed at least 65.9 kg (145 pounds).

15 to 17) adolescents, and considers variables associated with those assessments—physical and mental health, socio-economic status and lifestyle (see *Definitions and Methods*).

Boys' self-evaluations higher

Boys' self-evaluations of health tend to be more positive than those of girls. This is consistent with the difference between the sexes typically found at older ages.^{1,2,11-14} In 2000/01, 74% of boys aged 12 to 17 reported their health as being very good or excellent, compared with 69% of girls. The overall difference, however, stemmed from a gender gap among older teens. At ages 12 to 14, 73% of both boys and girls reported very good/excellent health. By ages 15 to 17, the percentage of boys reporting this level of health was similar, but the figure for girls was only 66% (Chart 1, Appendix Table A).

This difference in self-perceived health has been attributed to girls' concerns related to reproduction, to their higher levels of emotional distress, to their greater preoccupation with other health matters, and to their attention to appearance, weight and social relationships,¹⁵⁻¹⁶ all of which intensify as they move from early- to middle adolescence.

While gender is clearly associated with self-perceived health among older adolescents, many other factors may be involved. Some are well known

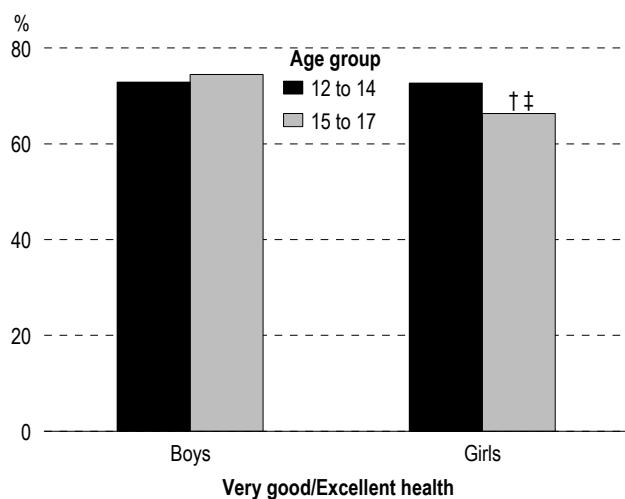
and can be altered only with difficulty or not at all, such as socio-economic status or the presence of a chronic condition. Other factors that could influence teenagers' assessments of their health are subject to modification, such as smoking, alcohol consumption, physical activity, nutrition and weight. However, these variables can be interrelated, a fact that should be taken into account in any attempt to determine which ones make a difference for self-perceived health. As well, the rapid physical and social transitions of adolescence mean that the factors affecting the perceptions of 12- to 14-year-olds may differ from those that are important for 15- to 17-year-olds.

Physical and mental health

To some degree, adolescent boys' and girls' self-perceived health reflects their actual physical and mental state.

In 2000/01, a substantial percentage of teenagers—29%—reported having at least one chronic condition (most commonly, asthma, bronchitis, back pain or migraine). The percentage of boys with a chronic condition did not differ significantly by age: 25% at ages 12 to 14; 27% at ages 15 to 17 (Chart 2, Appendix Table A). By contrast, among girls, the prevalence of chronic conditions was significantly higher at older ages: 36% aged 15 to 17 reported such a condition, compared with 27% aged 12 to 14.

Chart 1
Percentage of adolescents reporting very good/excellent health, by sex and age group, household population, Canada excluding territories, 2000/01



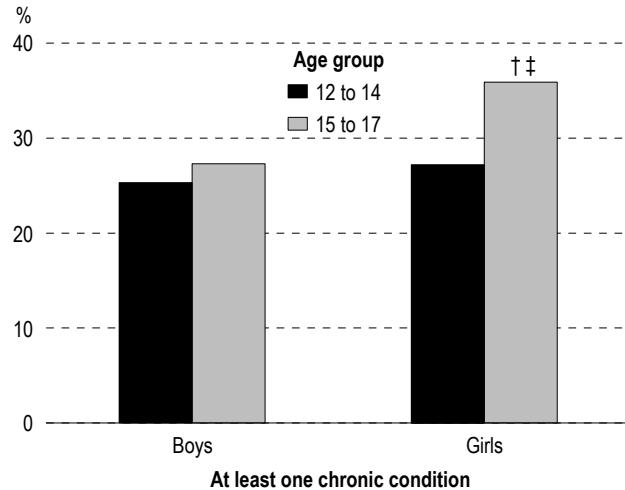
Data source: 2000/01 Canadian Community Health Survey, cycle 1.1

Note: Adjusted for multiple comparisons

† Significantly different from ages 12 to 14 of same sex ($p < 0.05$)

‡ Significantly different from boys in same age group ($p < 0.05$)

Chart 2
Percentage of adolescents reporting at least one chronic condition, by sex and age group, household population, Canada excluding territories, 2000/01



Data source: 2000/01 Canadian Community Health Survey, cycle 1.1

Note: Adjusted for multiple comparisons

† Significantly different from ages 12 to 14 of same sex ($p < 0.05$)

‡ Significantly different from boys in same age group ($p < 0.05$)

■ Adolescents' self-perceived health

As might be anticipated, even when the sex of the adolescent and other potentially influential factors were

Table 1

Adjusted odds ratios for reporting very good/excellent health, by age group and selected characteristics, household population aged 12 to 17, Canada excluding territories, 2000/01

	12 to 14		15 to 17	
	Adjusted odds ratio	95% confidence interval	Adjusted odds ratio	95% confidence interval
Sex				
Boys	0.92	0.79, 1.07	1.34*	1.13, 1.59
Girls [†]	1.00	...	1.00	...
Chronic conditions				
At least one	0.54*	0.45, 0.64	0.61*	0.52, 0.72
None [†]	1.00	...	1.00	...
Major depressive episode in past year				
Yes	0.34*	0.23, 0.51	0.67*	0.51, 0.88
No [†]	1.00	...	1.00	...
Household income				
Lowest	0.57*	0.43, 0.77	0.57*	0.42, 0.78
Lower-middle	0.74*	0.58, 0.94	0.68*	0.52, 0.87
Upper-middle	0.79*	0.62, 0.99	0.75*	0.60, 0.93
Highest [†]	1.00	...	1.00	...
Highest education in household				
Postsecondary graduation	1.13	0.93, 1.36	1.28*	1.07, 1.53
Less than postsecondary graduation [†]	1.00	...	1.00	...
Daily smoker				
Yes	...	...	0.50*	0.40, 0.63
No [†]	1.00	...
Episodic heavy drinking				
Yes	...	...	0.75*	0.61, 0.94
No [†]	1.00	...
Leisure time				
Inactive	0.75*	0.62, 0.91	0.65*	0.54, 0.79
Active [†]	1.00	...	1.00	...
Fruit/Vegetable consumption				
Less than twice daily	0.54*	0.41, 0.70	0.62*	0.47, 0.80
At least twice daily [†]	1.00	...	1.00	...
Obese				
Yes	0.39*	0.27, 0.56	0.43*	0.30, 0.63
No [†]	1.00	...	1.00	...
Province				
Newfoundland	0.93	0.60, 1.43	1.31	0.90, 1.93
Prince Edward Island	0.73	0.47, 1.13	1.13	0.65, 1.98
Nova Scotia	1.10	0.76, 1.59	1.47*	1.01, 2.14
New Brunswick	0.97	0.66, 1.42	1.11	0.77, 1.61
Québec	0.91	0.71, 1.17	1.34*	1.06, 1.69
Ontario [†]	1.00	...	1.00	...
Manitoba	0.85	0.58, 1.25	0.97	0.70, 1.34
Saskatchewan	0.69*	0.52, 0.91	0.95	0.72, 1.26
Alberta	0.87	0.67, 1.14	0.84	0.65, 1.10
British Columbia	0.80	0.64, 1.01	0.84	0.67, 1.07

Data source: 2000/01 Canadian Community Health Survey, cycle 1.1

[†] Reference category

* Significantly different from reference category ($p < 0.05$)

... Not applicable

taken into account, having a chronic condition significantly lowered the odds that both younger and older teens would report very good/excellent health (Table 1).

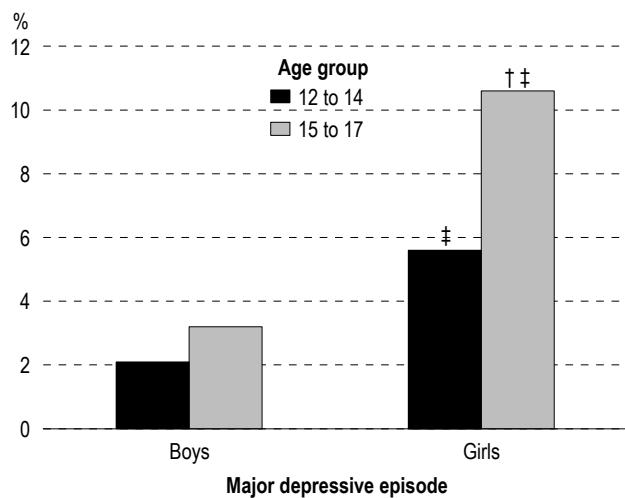
Responses to a general question about health are, of course, based on more than actual physical condition. For example, earlier research has shown that, compared with severely depressed adolescents, those with lower levels of depression tend to report better health.^{2,13,14,17} As well, adolescents are more vulnerable to depression than are older people,¹⁷⁻²⁰ yet they are the least likely of any age group to get professional help.²¹

In 2000/01, close to 6% of girls aged 12 to 14 had suffered a major depressive episode (MDE) in the previous year, well above the 2% of boys in this age group who had been depressed (Chart 3, Appendix Table A). At ages 15 to 17, the proportion of girls who had had an MDE was a considerably higher 11%. By contrast, boys aged 15 to 17 were no more likely than those aged 12 to 14 to have been depressed.

For both younger and older age groups, depression was significantly associated with reduced odds that teenagers would report very good/excellent health, even accounting for other factors such as chronic conditions, socio-economic status, obesity, and health behaviours.

Chart 3

Percentage of adolescents experiencing major depressive episode in past year, by sex and age group, household population, Canada excluding territories, 2000/01



Data source: 2000/01 Canadian Community Health Survey, cycle 1.1

Note: Adjusted for multiple comparisons

† Significantly different from ages 12 to 14 of same sex ($p < 0.05$)

‡ Significantly different from boys in same age group ($p < 0.05$)

Socio-economic status

Considerable research has demonstrated links between socio-economic status and health.²²⁻³¹ Although most studies have focussed on adults, higher family income has been found to be positively associated with better self-evaluations of health among adolescents,¹⁴ and physical problems have been tied to adolescents' worry about family finances.¹¹

In 2000/01, 78% of adolescents in the highest income households reported very good/excellent health, compared with 64% in the lowest (data not shown). This difference prevailed among both younger and older adolescents (Table 2). The fact that at least one household member held postsecondary credentials also seemed to make a difference. A significantly higher percentage of adolescents in households where this was the case rated their health as very good/excellent, compared with those in households where no one had completed postsecondary schooling.

Even when factors such as sex, age, chronic conditions and health behaviours were taken into account, living in a less affluent household was associated with lower odds that younger and older adolescents would report very good/excellent health. A higher level of household education raised the odds of reporting very good/excellent health among older teens (Table 1).

Table 2

Percentage of adolescents reporting very good/excellent health, by age group, household income and highest level of education in household, household population, Canada excluding territories, 2000/01

	Age group	
	12 to 14	15 to 17
Total [†]	72.8	70.4
Household income		
Lowest	66.6*	62.0*
Lower-middle	71.9*	67.9*
Upper-middle	72.9	71.1*
Highest [‡]	78.2	77.8
Highest education in household		
Postsecondary graduation	74.2*	73.4*
Less than postsecondary graduation [‡]	69.8	64.4

Data source: 2000/01 Canadian Community Health Survey, cycle 1.1

[†] Includes missing

[‡] Reference category

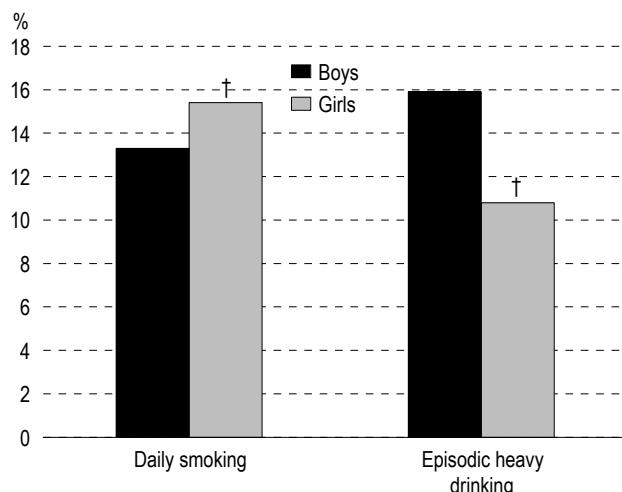
* Significantly different from reference category ($p < 0.05$)

Smoking and drinking

Consistent evidence links smoking with lower self-ratings of health in adolescence, but the findings for alcohol use have been mixed.^{12,14,32,33} Nonetheless,

Chart 4

Percentage of adolescents aged 15 to 17 reporting daily smoking and episodic heavy drinking, by sex, household population, Canada excluding territories, 2000/01



Data source: 2000/01 Canadian Community Health Survey, cycle 1.1

[†] Significantly different from boys ($p < 0.05$)

even when demographic, socio-economic and other lifestyle factors were taken into account, 15- to 17-year-olds who were daily smokers or episodic heavy drinkers (five or more drinks on one occasion at least once a month) had lower odds of reporting very good/excellent health, compared with those who did not engage in these practices (Table 1). (The small sample of 12- to 14-year-olds who were daily smokers or episodic heavy drinkers precluded analysis for this group.)

The results of other studies suggest that, at some level, adolescents may be aware of the health impact of smoking,^{1,34} and recognize the potentially harmful effects of excessive alcohol consumption. Nonetheless, 14% of 15- to 17-year-olds were daily smokers; the percentage of girls who smoked (15%) was slightly yet significantly higher than the percentage of boys (13%) (Chart 4, Appendix Table A). Overall, almost as many adolescents of these ages—13%—reported episodic heavy drinking, though in this case, the practice was significantly more common among boys (16%) than girls (11%).

These relatively high rates of smoking and heavy drinking seem to confirm the widespread perception that, despite some recognition of the health risks, adolescents have a reduced sense of personal vulnerability to the consequences of risky behaviour,^{16,35} or are willing to disregard them.

Physical activity, nutrition and obesity

Beyond smoking and drinking, other aspects of lifestyle—notably, physical activity, nutrition and

Methods

Data sources

The data in this analysis are from cycle 1.1 of Statistics Canada's biennial Canadian Community Health Survey (CCHS). Data collection for cycle 1.1 began in September 2000 and continued over 14 months. The sample used for this analysis covers the household population aged 12 to 17 in all provinces, except persons living on Indian reserves, on Canadian Forces bases, and in some remote regions.

The area frame designed for the Labour Force Survey is the primary sampling frame of the CCHS. A multistage stratified cluster design was used to sample dwellings within the area frame. A list of the dwellings was prepared, and a sample was selected from the list. The majority (83%) of the sampled households came from the area frame, and face-to-face interviews were held with respondents randomly selected from households in this frame. In some areas, a random digit dialling technique and/or a list frame of telephone numbers was used to conduct telephone interviews with the remaining 17% of the targeted sample.

In about 82% of the households selected from the area frame, one person was randomly selected; two people were randomly chosen in the remaining households. For households selected from the telephone frames, one person was randomly chosen. The response rate for the combined frame was 84.7%. A total of 6.4% of the interviews were obtained by proxy. More detailed descriptions of the CCHS design, sample and interview procedures can be found in a published report.³⁶

Out of the 12,847 CCHS respondents in the 12-to-17 age range, 132 (1.0%) were excluded from this analysis because data for at least one of the following were missing: self-reported health, smoking, drinking, and chronic conditions (Appendix Table B).

Analytical techniques

Cross-tabulations were used to estimate the prevalence of various characteristics and health behaviours for the 12-to-14 and 15-to-17 age groups. Proportions were estimated using the CCHS sample weights so that the findings are representative of the Canadian population for each sex/age group combination. Multiple logistic regression was used to model associations between very good/excellent self-reported health and adolescents' characteristics. Separate analyses were performed for younger and older adolescents.

Based on a review of the literature and availability from the CCHS, the following independent variables were included in the model: the presence of at least one chronic condition, major depressive episode in past year, household income, highest education in household, daily smoking, episodic heavy drinking, physical activity

during leisure time, daily fruit and vegetable consumption, obesity, and province of residence. To adjust for potential bias due to missing data and to ensure an adequate sample size, the regression models included missing categories for depression, household income, leisure-time activity, fruit and vegetable consumption and obesity, but their odds ratios are not shown.

Because of the small number of cases, variables for daily smoking and episodic heavy drinking were not included in the analyses for 12- to 14-year-olds.

To account for survey design effects, standard errors and coefficients of variation were estimated with the bootstrap method.³⁷⁻³⁹ Results with a p-value of less than 0.05 were considered significant. Multiple comparisons were used to test for statistical differences between estimated rates.

Limitations

The data used for this analysis were self- or proxy-reported; the information was not verified by direct measures or independent sources and may therefore be inaccurate. For example, reports of chronic conditions were not validated against clinical records, nor was it possible to confirm if adolescents who reported engaging in specific activities actually did so, or with the frequency and duration claimed. Recall errors could also have affected reported levels for variables such as physical activity and fruit and vegetable consumption. As well, it is possible that respondents may have provided what they considered socially desirable answers to questions on issues such as physical activity, smoking, drinking and weight.

Data from the CCHS are cross-sectional and refer to one point in time. As a result, while relationships between variables can be described, causality and temporal associations cannot be inferred. Similarly, no conclusions can be made about apparent changes in relationships between risk factors and self-perceived health as adolescents move from the younger to the older age group.

The nutrition questions in the CCHS were developed for the Behavioral Risk Factor Surveillance System by the United States Centers for Disease Control,⁴⁰ and are limited to fruit and vegetable consumption. While this information may be indicative, it does not necessarily represent an adolescent's eating habits. As well, the questions ask the number of times fruits or vegetables were consumed, but not the amounts. Because portion sizes were not specified, compliance with daily intake recommendations, such as those in the Canada Food Guide,⁴¹ cannot be assessed.

Not all factors that might be associated with self-perceived health are available from the CCHS, so they could not be considered in the analysis; for example, family relationships, academic achievement, self-esteem, and peer group influences.

obesity—are related to adolescents' self-perceived health.

Earlier studies^{42,43} have linked physical inactivity in adolescence with lower levels of self-perceived health. Conversely, regular participation in sports and exercise has been found to be positively related to better self-reported health,^{2,13} a relationship that may reflect a sense of competence,¹³ as much as physical functioning. Similarly, results of the analysis of CCHS data indicate that even when the effects of other potentially influential variables were controlled, inactivity was associated with lower odds that younger and older adolescents would report very good or excellent health (Table 1).

Nonetheless, a substantial proportion of Canadian adolescents spend their leisure time in sedentary pursuits. Inactivity tends to be more common among girls than boys, and increases with age among both sexes. In 2000/01, 17% of boys and 26% girls aged 12 to 14 reported a level of energy expenditure during leisure time that placed them in the inactive category. At ages 15 to 17, the figures were higher: 21% of boys and 36% of girls were inactive (Chart 5, Appendix Table A).

Whether they were younger or older, boys or girls, around 10% of adolescents reported eating fruit or vegetables less than twice a day. Teens with this level of fruit and vegetable consumption had significantly lower odds of reporting very good/

excellent health, compared with teens reporting higher levels of consumption. These results persisted even when other variables that might be related were taken into account, including smoking and chronic conditions.

In 2000/01, 1 in 25 Canadian teenagers had a body mass index that placed them in the obese range. Although girls were less likely to be physically active, a higher percentage of boys were obese: 5% versus 3%. And as might be expected, being obese significantly reduced adolescents' odds of reporting very good/excellent health.

Provincial variations

For the total population, levels of self-perceived health, along with other indicators such as life expectancy, disease prevalence and lifestyle risk factors,^{1,44} vary among the provinces. Therefore, it is no surprise that in 2000/01, the proportion of adolescents reporting very good/excellent health also differed by province: from 66% in Saskatchewan to 74% in Nova Scotia (data not shown).

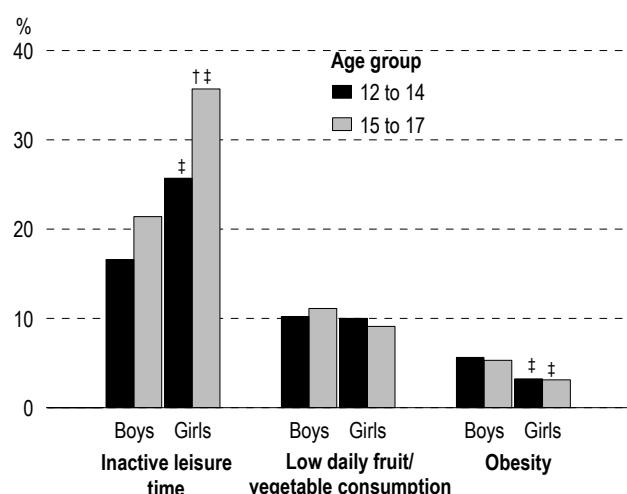
However, when adjustments were made to account for chronic conditions, depression, socio-economic status and lifestyle, few significant provincial differences in adolescent self-reported health emerged (Table 1). For 12- to 14-year-olds, only those in Saskatchewan had significantly lower odds of reporting very good/excellent health, compared with those in the reference province, Ontario. At ages 15 to 17, the only provincial differences were in Nova Scotia and Québec, where the odds of reporting very good/excellent health were significantly higher.

Concluding remarks

If there is any time in an individual's life when he or she might be expected to be in the best of health, it is during youth. And according to the 2000/01 Canadian Community Health Survey, a majority of Canadian adolescents rated their health as "very good" or "excellent." Yet close to a third considered their health to be no better than "good."

No single factor accounts for an adolescent's self-perceived health. Not surprisingly, the presence of chronic conditions and depression reduced the odds of reporting very good/excellent health. And as is true for adults,⁶ adolescents' self-perceived health is linked to socio-economic factors. Lower levels of income and educational attainment in a household were associated with low odds of reporting very good/excellent health, particularly for older adolescents. In addition, smoking, episodic heavy drinking, inactivity, nutrition and obesity were each independently associated with lower ratings of health.

Chart 5
Percentage of adolescents reporting inactive leisure time, low daily fruit/vegetable consumption and obesity, by sex and age group, household population, Canada excluding territories, 2000/01



Data source: 2000/01 Canadian Community Health Survey, cycle 1.1

Note: Adjusted for multiple comparisons

† Significantly different from ages 12 to 14 of same sex ($p < 0.05$)

‡ Significantly different from boys in same age group ($p < 0.05$)

Lower ratings were relatively common among older adolescent girls, a striking contrast to boys whose level of self-perceived health was stable from age 12 through 17. In the older age group, girls were more likely than boys to report a chronic condition, and whether they were aged 12 to 14 or 15 to 17, girls were more likely than boys to have experienced a recent episode of depression.

Lifestyle may also play a role in this difference. Girls were more likely than boys to be sedentary in their leisure time. And while both sexes tended to become less active as they got older, by ages 15 to 17, well over a third of girls, compared with just over a fifth of boys, were inactive. Also, at these ages, a significantly higher percentage of girls than boys were daily

smokers. On the other hand, obesity and episodic heavy drinking were more common among boys.

Some of the factors associated with adolescent health—for instance, smoking, drinking, inactivity and nutrition—are already the focus of separate wide-ranging programs designed to promote healthy living. Others require concerted action that addresses underlying socio-economic conditions.

The risk factors examined in this analysis not only have an impact on self-perceived health in adolescence, but also have long-term implications for health in adulthood. An understanding of these factors can benefit both the individuals concerned and the health care system that will eventually have to deal with the consequences. ■

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Appendix

Table A
Percentage of adolescents reporting selected health characteristics and risk factors, by sex and age group, household population, Canada excluding territories, 2000/01

	Both sexes			Boys			Girls		
	Total	12 to 14	15 to 17	Total	12 to 14	15 to 17	Total	12 to 14	15 to 17
		%	%		%	%		%	%
Very good/Excellent health	71.5	72.8	70.4 [†]	73.7	72.9	74.5	69.3 [‡]	72.7	66.3 [‡]
At least one chronic condition	29.0	26.2	31.6 [†]	26.3	25.3	27.3	31.9 [‡]	27.2	35.9 [‡]
Major depressive episode in past year	5.4	3.8	6.9 [†]	2.7	2.1	3.2	8.3 [‡]	5.6 [‡]	10.6 [‡]
Daily smoker	...	...	14.3	...	...	13.3	...	...	15.4 [‡]
Episodic heavy drinking	...	...	13.3	...	...	15.9	...	...	10.8 [‡]
Inactive leisure time	24.9	21.0	28.5 [†]	19.1	16.6	21.4	31.1 [‡]	25.7 [‡]	35.7 [‡]
Consume fruit/vegetables less than twice daily	10.1	10.1	10.1	10.6	10.2	11.1	9.5	10.0	9.1
Obese	4.2	4.4	4.1	5.4	5.6	5.3	3.0 [‡]	3.1 [‡]	2.9 [‡]

Data source: 2000/01 Canadian Community Health Survey, cycle 1.1

Notes: Adjusted for multiple comparisons. Because of small numbers, percentages of daily smokers and episodic heavy drinkers were not calculated for ages 12 to 14.

[†] Significantly different from ages 12 to 14 of same sex ($p < 0.05$)

[‡] Significantly different from boys in same age group ($p < 0.05$)

... Not applicable

Table B
**Distribution of selected characteristics, by age group,
household population aged 12 to 17, Canada excluding
territories, 2000/01**

	12 to 14			15 to 17		
	Sample size	Estimated population		Sample size	Estimated population	
		'000	%		'000	%
Total	6,247	1,140	100.0	6,468	1,261	100.0
Self-reported health						
Very good/Excellent	4,491	830	72.7	4,480	888	70.4
Poor/Fair/Good	1,756	310	27.2	1,988	373	29.6
Sex						
Boys	3,178	595	52.2	3,225	633	50.2
Girls	3,069	545	47.8	3,243	629	49.9
Chronic conditions						
At least one	1,726	299	26.2	2,086	398	31.6
None	4,521	841	73.8	4,382	864	68.5
Major depressive episode in past year						
Yes	231	43	3.8	522	87	6.9
No	5,926	1,085	95.2	5,842	1,154	91.5
Missing	90	12	1.0	104	21	1.7
Household income						
Lowest	742	139	12.2	626	123	9.8
Lower-middle	1,374	248	21.8	1,277	257	20.4
Upper-middle	1,871	320	28.1	1,980	358	28.4
Highest	1,488	285	25.0	1,501	308	24.4
Missing	772	148	13.0	1,084	216	17.1
Highest education in household						
Postsecondary graduation	4,252	778	68.2	4,312	842	66.8
Less than postsecondary graduation	1,995	362	31.8	2,156	420	33.3
Daily smoker						
Yes	...	...	...	1,019	181	14.4
No	...	...	...	5,449	1,081	85.7
Episodic heavy drinking						
Yes	...	...	...	1,041	168	13.3
No	...	...	...	5,427	1,093	86.7
Leisure time						
Inactive	1,276	239	21.0	1,767	360	28.5
Active	4,065	721	63.2	4,051	762	60.4
Missing	906	180	15.8	650	140	11.1
Fruit/Vegetable consumption						
Less than twice daily	577	115	10.1	702	127	10.1
At least twice daily	5,561	1,006	88.2	5,673	1,119	88.7
Missing	109	19	1.7	93	16	1.3
Obese						
Yes	296	50	4.4	319	52	4.1
No	5,665	1,037	91.0	5,992	1,181	93.7
Missing	286	53	4.6	157	29	2.3
Province						
Newfoundland	213	21	1.8	258	25	2.0
Prince Edward Island	145	6	0.5	128	6	0.5
Nova Scotia	305	38	3.3	273	37	2.9
New Brunswick	232	27	2.4	279	32	2.5
Québec	1,018	253	22.2	1,075	280	22.2
Ontario	1,878	439	38.5	1,879	492	39.0
Manitoba	421	40	3.5	472	49	3.9
Saskatchewan	404	42	3.7	448	46	3.6
Alberta	781	128	11.2	779	133	10.5
British Columbia	850	145	12.7	877	161	12.8

Data source: 2000/01 Canadian Community Health Survey, cycle 1.1

Note: Because of rounding, detail may not add to totals.

... Not applicable

Children who become active

- Overweight children aged 8 to 11 were less active than those aged 4 to 7.
- For overweight/obese children, a relatively high number of hours in physical education class was predictive of becoming physically active.
- Overweight/obese children who were frequent TV viewers had low odds of adopting and maintaining an active lifestyle.

Abstract

Objectives

This article examines factors associated with children aged 4 to 11 becoming and remaining active, and how this differed according to their weight.

Data source

The data are from the National Longitudinal Survey of Children and Youth: cycle 1 (1994/95) for the cross-sectional analysis, and cycles 1, 2 and 3 (1994/95 to 1998/99) for the longitudinal analysis.

Analytical techniques

Estimates of physical activity levels in 1994/95 among acceptable-weight and overweight/obese children are presented by age, sex and selected activities (TV viewing, playing computer/video games, and hours of physical education at school). Logistic regression models were constructed for children who were inactive in 1994/95, focusing on the selected activities as predictors of adopting and maintaining an active lifestyle.

Main results

Factors associated with children adopting and maintaining an active lifestyle differed, depending on their weight. For overweight/obese children, but not for acceptable-weight children, a relatively high number of physical education hours was predictive of becoming physically active, while frequent TV viewing lowered the odds.

Key words

exercise, obesity, physical fitness, physical education and training, sports, television

Author

Claudio E. Pérez (613-951-1733; Claudio.Perez@statcan.ca) is with the Health Statistics Division at Statistics Canada, Ottawa, Ontario, K1A 0T6.

Claudio E. Pérez

The prevalence of overweight and obesity among Canadian children has climbed dramatically in recent years,¹⁻⁴ mirroring trends in many other countries⁵ and among adults.² Estimates of the increase in the prevalence of overweight (including obesity) among boys range from a doubling to a tripling in the 15 years leading up to 1996; estimates for girls range from a 60% increase to a doubling. Increases in obesity alone are even sharper.^{1,2}

Overweight children experience physical and psychological health problems during childhood.⁶ They are also at risk of developing various chronic conditions in later life, because they are more likely than other children to become overweight adults.⁷

Assessing children's pastimes

The National Longitudinal Survey of Children and Youth (NLSCY) contains questions about pursuits that might be associated with children's level of physical activity, including television viewing, computer/video game use, and time spent in physical education (PE) classes at school.

To determine the child's television viewing habits, a parent (usually the mother) was asked two questions: "About how many days a week on average does the child watch TV or videos at home?" and "On those days, how many hours on average does he/she spend watching TV or videos?" Children watching more than 14 hours per week (2 hours a day) were identified as *frequent TV viewers*.

The parent was asked, "In the last 12 months, outside of school hours, how often has the child played computer or video games?" Possible answers were: most days, a few times a week, about once a week, about once a month, and almost never. Children who were reported to have played "most days" or "a few times a week" were considered *frequent computer or video game users*.

To determine time spent in physical education (PE) class, the principal of the child's school was asked:

- "It is first necessary to collect information regarding the length of the school's instructional cycle and the length of the school year. By instructional cycle we mean the number of days which make up one complete rotation through all regularly taught topics. For example, some schools run on a four-day instructional cycle. Overall, how long is one cycle of instruction in this student's home room class? (Specify the number of days.)"
- "For the most recent full cycle of instruction, please estimate how much class time this student spent on physical education (specify the number of minutes per cycle)."

Based on the distribution of responses, children who spent an average of 18 or more minutes a day in physical education class were considered to have a *high number of physical education hours*.

This rise in the prevalence of overweight among children has been attributed to changes not only in eating habits, but also in levels of physical activity.^{8,9} In response, Health Canada has published guidelines that call for children to devote more time to active pastimes and less to sedentary pursuits.¹⁰⁻¹² The logic is clear—less time in sedentary diversions frees up hours to increase energy expenditure, ideally in activities like sports. Such activities may improve fitness, and in turn, generate interest in other physical activities.

However, research reveals differences in psychological and other predictors of physical activity according to children's body mass index (BMI).^{13,14} It is possible, therefore, that active and sedentary pursuits may also vary as predictors of adopting an active lifestyle among children in different weight categories. For example, overweight children who view mandatory activity such as physical education classes as work rather than fun may not be motivated by the same factors as acceptable-weight children who regard physical activity more positively.

This analysis focuses on two groups of inactive children who were aged 4 to 11 in 1994/95: those who were of acceptable weight and those who were overweight or obese. It examines how three factors—television viewing, computer/video game use, and physical education classes—affected the odds that these children would adopt and maintain a physically active lifestyle over the next four years (see *Assessing children's pastimes*). The data are from the first three cycles of the National Longitudinal Survey of Children and Youth (NLSCY) (see *Definitions, Methods and Limitations*).

Most "inactive"

In 1994/95, according to the NLSCY, about a third (37%) of children aged 4 to 11 met the criterion to be considered "physically active" (Table 1). Specifically, a parent judged him or her to be "moderately more" or "much more" active than other children of the same age and sex (see *Measuring physical activity and weight in children*). According to this definition, the proportion of children who were physically active did not differ significantly by weight: 38% of acceptable-weight children were physically active; the figure among those who were overweight/obese was 34%.

Associations between physical activity and the sex of a child are well known. To some extent, these associations may be due to gender differences in the social importance placed on sports, as well as to physiological differences between boys and girls.¹⁵ Consistent with other research,¹⁶⁻²² results of this analysis show that, in 1994/95, a significantly lower percentage of girls than boys were physically active: 34% versus 39% (Table 1). The gap was particularly pronounced among overweight/obese children, with 30% of the girls being active, compared with 38% of the boys.

Although other studies have shown that older children tend to be less active than their younger counterparts,^{18,23,24} according to the measure used for this analysis, acceptable-weight children aged 10 or 11 were just as likely as those aged 4 or 5 to be active. By contrast, results for overweight/obese children

agree with the literature, in that a higher percentage of 4- and 5-year-olds than 8- to 11-year-olds were physically active.

Impact of TV varies

Television viewing has repeatedly been found to be associated with overweight and obesity among children.^{6,16,25,26} Not only is it a sedentary pastime, but it also provides opportunities for snacking and exposure to advertising that may affect children's food choices.^{15,27}

Measuring physical activity and weight in children

Determining levels of physical activity among children is particularly difficult. Questionnaires pertaining to children have not been tested and validated to the same degree as questionnaires for adults,²⁸ and recall bias is a problem.²⁹ Measures of caloric expenditure exist, but have their limitations²⁸ and are beyond the scope of the National Longitudinal Survey of Children and Youth (NLSCY).

The NLSCY asked a parent (usually the mother), "In your opinion, how physically active is the child compared with other children the same age and sex?" The choice of responses was: much more, moderately more, equally, moderately less, or much less. For this analysis, a *physically active* child was one reported to be "moderately more" or "much more" active than other children of the same age and sex; otherwise they were considered *inactive*. The children examined in the longitudinal analysis were all inactive in 1994/95 (cycle 1) according to this definition and either remained inactive in the next two cycles or became active by cycle 2 and remained active in cycle 3. Children who did not fit one of these patterns (for instance, became active in cycle 2 and inactive in cycle 3) were out of scope for the longitudinal analysis.

This definition is conservative, as only children deemed to be at least "moderately more" active than other children are classified as "physically active." Those rated "equally" active (the vast majority) were grouped with the "inactive," on the premise that most children are not active enough for optimal growth and development.⁴

The definition of "becoming active" is also conservative. To "become active," a child who was inactive in cycle 1 had to meet the criterion to be classified as "active" in both subsequent cycles. This was to ensure that the child had truly adopted an active lifestyle, and that it was not a short-lived spike in activity.

In an attempt to validate the longitudinal outcome of "becoming active," the body mass index (BMI) of children who started off overweight or obese was calculated for cycles 1 and 3. This was done separately for children who became active and those who remained inactive. When age and sex differences between the newly active and inactive children were controlled, both groups' BMIs

The association between hours of TV viewing and physical activity is less clear and may vary among different groups of children. For example, US studies reveal that boys watch more television than do girls, but boys are also more likely to participate in sports.²⁰ Analysis of the NLSCY data found that acceptable-weight children who watched at least two hours of TV a day were not as likely to be physically active as were those who spent less time in front of a set: 34% of frequent viewers were physically active, compared with 39% of those who watched less TV. Among heavier

dropped. However, the inactive children's average BMI fell from 22.5 to 21.2, while that of newly active children fell from 22.3 to 20.1, a significantly greater decline (data not shown), which suggests that this measure of physical activity, although not directly comparable with other measures, is a meaningful concept with tangible results.

BMI was derived from the child's weight and height as reported by the parent, using the formula $BMI = (\text{weight in kg})/(\text{height in m})^2$. Respondents were identified as being *overweight/obese* according to the age- and sex-specific BMI cut-offs defined by Cole et al.³⁰

Age (years)	<i>Overweight/Obese is BMI greater than or equal to:</i>	
	Boys	Girls
4.0	17.55	17.28
4.5	17.47	17.19
5.0	17.42	17.15
5.5	17.45	17.20
6.0	17.55	17.34
6.5	17.71	17.53
7.0	17.92	17.75
7.5	18.16	18.03
8.0	18.44	18.35
8.5	18.76	18.69
9.0	19.10	19.07
9.5	19.46	19.45
10.0	19.84	19.86
10.5	20.20	20.29
11.0	20.55	20.74

For example, a 7-year-old boy measuring 120 cm (3 feet 11 inches) in height would have to weigh at least 25.8 kg (56.9 pounds) to be considered overweight.

Even though the models for acceptable-weight and overweight/obese children were constructed separately, the degree of overweight/obesity was also taken into account by indicating if the child was in the lower quartile of the BMI distribution of overweight/obese children ($BMI \leq 19.81$ or not). For consistency between models, a similar variable was derived for those of acceptable weight ($BMI \leq 14.34$ or not).

Table 1
Percentage of acceptable-weight and overweight/obese children aged 4 to 11 who were physically active, by selected characteristics, household population, Canada excluding territories, 1994/95

	Total [†]	Acceptable weight	Overweight/Obese
% physically active [‡]			
Both sexes	37	38	34
Boys	39*	40*	38*
Girls [§]	34	36	30
Age group			
4 or 5 [§]	37	38	38
6 or 7	35	36	34
8 or 9	35	38	29*
10 or 11	38	41	26*
Frequent TV viewer			
Yes	32*	34*	31
No [§]	37	39	32
Frequent computer/video game user			
Yes	38	40	34
No [§]	36	38	34
High number of physical education hours			
Yes	38*	40	32*
No [§]	33	37	23
Missing/Not applicable	37*	38	37*

Data source: 1994/95 National Longitudinal Survey of Children and Youth, cross-sectional file

Note: Based on 8,419 acceptable-weight and 4,067 overweight/obese children
[†] Includes children with missing BMI values.

[‡] Parent considers child "moderately more" or "much more" active than other children of same age and sex.

[§] Reference category

* Significantly different from reference category ($p < 0.05$)

children, the percentage who were physically active did not vary with TV viewing time.

The relationship between physical activity and playing computer or video games has received less attention than that with television. Another NLSCY-based study (of children aged 7 to 11) found that like TV viewing, computer/video game use was associated with overweight and obesity.³¹ However, in this analysis of NLSCY data, no statistically significant association between computer/video game use and physical activity was apparent, regardless of weight.

Physical education class

Another opportunity for children to be active is during physical education (PE) at school. According to the NLSCY results, time spent in PE class was significantly associated with being physically active, but only for heavier children. Close to a third (32%) of overweight/obese children who had a high number of PE hours

(averaging 18 or more minutes a day) were physically active, compared with 23% who spent less time in PE. Among acceptable-weight children, the proportions who were physically active did not differ significantly with PE time (40% versus 37%).

Four years later

Most research on physical activity among children is based on cross-sectional data, so it is difficult to discern causal relationships. With longitudinal data from the NLSCY, it is possible to establish at least temporal associations between various factors and the adoption and maintenance of an active lifestyle. By the rather strict criterion used in this analysis, just 38% of acceptable-weight and 34% of overweight/obese 4- to 11-year-olds were "physically active" in 1994/95. The remaining 62% who were of acceptable weight

Table 2
Adjusted odds ratios for adopting and maintaining physical activity[†] by 1998/99, by selected characteristics, household population aged 4 to 11 in 1994/95, Canada excluding territories

	Weight in 1994/95			
	Acceptable [‡]		Overweight/Obese [§]	
	Adjusted odds ratio	95% confidence interval	Adjusted odds ratio	95% confidence interval
Frequent TV viewer				
Yes	0.97	0.61, 1.53	0.38*	0.18, 0.80
No ^{††}	1.00	...	1.00	...
Frequent computer/video game user				
Yes	0.65	0.38, 1.13	1.19	0.58, 2.44
No ^{††}	1.00	...	1.00	...
High number of physical education hours				
Yes	0.88	0.47, 1.63	2.64*	1.10, 6.33
No ^{††}	1.00	...	1.00	...
Missing/Not applicable	0.67	0.34, 1.32	1.25	0.42, 3.67

Data source: 1994/95 to 1998/99 National Longitudinal Survey of Children and Youth, longitudinal file

Note: Adjusted for child's BMI quartile, sex, age, household income, general health, activity limitations, asthma, self-confidence, participation in organized and unorganized sports, physician consultations, living arrangements; parent's education, activity limitations, smoking status; proximity of parks/playgrounds; neighbourhood safety.

[†] Parent considers child "moderately more" or "much more" active than other children of same age and sex.

[‡] Based on 2,233 acceptable-weight children who were inactive in 1994/95 and either remained inactive in 1996/97 and 1998/99 (1,937) or became active in 1996/97 and remained active in 1998/99 (296).

[§] Based on 1,121 overweight/obese children who were inactive in 1994/95 and either remained inactive in 1996/97 and 1998/99 (999) or became active in 1996/97 and remained active in 1998/99 (122).

^{††} Reference category

* Significantly different from reference category ($p < 0.05$)

... Not applicable

and 66% who were overweight/obese were "inactive." These inactive children were traced over the next four years to determine which ones had become "active" by 1996/97 and remained "active" in 1998/99, and the factors associated with this change in behaviour. Among overweight/obese children not classified as active in 1994/95, 11% had become active by 1996/97 and remained so two years later. The corresponding proportion for acceptable-weight children was 13%.

Although the proportions of overweight/obese and acceptable-weight children becoming active are comparable, the factors associated with such a change in behaviour may differ between the two groups. In

addition to the pastimes and activities that are the focus of this analysis (television viewing, computer/video game use, and PE hours), the effects of other variables were taken into account. Most of them pertain to the child: BMI level, age, sex, household income, general health, presence of asthma, activity limitation due to a chronic condition, level of self-confidence, participation in organized and unorganized sports, general practitioner consultations, living with two parents or not, proximity to parks and playgrounds, and neighbourhood safety. Some characteristics of the parent were also considered: level of education, smoking status, and activity limitation.

Definitions

The following *age groups* were established: 4 or 5, 6 or 7, 8 or 9, and 10 or 11.

Household income was determined according to total household income and the number of household members, as follows:

Household income group	People in household	Total household income
Lowest	1 to 4	Less than \$10,000
	5 or more	Less than \$15,000
Lower-middle	1 or 2	\$10,000 to \$14,999
	3 or 4	\$10,000 to \$19,999
	5 or more	\$15,000 to \$29,999
Middle	1 or 2	\$15,000 to \$29,999
	3 or 4	\$20,000 to \$39,999
	5 or more	\$30,000 to \$59,999
Upper-middle	1 or 2	\$30,000 to \$59,999
	3 or 4	\$40,000 to \$79,999
	5 or more	\$60,000 to \$79,999
Highest	1 or 2	\$60,000 or more
	3 or more	\$80,000 or more

The child's *general health* was determined by asking the parent: "In general, would you say the child's health is: excellent, very good, good, fair or poor?" The first three and last two categories were grouped.

To determine if the child had *asthma*, the parent was asked, "Has the child ever had asthma that was diagnosed by a health professional?" (Yes/No)

To determine if the child had an *activity limitation* due to a chronic condition, the parent was asked, "Does the child have any long-term conditions or health problems that prevent or limit his/her participation in school, at play, or in any other activity for a child of his/her age?" (Yes/No)

The school principal was asked how often the child demonstrated *self-confidence*. The possible answers were: never, rarely, sometimes, usually and always. If the response was "always," the child was considered to have a high level of self-confidence.

The parent was asked, "In the last 12 months, outside of school hours, how often has the child taken part in any sports that involved coaching or instruction?" The possible answers were: most days, a few times a week, about once a week, about once a month, and almost never. In the same way, the parent was asked if the child had "taken part in unorganized sports or physical activities." In both cases, "most days" and "a few times a week" were grouped to identify *frequent organized/unorganized sports players*.

To determine *physician consultations*, the parent was asked, "In the past year, how many times have you seen or talked on the telephone about the child's physical or mental health with a general practitioner, family physician?"

A derived family status variable grouped children according to the number of parents with whom he/she lived: with two; with one; and does not live with a parent. Parents include biological, adoptive, step, and foster parents. From these values, children were determined to be *living with two parents* or not.

The parent's *education* was categorized as: less than secondary graduation, secondary graduation, some postsecondary, or postsecondary degree/diploma.

The parent was asked, "At the present time do you smoke cigarettes daily, occasionally or not at all?" Daily and occasional smokers were categorized as *smokers*.

The parent was asked, "Because of a long-term physical or mental condition or a health problem, are you limited in the kind or amount of activity you can do in activities such as transportation to or from work or leisure time activities?" (Yes/No)

The parent was asked, "Do you strongly agree, agree, disagree, or strongly disagree with this statement about your neighbourhood?"

- There are good parks, playgrounds and play spaces in this neighbourhood.
- It is safe for children to play outside during the day.

In both cases, the answers were grouped into "strongly agree" versus the other responses.

Methods

Data source

The biennial National Longitudinal Survey of Children and Youth (NLSCY) is conducted by Statistics Canada and Human Resources Development Canada. The survey, which began in 1994/95, has longitudinal and cross-sectional components. It follows a representative sample of Canadian children aged newborn to 11 in all provinces and territories into adulthood.

From each randomly selected household, most often one child was selected, although in some cases, up to four children were chosen. A parent (usually the mother) completed a set of questions designed to provide socio-economic and general health information about him/herself and his/her spouse or partner and about the child, including the child's health and social environment. For some questions (for example, physical education classes), information was obtained from the principal of the child's school.

In 1994/95 (cycle 1), a total of 15,579 households were selected to participate in the NLSCY. Of these, 13,439 responded, yielding an overall household response rate of 86.3%. The longitudinal response rates for 1996/97 and 1998/99 (cycles 2 and 3), based on the 16,903 respondents in cycle 1, were 92% (15,468 respondents) and 89% (15,005 respondents), respectively.

This analysis was restricted to a subsample of children in the 10 provinces, who were aged 4 to 11 in 1994/95. The cross-sectional sample consisted of 14,226 children with known weight and height; the longitudinal subsample comprised 8,387 children for whom data were obtained in both cycles 2 and 3 (Appendix Tables A and B). Of those, 3,354 met the criteria to be included in the logistic regression models; that is, either they were not physically active in any cycle, or they had become active by cycle 2 and maintained that level of activity in cycle 3. Children with other activity trajectories were not in scope for the longitudinal analysis.

Analytical techniques

Respondents were divided into categories on the basis of their body mass index (BMI) in 1994/1995. Estimates of physical activity levels in 1994/95 were calculated for acceptable-weight and overweight/

When the effects of these other variables were controlled, hours of television viewing, computer/video game use, and physical education did not significantly affect the odds that acceptable-weight children would adopt and maintain physical activity (Table 2).

For overweight/obese children, two of the factors were influential: time devoted to TV and PE class time. Overweight/obese children who watched more than two hours of television a day had significantly

obese children by sex, age and frequency of involvement in three activities: watching television, playing video and computer games, and physical education classes.

The longitudinal analysis examined only the 4,732 children classified as being inactive in 1994/95 to determine which factors (measured in 1994/95) were significantly associated with becoming active by 1996/97 and continuing to be active in 1998/99. Children who were inactive at baseline, but who had become physically active two years later, and who continued to be active two years after that were contrasted with those who remained inactive throughout the period (1994/95 to 1998/99). Children who were of acceptable weight in 1994/95 were analyzed separately from those who were overweight or obese. The models included the sedentary/active pursuits on which the analysis focuses: TV viewing, computer/video game use, and physical education at school. Adjustments were made for the child's age, sex, household income, general health, the presence of asthma, activity limitations due to a chronic condition, depression, self-confidence, participation in organized and unorganized sports, living arrangements (with two parents or not), the presence of parks and playgrounds in the neighbourhood, whether it is safe to play outside, general practitioner consultations, and the educational attainment, smoking status and activity limitation status of the parent (Appendix Table C). Because the NLSCY was not designed to examine determinants of physical activity, the choice of control variables was limited. For example, it would have been preferable to adjust for the parent's physical activity level, but instead, smoking status was used as an indicator of the parent's health-related behaviour.

The data were weighted using cross-sectional or longitudinal weights, as appropriate, to represent the household population in Canada aged 4 to 11 in 1994/95. The statistical significance threshold was set at $p \leq 0.05$. To account for the complex sample design, significance testing and variance estimation were performed using the bootstrap technique.³²⁻³⁴ In September 2003, revisions were made to the NLSCY weights. This analysis was based on weights prior to those revisions.

lower odds of becoming and remaining active, compared with those who spent less time watching TV. On the other hand, overweight/obese children who averaged at least 18 minutes a day in PE class in 1994/95 had much higher odds of becoming active by 1996/97 and remaining active in 1998/99, compared with those who had less time in such classes.

Limitations

The definition of the outcome—becoming physically active—used in this analysis is less than ideal (see *Measuring physical activity and weight in children*). It is not an empirical measure of energy output or even of time spent in physical activity. Rather, it is the subjective assessment made by a parent of the child's level of activity compared with that of other children of the same age and sex. Consequently, the results of this analysis may not be directly comparable with objective measures of physical activity.

Moreover, to be classified as "physically active," a child had to be judged at least "moderately more" active than his or her peers. It is likely that the parent's assessment would be based on her (most were mothers) observations of the child's friends. Thus, a different standard is used for each child. And because children may select their friends according to their level of physical activity, a very active child with active friends might be categorized as "equally" active, and therefore fall into the "inactive" category. At the same time, a relatively inactive child with even less energetic companions would be considered "active." Indeed, a cross-sectional tabulation reveals that, based on this conservative definition, only 48% of children who frequently participated in unorganized sports were classified as "physically active" in 1994/95. Using participation in organized and unorganized sports as the dependent variable in the longitudinal analysis (as opposed to the parent's perception of the child's level of activity relative to his or her peers) was not possible owing to substantial changes in the questions in subsequent survey cycles.

There was, however, consistency over time, in that the observations were made by the same person (parent). If this person, presumably close to the child, perceived a sustained change in activity, some change probably did occur. To further control for these perception and classification problems, frequency of participation in organized and unorganized sports in 1994/95 were used as control variables in the longitudinal analysis.

Given that the abilities and interests of boys and girls differ widely, particularly with regard to sports and physical activity, it would have been desirable to analyze the sexes separately. However, the small sample size available in the National Longitudinal Survey of Children and Youth (NLSCY) precluded such breakdowns. Similarly, children's interests tend to change as they enter adolescence, so an examination of the data by age group would have been useful, notably for the older children (10- and 11-year-olds at baseline) who, in the period covered by the survey, might have entered middle school or high school. But again, sample size did not permit such analyses.

The NLSCY was not specifically designed to measure predictors of physical activity, so information about many important variables was not collected: for example, athletic ability, parental activity levels, confidence about one's ability to participate in physical activities, and other psychological variables.

All the questions about the child were answered by proxy, most by the parent, but a few by the principal of the child's school. Some responses might have been different had the children answered on their own behalf.

Although research has shown that physical education time is generally overestimated when reported by the principal,³⁵ this should not greatly affect the grouping of respondents into those spending a "high" or "low" number of hours in physical education class. However, the variable assessing hours of physical education may be correlated with other characteristics of the school that were not included in the survey, but which may be associated with a child's likelihood of becoming physically active.

Weighting for the longitudinal file was done for respondents who answered in cycle 1 and in at least one of the next two cycles (some non-respondents in cycle 2 were converted to respondents in cycle 3). However, only those who answered in all three cycles were used in this analysis. This could bias the results if the excluded children differed systematically from those who were included.

Concluding remarks

The results of this analysis of data from the National Longitudinal Survey of Children and Youth demonstrate that physical education class time and television viewing were associated with the odds that inactive children would become active, but only for those who were overweight/obese. Thus, while it seems worthwhile to promote participation in PE classes and to discourage excessive TV viewing, the

findings point to the importance of weight in the likelihood that children will benefit from specific activities.

These results are particularly important in an era when childhood obesity is increasing and, as researchers throughout North America have noted, physical education in schools has been cut substantially.³

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Appendix

Table A

Cross-sectional file sample sizes, acceptable-weight and overweight/obese household population aged 4 to 11, Canada excluding territories, 1994/95

	Total†			Acceptable weight			Overweight/Obese		
	Sample size	Estimated population		Sample size	Estimated population		Sample size	Estimated population	
		'000	%		'000	%		'000	%
Both sexes	14,226	3,129.0	100.0	8,419	1,909.1	100.0	4,067	844.3	100.0
Boys	7,230	1,599.1	51.1	4,273	967.9	50.7	2,038	437.5	51.8
Girls	6,996	1,529.9	48.9	4,146	941.2	49.3	2,029	406.8	48.2
Age group									
4 or 5	3,728	800.1	25.6	2,087	448.1	23.5	1,172	247.6	29.3
6 or 7	3,550	763.6	24.4	1,979	423.5	22.2	1,081	231.0	27.4
8 or 9	3,514	783.0	25.0	2,077	492.5	25.8	1,067	214.5	25.4
10 or 11	3,434	782.3	25.0	2,276	544.9	28.5	747	151.2	17.9
Frequent TV viewer									
Yes	3,287	669.5	21.4	1,902	397.3	20.8	1,048	203.0	24.0
No	10,387	2,351.0	75.1	6,377	1,482.3	77.6	2,896	616.0	73.0
Missing	552	108.6	3.5	140	29.5	1.5	123	25.2	3.0
Frequent computer/video game user									
Yes	3,414	738.7	23.6	2,045	451.9	23.7	1,035	216.9	25.7
No	10,542	2,343.2	74.9	6,369	1,456.4	76.3	3,025	626.4	74.2
Missing	270	47.1	1.5	5	F	F	7	F	F
High number of physical education hours									
Yes	2,726	590.5	18.9	1,695	382.2	20.0	741	140.8	16.7
No	2,341	481.5	15.4	1,410	296.6	15.5	716	144.4	17.1
Missing/Not applicable	9,159	2,057.0	65.7	5,314	1,230.4	64.4	2,610	559.1	66.2

Data source: 1994/95 National Longitudinal Survey of Children and Youth, cross-sectional file

† Includes children with missing BMI values.

F Coefficient of variation greater than 33%

Children who become active

Table B
Longitudinal file sample sizes, acceptable-weight and overweight/obese household population aged 4 to 11 in 1994/95, Canada excluding territories

	Acceptable weight		Overweight/Obese			Acceptable weight		Overweight/Obese	
	Sample size	Estimated population	Sample size	Estimated population		Sample size	Estimated population	Sample size	Estimated population
		'000	%		'000	%		'000	%
Both sexes	2,233	779	100.0	1,121	350	100.0			
Frequent TV viewer									
Yes	553	171	21.9	305	97	27.6			
No	1,651	600	77.0	785	244	69.8			
Missing	29	8 ^{E1}	1.0 ^{E1}	31	9 ^{E2}	2.6 ^{E2}			
Frequent computer/video game user									
Yes	534	179	22.9	285	98	28.1			
No	1,698	599	76.9	834	251	71.8			
Missing	1	F	F	2	F	F			
High number of physical education hours									
Yes	451	165	21.2	198	56	16.0			
No	390	117	15.0	249	80	22.8			
Missing/Not applicable	1,392	497	63.8	674	214	61.2			
Body mass index									
Lower quartile	542	194	24.9	202	70	20.0			
Upper three quartiles	1,691	584	75.1	919	280	80.0			
Sex									
Boys	1,073	382	49.1	508	169	48.3			
Girls	1,160	397	50.9	613	181	51.7			
Age group									
4 or 5	606	196	25.2	308	100	28.7			
6 or 7	525	177	22.7	274	85	24.2			
8 or 9	533	202	26.0	309	102	29.2			
10 or 11	569	204	26.2	230	63	17.9			
Household income									
Lowest/Lower-middle	349	120	15.4	202	56	16.0			
Middle	805	275	35.3	419	122	34.8			
Upper-middle	829	273	35.1	409	139	39.6			
Highest	361	112	14.3	91	34	9.6			
General health									
Excellent/Very good/Good	2,190	765	98.2	1,092	342	97.8			
Fair/Poor	43	14	1.8	29	8 ^{E2}	2.2 ^{E2}			
Limiting chronic condition									
Yes	98	33	4.3	1,066	18	5.0			
No	2,135	745	95.7	55	333	95.0			
Asthma									
Yes	282	101	13.0	177	56	15.9			
No	1,951	677	87.0	944	295	84.1			
High self-confidence									
Yes	254	83	10.7	112	32	9.2			
No	913	315	40.4	496	157	44.8			
Missing	1,066	380	48.9	513	161	46.0			

Data source: 1994/95 to 1998/99 National Longitudinal Survey of Children and Youth, longitudinal file

E1 Coefficient of variation between 16.6% and 25.0%

E2 Coefficient of variation between 25.1% and 33.3%

F Coefficient of variation greater than 33.3%

Table C

Adjusted odds ratios for adopting and maintaining physical activity[†] by 1998/99, by selected characteristics, household population aged 4 to 11 in 1994/95, minimal and full models, Canada excluding territories

	Weight in 1994/95							
	Acceptable [‡]				Overweight/Obese [§]			
	Minimal model||		Full model [#]		Minimal model||		Full model [#]	
	Adjusted odds ratio	95% confidence interval	Adjusted odds ratio	95% confidence interval	Adjusted odds ratio	95% confidence interval	Adjusted odds ratio	95% confidence interval
Frequent TV viewer								
Yes	0.90	0.58, 1.39	0.96	0.61, 1.53	0.35*	0.17, 0.73	0.38*	0.18, 0.80
No||	1.00	...	1.00	...	1.00	...	1.00	...
Frequent computer/video game user								
Yes	0.70	0.42, 1.18	0.65	0.38, 1.13	0.98	0.49, 1.96	1.19	0.58, 2.44
No||	1.00	...	1.00	...	1.00	...	1.00	...
High number of physical education hours								
Yes	0.93	0.51, 1.71	0.88	0.47, 1.63	2.83*	1.11, 7.24	2.64*	1.10, 6.33
No||	1.00	...	1.00	...	1.00	...	1.00	...
Missing/Not applicable	0.89	0.52, 1.53	0.67	0.34, 1.32	1.52	0.65, 3.60	1.25	0.42, 3.67
Body mass index								
Lower quartile			1.10	0.69, 1.75			2.20*	1.04, 4.67
Upper three quartiles||			1.00	...			1.00	...
Sex								
Boys||			1.00	...			1.00	...
Girls			0.84	0.58, 1.22			0.50*	0.27, 0.91
Age group								
4 or 5||			1.00	...			1.00	...
6 or 7			1.13	0.65, 1.95			0.46	0.20, 1.09
8 or 9			1.11	0.60, 2.03			0.31*	0.10, 0.94
10 or 11			0.90	0.50, 1.60			0.24*	0.06, 0.85
Household income								
Lowest/Lower-middle			0.23*	0.10, 0.52			0.41	0.12, 1.36
Middle			0.29*	0.17, 0.52			0.64	0.25, 1.66
Upper-middle			0.29*	0.17, 0.52			0.56	0.22, 1.43
Highest||			1.00	...			1.00	...
General health								
Excellent/Very good/Good			1.18	0.26, 5.44			0.34	0.04, 2.68
Fair/Poor||			1.00	...			1.00	...
Limiting chronic condition								
Yes			1.22	0.46, 3.24			0.22	0.04, 1.28
No||			1.00	...			1.00	...
Asthma								
Yes			0.81	0.46, 1.43			0.21*	0.07, 0.58
No||			1.00	...			1.00	...
High self-confidence								
Yes			0.93	0.52, 1.67			1.61	0.68, 3.80
No||			1.00	...			1.00	...
Missing			1.37	0.76, 2.48			1.24	0.54, 2.83
Frequent organized sports player								
Yes			1.58*	1.05, 2.37			1.85	0.92, 3.74
No||			1.00	...			1.00	...
Frequent unorganized sports player								
Yes			1.33	0.91, 1.95			0.81	0.43, 1.52
No||			1.00	...			1.00	...
Physician consultations last year								
None||			1.00	...			1.00	...
One			1.94*	1.16, 3.27			2.39*	1.06, 5.40
Two or more			1.92*	1.19, 3.08			1.10	0.53, 2.25

continued.....

Table C – concluded

Adjusted odds ratios for adopting and maintaining physical activity[†] by 1998/99, by selected characteristics, household population aged 4 to 11 in 1994/95, minimal and full models, Canada excluding territories

	Weight in 1994/95							
	Acceptable [‡]				Overweight/Obese [§]			
	Minimal model||		Full model [#]		Minimal model||		Full model [#]	
	Adjusted odds ratio	95% confidence interval	Adjusted odds ratio	95% confidence interval	Adjusted odds ratio	95% confidence interval	Adjusted odds ratio	95% confidence interval
Lives with two parents								
Yes			0.94	0.50, 1.78			0.46	0.18, 1.14
No|||			1.00	...			1.00	...
Parent's education								
Less than secondary graduation			0.78	0.44, 1.39			0.39	0.13, 1.22
Secondary graduation			1.26	0.73, 2.17			0.52	0.24, 1.13
Some postsecondary			1.05	0.65, 1.71			0.77	0.37, 1.59
Postsecondary degree/diploma|||			1.00	...			1.00	...
Parent smokes								
Yes			0.96	0.63, 1.48			1.25	0.65, 2.44
No|||			1.00	...			1.00	...
Parent restricted in activities								
Yes			3.09*	1.67, 5.71			0.17*	0.04, 0.80
No|||			1.00	...			1.00	...
Parks/Playgrounds nearby								
Yes			1.14	0.71, 1.86			0.88	0.46, 1.68
No|||			1.00	...			1.00	...
Safe neighbourhood								
Yes			0.97	0.63, 1.49			0.58	0.31, 1.11
No|||			1.00	...			1.00	...

Data source: 1994/95 to 1998/99 National Longitudinal Survey of Children and Youth, longitudinal file

† PMK considers child "moderately more" or "much more" active than other children of same sex and age.

‡ Based on 2,233 acceptable-weight children who were inactive in 1994/95 and either remained inactive in 1996/97 and 1998/99 (1,937) or became active in 1996/97 and remained active in 1998/99 (296).

§ Based on 1,121 overweight/obese children who were inactive in 1994/95 and either remained inactive in 1996/97 and 1998/99 (999) or became active in 1996/97 and remained active in 1998/99 (122).

|| Adjusted for sex, age, household income and parent's education

Adjusted for all variables listed

||| Reference category

* Significantly different from reference category ($p < 0.05$)

... Not applicable

Parent and child factors associated with youth obesity

- In 2000/01, boys were twice as likely as girls to be obese, even though they were more likely to have reported being physically active.
- Girls who were former smokers had higher odds of obesity than their non-smoking counterparts.
- Health behaviours of both boys and girls were associated with those of the responding parent, and for boys only, those with a parent who smoked had higher odds for obesity.
- Parental obesity was strongly associated with youth obesity.

Abstract

Objectives

This article examines relationships between parent and adolescent weight, as well as other selected characteristics and health behaviours of both, and then explores which factors are associated with youth obesity.

Data source

The analysis is based on cross-sectional household data from cycle 1.1 of the 2000/01 Canadian Community Health Survey (CCHS), conducted by Statistics Canada. The sample comprises 4,803 girls and 4,982 boys who were aged 12 to 19 in 2000/01.

Analytical techniques

Estimates of body mass index (BMI) were calculated and selected health behaviours were evaluated for adolescents and a parent who lived in the same household. Multiple logistic regression was used to identify factors associated with youth obesity while controlling for age of the youth and the sex of the reporting parent.

Main results

For both sexes, having an obese parent greatly increased the odds for youth obesity. Among girls, former smokers had higher odds for obesity, but smoking behaviour was not associated with obesity for boys. For boys, being physically inactive or even moderately active increased the odds of obesity. And if the responding parent smoked daily, this increased the odds of obesity for boys.

Key words

adolescence, body weight, exercise, family health, health behaviour, health surveys

Author

Gisèle Carrière (604-666-5907; Gisele.Carriere@statcan.ca) is with the Health Statistics Division at Statistics Canada and is based in the Western Region and Northern Territories Office in Vancouver, British Columbia, V6B 6C7.

Gisèle Carrière

Overweight children have become a major health concern in Canada. Between 1981 and 1996, the prevalence of overweight among 7- to 13-year-old boys rose from 15% to 35%; among girls of the same ages, the prevalence increased from 15% to 29%.¹ And beyond the overweight category, the prevalence of obesity tripled during the same period, from 5% for both sexes to 17% for boys and to 15% for girls.¹ Such trends have been attributed to the lifestyles of an "obesogenic" society.²

Along with issues of social acceptance, body image and self-esteem,³ obese children are more likely to face short-term health problems (hypertension, glucose intolerance and orthopedic complications, for example) than their non-obese counterparts.⁴ Overweight children also tend to remain overweight as adults,⁵ and there are well documented long-term health consequences associated with childhood obesity.

Definitions

Two age groups—12 to 15 and 16 to 19—were used, based on the age of the youth at the time of the interview. In the multivariate analysis, years of age was used as a continuous variable.

Body mass index, or BMI, is calculated by dividing weight in kilograms by height in metres squared. Youth respondents were classified as *overweight* or *obese* according to the age- and sex-specific BMI cut-offs defined by Cole et al.⁶

Age (years)	Overweight is BMI greater than or equal to:		Obese is BMI greater than or equal to:	
	Boys	Girls	Boys	Girls
12.0	21.22	21.68	26.02	26.67
12.5	21.56	22.14	26.43	27.24
13.0	21.91	22.58	26.84	27.76
13.5	22.27	22.98	27.25	28.20
14.0	22.62	23.34	27.63	28.57
14.5	22.96	23.66	27.98	28.87
15.0	23.29	23.94	28.30	29.11
15.5	23.60	24.17	28.60	29.29
16.0	23.90	24.37	28.88	29.43
16.5	24.19	24.54	29.14	29.56
17.0	24.46	24.70	29.41	29.69
17.5	24.73	24.85	29.70	29.84
18+	25.00	25.00	30.00	30.00

Mid-year age points were chosen as the age criteria (for example, 12.5 for 12-year-olds). Overweight, therefore, was defined as having a BMI that fell within the 85th to 95th centile curves modelled by Cole et al.⁶ for children of the same age and sex; obese, as having a BMI that fell at or over the 95th percentile within the age and sex group. For example, a 13-year-old girl who was 160 cm (5 feet, 3 inches) tall would be considered obese if she weighed 73 kg (161 pounds) (BMI = 28.5).

Self-perceived weight of youth was based on respondents' answers to a question that asked whether they considered themselves to be "overweight", "underweight" or "just about right" (see *Girls, boys and weight—self-perceptions versus reality*).

The *reporting parent's BMI* was calculated by dividing weight in kilograms by height in metres squared. Overweight was defined as a BMI of 25 or more and less than 30, obese as a BMI of 30 or more.

Leisure-time activity level was categorized using respondents' answers to questions about the frequency and duration of their participation in a variety of physical activities. To derive respondents' overall level of activity, their energy expenditure was estimated for each reported activity. Energy expenditure (EE) was calculated by multiplying the number of times a respondent engaged in an activity over a 12-month period (a 3-month recall period multiplied by 4) by the average duration in minutes and the energy cost of the activity (expressed as kilocalories expended per kilogram of body weight per hour of activity). To calculate the daily energy expenditure for

the activity, the yearly estimate was divided by 365. This calculation was repeated for all leisure-time activities reported, and the resulting estimates were summed to provide the aggregate average daily energy expenditure. Respondents whose leisure-time EE was below 1.5 kcal/kg/day were considered physically inactive. A value between 1.5 and 2.9 kcal/kg/day indicated moderately active; 3.0 or more, active.⁷ This index does not consider physical activity during school or in the workplace.

Three types of *smoking status* were considered for youth. Daily and occasional smokers were grouped together, as the numbers of occasional smokers were too small to analyze separately. Youth who had smoked either daily or occasionally in the past, but who were no longer smoking were considered former smokers. And non-smokers were those who reported not smoking and never having smoked a cigarette. For responding parents, daily smokers and occasional smokers were separated, but the other categories remained the same.

Daily fruit and vegetable consumption was based on the number of times respondents reported drinking fruit juices or eating fruits and vegetables. The amount consumed was not measured. The derived frequency was first grouped into three categories: less than 5 times per day; 5 to 10 times; and more than 10. Youth responses were regrouped as less than 5 times per day and 5 or more.

Household income groups were based on the number of people in the household and total household income from all sources in the 12 months before the 2000/01 interview:

Household income group	People in household	Total household income
Lowest	1 to 4	Less than \$10,000
	5 or more	Less than \$15,000
Lower-middle	1 or 2	\$10,000 to \$14,999
	3 or 4	\$10,000 to \$19,999
	5 or more	\$15,000 to \$29,999
Middle	1 or 2	\$15,000 to \$29,999
	3 or 4	\$20,000 to \$39,999
	5 or more	\$30,000 to \$59,999
Upper-middle	1 or 2	\$30,000 to \$59,999
	3 or 4	\$40,000 to \$79,999
	5 or more	\$60,000 to \$79,999
Highest	1 or 2	\$60,000 or more
	3 or more	\$80,000 or more

For the logistic regression model, household income was regrouped into three categories: low income (includes lowest and lower-middle incomes), middle income, and high income (includes upper-middle and highest incomes).

For example, it has been associated with chronic and life-threatening conditions such as diabetes and heart disease.^{5,8} In fact, a high body mass index in adolescence has been shown to be predictive of earlier adult mortality.⁹

Research indicates that parental obesity is a risk factor for obesity in children;¹⁰⁻¹² therefore, the link between health behaviours of parents and those of their offspring is an important consideration. It is possible that behaviours predictive of obesity prevail in some households. Some researchers have reported evidence of parent-child correlations across a variety of behaviours, including diet and exercise.¹³⁻¹⁵

This analysis uses a subset of data from the 2000/01 Canadian Community Health Survey (CCHS) to examine relationships between parents' and adolescents' weight, as well as other selected characteristics and health behaviours of both, and then to determine which factors are associated with youth obesity (see *Definitions, Methods and Limitations*). Previous studies have been criticized for their reliance on children's perceptions of their parent's behaviours, or parents' reports of their children's behaviour.¹⁵ However, this analysis is based on two independent reports: one directly from a youth aged 12 to 19, and another from one of his or her parents. Both were living in the same household at the time of the CCHS interview. The large national sample permits separate analysis by sex.

Excess weight more common among boys

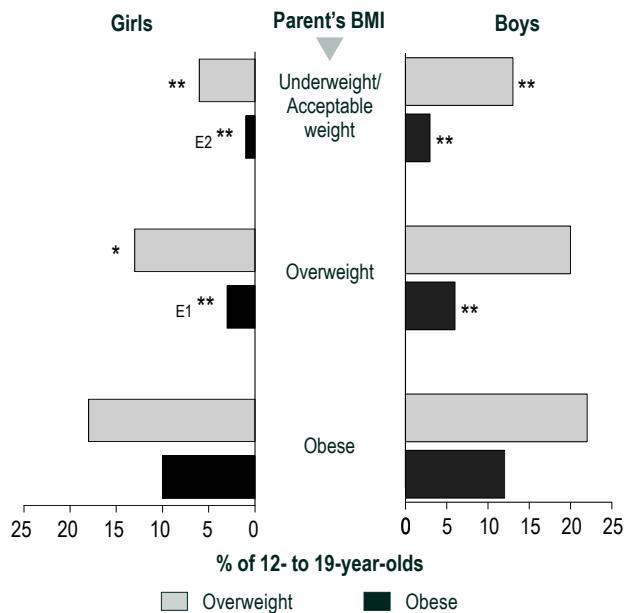
Among the subset of 12- to 19-year-olds examined in this analysis, close to 5% were considered obese in 2000/01. The proportion of boys who were obese (6%) was about twice that for girls (3%) (Table 1). And nearly 17% of the boys these ages were overweight, as were 10% of the girls. Among boys, the prevalence of overweight was higher in the 12-to-15 age group, compared with the 16-to-19 group. The differences in weight between boys and girls did not always match their self-perceptions. For example, girls were more likely to erroneously see themselves as overweight, while boys were more likely to perceive themselves as underweight (see *Girls, boys and weight—self-perceptions versus reality*).

Factors related to overweight/obesity

Consistent with previous research, this analysis found associations between the weight of young people and that of their parents. Adolescents who lived with an obese parent were more likely to be overweight or obese than their counterparts whose reporting parent

Chart 1

Overweight or obese youth, by sex and parent's BMI, population aged 12 to 19 in households where both a youth and parent were surveyed, Canada, 2000/01



Data source: 2000/01 Canadian Community Health Survey, cycle 1.1

* Significantly different from value for corresponding category in household with an obese parent ($p < 0.05$, adjusted for multiple comparisons)

** Significantly different from value for corresponding category in household with an obese parent ($p < 0.01$, adjusted for multiple comparisons)

E1 Coefficient of variation between 16.6% and 25.0%

E2 Coefficient of variation between 25.1% and 33.3%

had a BMI in the acceptable-to-underweight range (Table 1, Chart 1).

Excess parental weight was a major factor in excess weight for youth of both sexes (Table 1). Among girls with an obese parent, 18% were overweight and 10%, obese. The situation was similar for boys with an obese reporting parent: about 22% were overweight and 12% were obese. Among both girls and boys, obesity and overweight were much less common if they lived with a parent whose weight was considered underweight or acceptable, or even overweight (Chart 1). Other associations emerged between parents and youths, not only with weight, but also with physical activity, smoking and eating habits—a set of risk factors that other researchers have suggested should be considered together in investigations of youth obesity.¹⁶⁻¹⁸ In this analysis, the 12- to 19-year-olds with a reporting parent who was inactive during leisure time, who was a smoker, or who consumed fruits and vegetables less than five times a day, were likely to report these behaviours as well (Charts 2 to 4).

Table 1
Prevalence of overweight and obesity, by sex and selected characteristics, population aged 12 to 19 in households where both a youth and parent were surveyed, Canada, 2000/01

	Girls				Boys				
	Overweight		Obese		Overweight		Obese		
	Sample size	Estimated population	Sample size	Estimated population	Sample size	Estimated population	Sample size	Estimated population	
	'000	%	'000	%	'000	%	'000	%	
Total	529	81	10[‡]	162	26	3[‡]	904	148	17
Age group									
12-15	301	44	10	81	14	3	485	85	18*
16-19 [†]	228	36	10	81	12	3	419	63	15
Reporting parent's BMI									
Obese	163	24	18**	79	14	10**	224	32	22**
Not obese [†]	356	55	8	78	11 ^{E1}	2 ^{E1}	655	111	15
Leisure-time									
Inactive	184	28	11*	69	10	4**	176	28	16
Moderately active	130	22	11*	39	5 ^{E1}	3 ^{E1}	167	25	14
Active [†]	145	20	7	35	6 ^{E2}	2 ^{E2}	407	66	17
Smoking status									
Daily/Occasional	79	13	11	24	3 ^{E2}	3 ^{E2}	144	22	18
Former	91	11	10	34	6 ^{E1}	5 ^{E1}	133	18	15
Never [†]	357	56	10	103	16	3	621	107	17
Daily frequency of fruit/vegetable consumption									
Less than 5 times	305	44	10*	101	17	4	541	86	16
5-10 times	179	28	9	54	8 ^{E1}	3 ^{E1}	302	50	16
More than 10 times [†]	41	8 ^{E1}	17 ^{E1}	6	F	F	53	11 ^{E1}	23 ^{E1}
Reporting parent's leisure time									
Inactive	289	44	10	105	17	4	474	78	17
Moderately active	121	18	10	25	4 ^{E2}	2 ^{E2}	220	34	17
Active [†]	85	12	9	22	3 ^{E2}	2 ^{E2}	134	22	15
Reporting parent's smoking status									
Daily	142	19	10	67	9	5	230	34	17
Occasional	22	3 ^{E2}	9 ^{E2}	6	F	F	32	6 ^{E1}	19 ^{E1}
Former	223	35	10	56	8 ^{E1}	2 ^{E1}	420	66	17
Never [†]	142	24	11	33	8 ^{E2}	3 ^{E1}	222	42	17
Reporting parent's daily frequency of fruit/vegetable consumption									
Less than 5 times	361	53	11	110	16	3	620	98	17
5-10 times	147	24	9	47	9 ^{E1}	3 ^{E1}	249	44	16
More than 10 times [†]	18	3 ^{E2}	F	5	F	F	28	5 ^{E1}	16 ^{E2}
Household income									
Lowest/Lower-middle	44	7 ^{E1}	10 ^{E1}	18	F	F	76	13	16
Middle	115	16	10	45	8 ^{E1}	5 ^{E1}	175	26	15
Upper-middle/Highest [†]	344	54	10	95	15	3	597	99	17

Data source: 2000/01 Canadian Community Health Survey, cycle 1.1

Note: Based on a sample of 4,803 female and 4,982 male youth (see Appendix Table A)

[†] Reference category

[‡] For total, significantly different from corresponding estimate for boys ($p < 0.01$)

E1 Coefficient of variation between 16.6% and 25.0%

E2 Coefficient of variation between 25.1% and 33.3%

F Coefficient of variation greater than 33.3%

* Significantly different from reference category ($p < 0.05$)

** Significantly different from reference category ($p < 0.01$)

A subtle sex difference in adolescent's activity during leisure time is evident (Chart 2). The proportion of boys who reported being active was similar in households with an active (62%) or moderately active (58%) reporting parent. This was not the case for girls, as they were less active even when the reporting parent was moderately active. This raises the possibility that if parents' level of physical activity is

emulated by their children, then the parental example may be more important for girls than for boys.

The youths most likely to smoke, either daily or occasionally, lived in homes where the reporting parent was a daily smoker (Chart 3). And the highest proportion of adolescents who had never smoked was in homes where the reporting parent had also never smoked. This calls into question the notion that there

Girls, boys and weight—self-perceptions versus reality

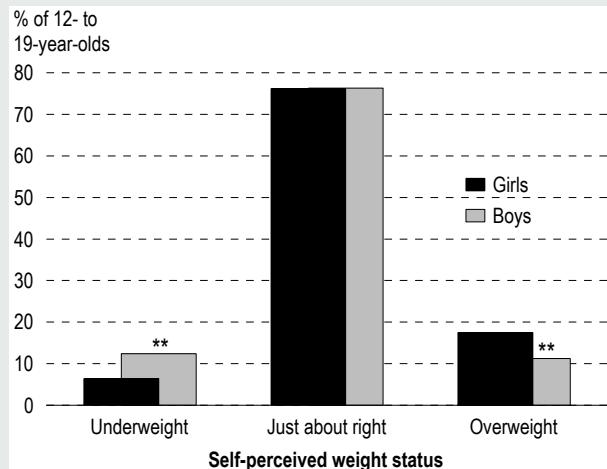
According to the 2000/01 CCHS, about three-quarters (76%) of both boys and girls aged 12 to 19 thought their weight was "just about right" (Chart). Boys were more likely to see themselves as underweight (12% versus 6% for girls), while a higher proportion of girls perceived themselves as overweight.

Yet comparing the adolescents' self-perceptions with their actual body mass index (BMI) revealed that perceptions may not always mesh with reality (all differences between sexes are significant; $p < 0.05$).

Girls were more likely than boys to misjudge themselves as overweight when they were not (Table). Slightly more than half (53%) of the girls who perceived themselves as overweight were neither obese nor overweight according to their BMI. By contrast, the proportion of boys who thought themselves overweight when they were neither obese nor overweight was 22%. Overall, these findings are consistent with those reported elsewhere on self-perceptions of weight among adolescents.¹⁹ Among those who perceived their weight as "just about right" or "underweight," only 6% of girls, compared with 16% of boys, had a BMI that classified them as overweight.

The implications of these results are cause for concern. Dieting has been associated with the likelihood that adolescents view themselves as overweight, whether or not they actually are.¹⁹ This

Self-perceived weight, by sex, population aged 12 to 19 in households where both a youth and parent were surveyed, Canada, 2000/01



Data source: 2000/01 Canadian Community Health Survey, cycle 1.1

** Significantly different from value for corresponding category for females ($p < 0.01$, adjusted for multiple comparisons)

raises the possibility of unhealthy eating practices, especially among young women who may, in fact, already be a healthy weight.

Youth body mass index (BMI) by sex and self-perceived weight, population aged 12 to 19 in households where both a youth and parent were surveyed, Canada, 2000/01

	BMI girls								BMI boys								
	Obese/Overweight				Normal/Underweight				Obese/Overweight				Normal/Underweight				
	Sample size	Estimated population	Sample size	Estimated population	Sample size	Estimated population	Sample size	Estimated population	Sample size	Estimated population	Sample size	Estimated population	Sample size	Estimated population	Sample size	Estimated population	
Self-perceived weight		'000	%		'000	%		'000	%		'000	%		'000	%		
Overweight [†]	441	66	47	405	74	53	497	77	78	120	22	22	3,522	657	84*		
Just about right/Underweight	248	40	6*	3,520	626	94*	731	122	16*								

Data source: 2000/01 Canadian Community Health Survey, cycle 1.1

Notes: Based on a sample of 4,803 female and 4,982 male youth (see Appendix Table A).

[†] Reference category

* Significantly different from self-perceived overweight ($p < 0.05$)

Methods

Data source

This analysis is based on a subset of data from cycle 1.1 of Statistics Canada's 2000/01 Canadian Community Health Survey (CCHS). The CCHS collects cross-sectional information about the health of Canadians every two years. Data collection for cycle 1.1 began in September 2000 and continued over 14 months. The sample used for this analysis represents the household population aged 12 to 19 in all provinces and territories, except persons living on Indian reserves, on Canadian Forces bases, and in some remote areas. More detailed descriptions of the CCHS design, sample and interview procedures can be found in a published report.²⁰

The area frame designed for the Labour Force Survey is the primary sampling frame of the CCHS. A multistage stratified cluster design was used to sample dwellings within the area frame. A list of the dwellings was prepared, and a sample was selected from the list. The majority (83%) of the sampled households came from the area frame. Face-to-face interviews were held with respondents randomly selected from households in this frame. In some areas, a random digit dialling technique and/or a list frame of telephone numbers was used to conduct telephone interviews with the remaining 17% of the targeted sample.

In about 82% of the households selected from the area frame, one person was randomly selected; two people were randomly chosen in the remaining households. For households selected from the telephone frames, one person was randomly chosen. The response rate for the combined frame was 84.7%, with a responding sample size of 131,535. A total of 6.3% of interviews were obtained by proxy.

For this analysis, a subset of the sample was created from households in the CCHS area frame in which two people were randomly chosen to complete the interview. This represents approximately 15% of the total sample. From this subset, 12- to 19-year-olds were included for analysis if: (1) they were identified as living with one or both parent(s); and (2) if the second person who responded to the survey was identified as a parent, with or without a spouse, living with one or more children. This information was derived from the household roster that was collected at the start of the interviews. The analysis excludes 188 youth cases because the age difference between the youth and parent was less than 18 years or more than 45 years. In these cases, it was assumed that there may have been more than one family in the household (for example, a youth respondent and an unrelated parent with his/her own child in the same household), or some type of extended family within one household (for example, a youth and grandparent were selected for the survey, but the youth's parent, also living in the house, was not selected). For the subset of youth retained for analysis, the responses from the parent were attached to the youth file using the unique identifier for the household to match the cases. The final sample comprised 9,785 respondents aged 12 to 19: 4,803 girls and 4,982 boys (Appendix Table A). In the CCHS subset, the proxy rates for youth and responding parents were 13% and 7%, respectively.

Analytical techniques

Cross-tabulations were used to estimate the prevalence of various characteristics and health behaviours as reported independently by

an adolescent and one of his or her parents, both in the same household. Proportions were estimated using the CCHS sample weights so that the findings could be generalized to the general population of the same ages.

Multiple logistic regression was used to model associations between youth obesity, selected characteristics and health behaviours of the adolescents and the reporting parent, while adjusting for youth age and household income. Obesity was chosen as the dependent variable, based on research showing clearly that obesity is a factor in ill health. As well, because BMI was derived from self-report rather than direct physical measurement (see *Limitations*), it was assumed that selection of a more extreme BMI status (obese) would serve as a conservative starting point in the investigation of factors associated with weight in youth. Without adjustment for parent physical activity level and smoking behaviour, the odds ratios for age and physical activity for males were not significant (data not shown). This was also the case if parent physical activity only was added to the model. However, adjusting for the responding parent's smoking behaviour produced the effects seen for males. To minimize the number of cases dropped, parental physical activity was excluded from the model while smoking behaviour was included.

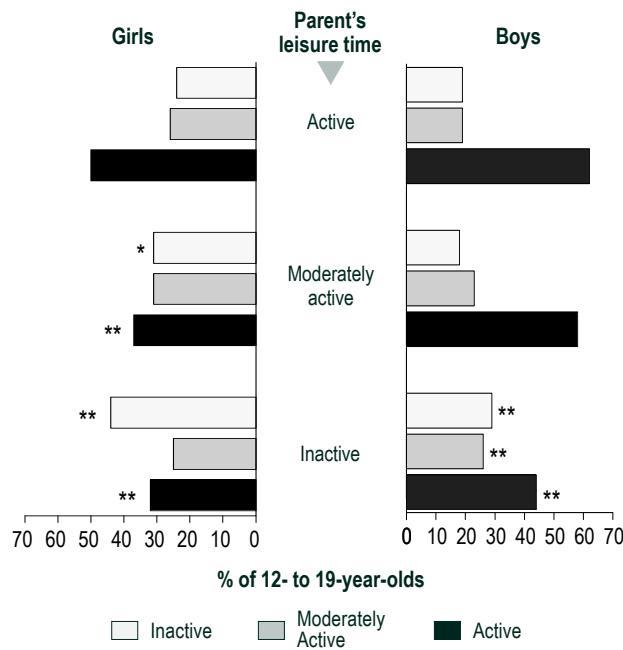
The sex of the reporting parent was also taken into account, because previous research has found that associations between parental and child behaviours and obesity may vary depending on the sex of the parent and child.^{11,13,21} In this subset of CCHS data, 55% of the parents selected for interview were mothers; 45%, fathers. The distribution was similar for both girls and boys, meaning that for more than half (56%) of the girls, their mother responded, and for 46% of the boys, their father responded (data not shown). An interaction variable built using the sex and obesity status of the parent was included in preliminary modelling, but was not significant. Because Canadian research has shown an association between socio-economic status and body mass index,^{22,23} household income was added to the model. Separate analyses were performed for male and female youth in order to examine any associations between obesity and other factors that might be sex-specific.

With the exception of age, a continuous variable, the outcome and explanatory variables considered in the regression models were dichotomized. The dependent variable was defined as a body mass index of "obese", compared with underweight, acceptable and overweight. Youth obesity as an outcome was examined in relation to the following independent variables: age, leisure-time activity level, smoking status, daily fruit and vegetable consumption, reporting parent's smoking status and BMI, and household income group. Adolescents may be influenced differently by their parents, depending on the sex of the child and the parent. Therefore, a variable defining the sex of the reporting parent as the same as or different from his or her child was also included in the multivariate analysis.

To account for survey design effects, standard errors and coefficients of variation were estimated with the bootstrap technique.²⁴⁻²⁶ The significance level was set at $p < 0.05$. When testing for differences between more than two estimates, adjustment was made to account for multiple comparisons.

Chart 2

Youth leisure time, by sex and parent's leisure-time, population aged 12 to 19 in households where both a youth and parent were surveyed, Canada, 2000/01



Data source: 2000/01 Canadian Community Health Survey, Cycle 1.1

* Significantly different from value for corresponding category in household with an active parent ($p < 0.05$, adjusted for multiple comparisons)

** Significantly different from value for corresponding category in household with an active parent ($p < 0.01$, adjusted for multiple comparisons)

is little parents can do to prevent external influences from encouraging adolescents to become smokers.²⁷

As parents often prepare family meals, it is not surprising that adolescents' eating habits mirrored those of the reporting parent. For example, those with parents who consumed fruits and vegetables five or more times per day were more likely to do the same (Chart 4).

Parental obesity strongly associated with youth obesity

If the ultimate goal is to understand the risk factors for youth obesity, the characteristics of both adolescents and their parents must be examined. In this case, the youth's age, leisure time activity level, smoking status and daily fruit and vegetable consumption, as well as the reporting parent's smoking status and BMI, and household income, were all taken into account, along with the sex of the reporting parent (see *Methods*).

Consistent with previous research,¹⁰⁻¹² parental obesity emerged as being strongly associated with youth obesity. For both girls and boys, the odds of being obese were high if their parent was obese,

Chart 3

Youth smoking status, by sex and parent's smoking status, population aged 12 to 19 in households where both a youth and parent were surveyed, Canada, 2000/01



Data source: 2000/01 Canadian Community Health Survey, Cycle 1.1

† Daily and occasional smokers

* Significantly different from value for corresponding category in household with a smoking parent ($p < 0.05$, adjusted for multiple comparisons)

** Significantly different from value for corresponding category in household with a smoking parent ($p < 0.01$, adjusted for multiple comparisons)

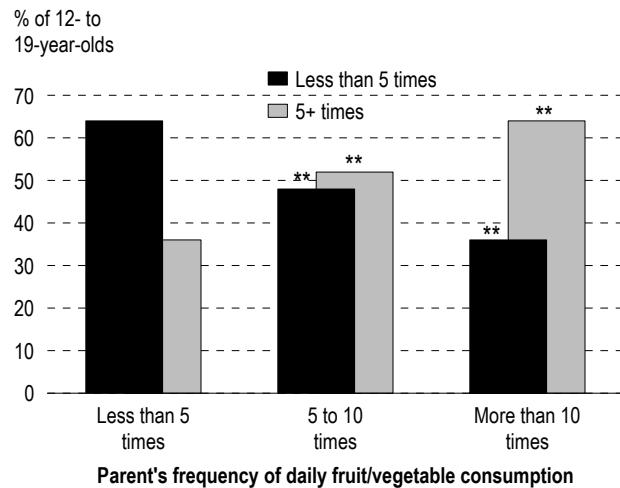
compared with their contemporaries whose parent was not obese: almost six times higher for girls and three times higher for boys (Table 2).

In this analysis, male responding parents were more likely to be obese than their female counterparts (19% versus 15%); however, further analysis confirmed that obese mothers were as likely as obese fathers to have an obese youth (data not shown). And more specifically, in households with an obese father, boys and girls had the same rates of obesity. This suggests that, even though the male parents in this study were more likely to be obese than the female parents, there was no association between the sex and BMI of the parent and the sex and BMI of the child.

Leisure-time activity level was not associated with obesity for girls, but boys who were moderately active or inactive had higher odds of obesity (1.63 and 1.55), compared with those who were active. It may be that because the prevalence of obesity was lower in girls than in boys, any association of physical exercise with girls' weight status may have been too small to detect. Others have found a negative association between

Chart 4

Youth daily frequency of fruit and vegetable consumption, by parent's frequency of daily consumption, population aged 12 to 19 in households where both a youth and parent were surveyed, Canada, 2000/01



Data source: 2000/01 Canadian Community Health Survey, Cycle 1.1

** Significantly different from value for corresponding category in household with parent consuming fruits/vegetables less than five times daily ($p < 0.01$, adjusted for multiple comparisons)

physical activity and overweight and obesity in both females and males.²⁸ It is also possible that girls tend to manage their weight by eating less rather than with exercise;¹⁶ therefore, weight may not vary systematically by physical activity level among girls.

For boys, but not girls, an association with age is evident; with every year of age, the odds that boys would be obese increased by 11%. As well, for boys whose responding parent smoked daily, the odds of being obese were 1.6 times as high as those for boys whose parent had never smoked. Although the findings were similar for girls, they were not statistically significant. Further analysis revealed that while parents who were daily smokers were not more likely to be obese, they did have lower rates of physical activity, compared with parents who were former smokers or who had never smoked (data not shown).

Among girls, those who had quit smoking had approximately twice the odds of being obese as girls who had never smoked. No similar association between smoking cessation and obesity emerged for boys. Past research on adults has produced similar findings on BMI for former smokers.^{22,29} Some evidence suggests that smoking cessation in adult women may produce metabolic changes that contribute to weight gain,³⁰ but for this analysis, it is not possible to determine if obesity preceded or

Table 2

Adjusted odds ratios for obesity, by sex and selected youth and parental characteristics, population aged 12 to 19 in households where both a youth and parent were surveyed, Canada, 2000/01

	Girls		Boys	
	Odds ratio	95% confidence interval	Odds ratio	95% confidence interval
Age (continuous)	0.98	0.86, 1.11	1.11*	1.00, 1.22
Reporting parent's BMI status				
Obese	5.94**	3.54, 9.95	2.88**	1.96, 4.22
Not obese [†]	1.00	...	1.00	...
Leisure time				
Inactive	1.89	0.96, 3.72	1.55*	1.00, 2.41
Moderately active	1.26	0.63, 2.53	1.63*	1.05, 2.52
Active [†]	1.00	...	1.00	...
Smoking status				
Daily/Occasional	0.89	0.43, 1.86	0.63	0.38, 1.05
Former smoker	1.91*	1.06, 3.45	1.08	0.63, 1.84
Non-smoker [†]	1.00	...	1.00	...
Daily frequency of fruit/vegetable consumption				
Less than 5 times	1.27	0.77, 2.10	1.02	0.70, 1.48
5+ times [†]	1.00	...	1.00	...
Reporting parent's smoking status				
Daily smoker	1.55	0.76, 3.16	1.61*	1.01, 2.58
Occasional smoker	1.12	0.37, 3.40	1.92	0.62, 5.90
Former	0.55	0.28, 1.09	0.95	0.59, 1.54
Nonsmoker [†]	1.00	...	1.00	...
Household income				
Lowest/Lower-middle	1.00	0.44, 2.28	1.01	0.58, 1.76
Middle	1.35	0.70, 2.63	1.18	0.75, 1.86
Upper-middle/Highest [†]	1.00	...	1.00	...

Data source: 2000/01 Canadian Community Health Survey, cycle 1.1

Notes: Based on a sample of 3,796 female and 3,842 male youth for whom there were no missing values on any variable included. Controls for the sex of the reporting parent as same or different from the youth (not shown in table). Because of rounding, some odds ratios having confidence intervals with 1.00 as the upper/lower limit are statistically significant.

[†] Reference category

* $p < 0.05$

** $p < 0.01$

... Not applicable

followed smoking cessation. It is possible that factors related to smoking, such as diet and inactivity, lead to increased body weight and that quitting smoking occurred afterwards. A relationship between dieting and smoking as a means to control weight in adolescent girls has been documented elsewhere,¹⁸ but this smoking behaviour has been shown to be related to self-perceptions of weight rather than actual BMI.¹⁷

Limitations

This analysis is based on data collected independently from an adolescent between the ages of 12 and 19 and one of his or her parents, both of whom were living in the same household at the time of the survey. Therefore, it is restricted to relationships between the behaviours of the youth and the reporting parent. Because the Canadian Community Health Survey (CCHS) is cross-sectional, no inferences can be drawn about temporal or causal relationships among the behaviours reported or between these behaviours and obesity.

This analysis was formulated considering social learning theory and its assumptions about modelled behaviours.³¹ However, because information on the duration and stability of the child-parent relationships is not available from the CCHS, such factors could not be included.

Associations between parental and adolescent behaviours may be underestimated. Evidence of significant additive effects of both parents' behaviours on youth behaviors has been reported elsewhere.¹³ The CCHS, however, offers no information on the health behaviours of a second parent or another adult who may have influenced the adolescent. It is possible that, for example, young smokers in homes with a non-smoking reporting parent may have had a second parent who was a smoker. Although research has revealed a significant correlation of behaviours between spouses for substance use, diet, physical activity, and BMI,^{11,13,32} without more information, conclusions cannot be made about the behaviours of the entire household.

The self-reported data used in this analysis were not verified by direct measures or independent sources and may therefore be inaccurate. For example, recall errors may have affected reported levels of physical activity. In addition, there were no independent

sources to confirm whether people who reported engaging in specific activities actually did so, or with the frequency and duration claimed. It is also possible that respondents may have provided what they perceived as socially desirable responses to questions on issues such as activity, smoking and weight. Self-reported height and weight, in fact, tend to underestimate the prevalence of overweight, in particular among women.³³

The possibility that an adolescent respondent may have been influenced by the presence of a parent at the time of the interview was considered. However, administrative data provided by interviewers indicated that 77% of youth were actually alone during their interview. In addition, in 91% of the cases in which another person was present, the interviewer did not feel that the young person's responses were influenced by that person.

Non-responses, defined as refusals to reply, "missing" (no response stated) or responses of "don't know," were excluded from all analyses. Responses to all measures included in this analysis were obtained directly from the respondent with the exception of actual height, weight (not self-perceived) and smoking, in which case a proxy response could have been collected from another household member. If non-response or proxy responses were systematic in some way, this would have introduced error into the results. Youth smoking estimates, for example, might be affected, given that the proxy rate for youth in the CCHS subset used for this analysis was 13%.

Factors such as parenting style, developmental trajectories, and adolescent characteristics such as stress and coping styles, which have been included in other research, are not available from the CCHS and therefore could not be considered in this analysis.

Concluding remarks

According to this analysis of self-reported data from the 2000/01 Canadian Community Health Survey (CCHS), having an obese parent in the same household was strongly associated with youth obesity. Other similarities between adults and youth in the same household were evident. Physical activity levels, smoking status and eating habits among 12- to 19-year-old boys and girls were associated with those of a parent.

Over half (52%) of the reporting parents in this study were overweight or obese, which does not bode well for the health of their children who may face the risk of obesity, diabetes and cardiovascular disease.

Inferences about causation cannot be drawn from the cross-sectional data of the CCHS. However, the

results of this analysis do support the claim that parents may provide their children with examples of behaviours that may influence health and play a role in the development or prevention of childhood obesity. Parental overweight or obesity may be an early indicator of children at risk and may help identify certain family lifestyle factors that indicate intervention and prevention measures targeted to families. ■

Acknowledgement

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Appendix

Table A

Distribution of selected characteristics, household population aged 12 to 19 in households where both a youth and one of his/her parents were surveyed, Canada, 2000/01

	Girls			Boys				Girls			Boys		
	Sample size	Estimated population	Sample size	Estimated population	Sample size	Estimated population		Sample size	Estimated population	Sample size	Estimated population	Sample size	Estimated population
	'000	%	'000	%	'000	%		'000	%	'000	%	'000	%
Total	4,803	836	100	4,982	899	100							
Age													
12	660	102	12	705	114	13	Responding parent's sex						
13	675	108	13	699	125	14	Male	2,222	372	44	2,373	416	46
14	656	111	13	644	122	14	Female	2,581	464	56	2,609	483	54
15	677	131	16	630	123	14							
16	651	130	16	660	121	13	Responding parent's BMI						
17	592	96	12	604	105	12	Under to normal weight	2,101	397	48	2,190	421	47
18	498	89	11	550	99	11	Overweight	1,689	277	33	1,754	310	34
19	394	68	8	490	90	10	Obese	895	142	17	929	151	17
							Missing	118	20	2	109	18	2
Body mass index													
Under to normal weight	3,933	701	84	3,647	680	76	Responding parent's leisure time						
Overweight	529	81	10	904	148	16	Inactive	2,555	459	55	2,605	480	53
Obese	162	26	3	326	52	6	Moderately active	1,098	190	23	1,139	199	22
Missing	179	30	4	105	19	2	Active	815	130	16	856	152	17
Self-perceived weight							Missing	335	57	7	382	68	8
Underweight	256	52	6	605	110	12							
Just about right	3,543	618	74	3,685	676	75	Responding parent's smoking status						
Overweight	856	142	17	620	101	11	Daily	1,172	186	22	1,275	211	24
Missing	148	24	3	72	12 ^{E1}	1 ^{E1}	Occasional	194	36	4	173	32	4
Leisure time							Former	2,184	375	45	2,220	392	44
Inactive	1,553	274	33	1,024	186	21	Never smoked	1,244	237	28	1,308	263	29
Moderately active	1,101	197	24	977	182	20	Missing	9	F	F	6	F	F
Active	1,623	269	32	2,235	385	43							
Missing	526	96	11	746	146	16	Responding parent's daily frequency of fruit/vegetable consumption						
Smoking status							Less than 5 times	3,170	529	63	3,320	588	65
Daily/Occasional	695	120	14	748	128	14	5-10 times	1,474	276	33	1,490	278	31
Former	725	119	14	741	125	14	10+ times	136	28	3	137	28	3
Never	3,367	595	71	3,458	641	71	Missing	23	3 ^{E2}	0 ^{E2}	35	5 ^{E1}	1 ^{E1}
Missing	16	F	F	35	6 ^{E1}	1 ^{E1}							
Daily frequency of fruit/vegetable consumption							Household income						
Less than 5 times	2,704	458	55	3,067	537	60	Lowest	106	23	3	113	27	3
5-10 times	1,818	326	39	1,621	305	34	Lower-middle	317	60	7	310	57	6
More than 10 times	247	47	6	245	47	5	Middle	960	171	20	990	176	20
Missing	34	5 ^{E1}	1 ^{E1}	49	10 ^{E1}	1 ^{E1}	Upper-middle	1,763	288	34	1,747	292	32
							Highest	1,370	245	29	1,526	298	33
							Missing	287	49	6	296	50	6

Data source: 2000/01 Canadian Community Health Survey, cycle 1.1

Note: Because of rounding, detail may not add to 100%.

E1 Coefficient of variation between 16.6% and 25.0%

E2 Coefficient of variation between 25.1% and 33.3%

F Coefficient of variation greater than 33.3%

Adolescent self-concept and health into adulthood

- Girls' self-concept tends to be lower than that of boys.
- A weak self-concept in 1994/95 was predictive of depression among girls, physical inactivity among boys, and obesity among both sexes.
- A strong self-concept in adolescence had a positive long-term effect on girls' self-perceived health.

Abstract

Objectives

This article examines factors associated with adolescent self-concept and the impact of adolescent self-concept on psychological and physical health and health behaviour in young adulthood.

Data source

The data are from the household cross-sectional (1994/95) and longitudinal (1994/95 to 2000/01) components of Statistics Canada's National Population Health Survey.

Analytical techniques

Scores on self-concept indicators in 1994/95 were compared between the sexes and age groups (12 to 15 versus 16 to 19). Multivariate analyses were used to examine cross-sectional and longitudinal associations between adolescent self-concept and depression, self-perceived health, physical activity and obesity, controlling for other possible confounders.

Main results

Self-concept tends to be low among girls compared with boys. Cross-sectionally, adolescent self-concept was associated with household income and emotional support. For girls and for young adolescents, a weak self-concept in 1994/95 was related to the incidence of depression over the next six years; it was also predictive of physical inactivity among boys, and obesity among both sexes. A strong self-concept had a positive long-term effect on girls' self-perceived health.

Key words

self-esteem, mastery, perceived health, health behaviour, cross-sectional studies, longitudinal studies

Author

Jungwee Park (613-951-4598; Jungwee.Park@statcan.ca) is with the Health Statistics Division at Statistics Canada, Ottawa, Ontario, K1A 0T6.

Jungwee Park

Adolescence, the transitional period between childhood and adulthood, is marked by changes in the body, mind and social relationships. As teenagers confront these challenging years, they establish a self-concept; that is, some sense of who they are.^{1,2} Two important elements of self-concept³⁻⁵ are self-esteem, an assessment of one's own worth, and mastery, the extent to which one feels in control of important aspects of one's life.³⁻⁵ (see *Measuring self-concept*).

Numerous studies have revealed that self-esteem and mastery are buffers against a variety of stressors.⁶⁻⁹ As well, a positive self-concept has been associated with self-care,¹⁰⁻¹² compliance with medical advice,^{13,14} and involvement in activities.¹⁵ Thus, a positive self-concept during adolescence can influence not only mental, but also physical health.¹⁶

Most research on the health implications of adolescent self-concept is based on cross-sectional data, thus ignoring the continuing effects of early self-concept.¹⁷ To better grasp the long-term implications, longitudinal research that uses several measures is preferable,¹⁸ yet few such analyses have been undertaken.^{19,20} As a result, despite a considerable

Measuring self-concept

The National Population Health Survey (NPHS) contains questions about two *self-concept* indicators: self-esteem and mastery. Self-esteem is a global measure of individuals' self-worth,^{5,21,22} while mastery pertains to individuals' perception of their ability to control their environment.⁵ Because the two indicators are closely correlated, most research has been undertaken using only one at a time. High self-esteem tends to be found among people who perceive that they have control over their lives and are not subject to the whims of others.²³ Mastery questions in the NPHS are based on general self-efficacy items developed by Pearlin et al.,⁵ which have a strong relationship with self-esteem.²⁴⁻²⁶ In this analysis, the Pearson correlation coefficient of the two measures was 0.47, and they appeared to cancel each other when they were entered separately in one model. To overcome this problem and to grasp the full impact of self-esteem and mastery together, for this analysis, self-esteem and mastery were integrated into the single variable, self-concept.

To measure *self-esteem*, respondents were asked to reply to six statements on a five-point scale: strongly disagree (score 0), disagree (1), neither agree nor disagree (2), agree (3) or strongly agree (4). Higher scores indicate greater self-esteem.

- You feel that you have a number of good qualities.
- You feel that you're a person of worth at least equal to others.
- You are able to do things at least as well as most other people.
- You take a positive attitude toward yourself.
- On the whole, you are satisfied with yourself.
- All in all, you're inclined to feel you're a failure. (Reverse scored.)

To measure *mastery*, respondents were asked to reply to seven items on a five-point scale ranging from strongly agree (score 0) to strongly disagree (score 4). Higher scores indicate greater mastery.

- You have little control over the things that happen to you.
- There is really no way you can solve some of the problems you have.
- There is little you can do to change many of the important things in your life.
- You often feel helpless in dealing with problems of life.
- Sometimes you feel you are being pushed around in life.
- What happens to you in the future mostly depends on you. (Reverse scored.)
- You can do just about anything you really set your mind to. (Reverse scored.)

Because the means and standard deviations of the distributions of the 6 self-esteem and 7 mastery items varied, standard scores, or Z scores, were calculated. The sum of the 13 Z scores was used to measure self-concept.

body of literature dealing with adolescent self-concept, relatively little is known about its long-term impact, particularly on health.

This article focuses on associations between adolescent self-concept and health and health behaviour; specifically, depression, self-perceived health, physical activity and obesity (see *Health outcomes*). Data from the first four cycles of the National Population Health Survey (NPHS) make it possible to follow respondents who were aged 12 to 19 in 1994/95 to 2000/01 when they were aged 18 to 25 (see *Definitions, Methods and Limitations*).

Lower among girls

According to the 1994/95 NPHS, and consistent with the findings of other research,^{22,27-33} adolescent girls' self-concept tended to be weaker than that of boys (Table 1). Experts have attributed this difference to the varying experiences of boys and girls during early adolescence, when children begin to conform to gender-role stereotypes.³⁴

In middle childhood, both sexes seem to feel equally good about their appearance. But the physical development that occurs during puberty is generally more negative for girls. For boys, puberty entails maturational changes that are generally regarded as positive. But for girls, puberty brings menstruation and its associated symptoms, such as a gain in body fat and possible dissatisfaction with body image.³⁵⁻³⁸ Some research has found that girls' perceptions of their attractiveness tend to decline as their grade level rises, although no such drop was evident for boys.³⁹

Table 1
Self-esteem, mastery and self-concept scores, by sex and age group, household population aged 12 to 19, Canada excluding territories, 1994/95

	Total	Boys	Girls	12 to 15	16 to 19
Average score					
Self-esteem	19.35	19.69	19.00 [†]	19.33	19.38
Mastery	19.40	19.69	19.11 [†]	18.98	19.71 [‡]
Self-concept [§]	0.00	0.02	-0.02 [†]	-0.01	0.01

Data source: 1994/95 National Population Health Survey, cross-sectional sample, *Health file*

Note: Based on 1,684 respondents (833 male and 851 female; 750 aged 12 to 15 and 934 aged 16 to 19).

[†] Significantly different from boys ($p < 0.05$)

[‡] Significantly different from 12 to 15 ($p < 0.05$)

[§] Sum of Z scores of 13 self-esteem and mastery measures. Because of the use of Z scores, the mean of 0 is expected, and the distribution is normal.

Definitions

Two age groups in 1994/95 were established for this analysis: 12 to 15 and 16 to 19. For multiple regressions, age was treated as a continuous variable.

Household income was based on the number of people in the household and total household income from all sources in the 12 months before the 1994/95 interview:

Household income group	People in household	Total household income
Lowest	1 to 4	Less than \$10,000
	5 or more	Less than \$15,000
Lower-middle	1 or 2	\$10,000 to \$14,999
	3 or 4	\$10,000 to \$19,999
	5 or more	\$15,000 to \$29,999
Middle	1 or 2	\$15,000 to \$29,999
	3 or 4	\$20,000 to \$39,999
	5 or more	\$30,000 to \$59,999
Upper-middle	1 or 2	\$30,000 to \$59,999
	3 or 4	\$40,000 to \$79,999
	5 or more	\$60,000 to \$79,999
Highest	1 or 2	\$60,000 or more
	3 or more	\$80,000 or more

For the multivariate regression models, household income was regrouped into three categories: lowest/lower-middle, middle, and upper-middle/highest.

Living arrangements in 1994/95 were classified as living with one parent, living with both parents, or other.

Four "yes/no" questions were used to measure *emotional support* in 1994/95: Do you have someone...

- you can talk to about your private feelings or concerns?
- you can really count on in a crisis situation?
- you can really count on to give you advice when you are making important personal decisions?
- who makes you feel loved and cared for?

The "yes" responses were summed (potential range of 0 to 4), with higher scores indicating more perceived emotional support.

adolescence coincides with the transition from elementary school to junior high or middle school, which presents new challenges and requires numerous adjustments.⁴⁵ These changes, especially at ages 12 and 13, may generate greater disturbances in self-concept than at any other point in the life cycle.^{38,46}

However, according to the 1994/95 NPHS, the general tendency for self-concept to rise as adolescents age applied only to boys (Table 2). Among girls, increasing age had no significant effect on self-concept, possibly a reflection of the body image problems that girls may experience during this phase of their lives.

Income, living arrangements and emotional support

Household income is related to self-concept among adolescents, but most strongly at ages 16 to 19. Some insight into this finding may be found in theories of social class and self-esteem.^{40,47} At younger ages, social class is ascribed, so it is a weak determinant of self-esteem. In older adolescence, social class becomes more consequential for self-concept because it is associated with more meaningful achieved status.

Earlier studies have repeatedly suggested that families play a vital role in the development of self-concept.⁴⁸⁻⁵⁵ However, the only "family" variable available from the NPHS was living arrangements (with both, one or no parents), and it was not associated with adolescent self-concept. Information was not collected about other factors that might affect adolescent self-concept, such as parenting style (authoritarian, neglectful or indulgent, for instance), affective ties and family functioning.

Nonetheless, NPHS data are available on emotional support, much of which is provided by family members. And indeed, whether they were boys or girls, younger or older, adolescents' self-concept was positively associated with their level of perceived emotional support.

Risk of depression among girls

A robust self-concept may help individuals meet the day-to-day challenges of the difficult teenage years. But just as important, the strength of an adolescent's self-concept during this time may have long-term implications.

Self-concept has been found to be protective against stress.⁶⁻⁹ Researchers have argued that people with a strong self-concept may have coping strategies that are more problem-focused and less emotion-focused than the techniques employed by people whose self-

Getting older—getting better?

Previous research has revealed that self-concept tends to rise through the adolescent years.⁴⁰⁻⁴⁴ According to the 1994/95 NPHS, 16- to 19-year-olds had a higher sense of mastery than did 12- to 15-year-olds. This difference may be related to the dramatic physiological and social changes that occur in young adolescence. Physiologically, they include accelerating hormone production, growth spurts and voice changes, to name a few. Socially, early

Health outcomes

Using the methodology of Kessler et al,⁵⁶ the National Population Health Survey (NPHS) measures a *major depressive episode (MDE)* with a subset of questions from the Composite International Diagnostic Interview. These questions cover a cluster of symptoms for a depressive disorder, which are listed in the *Diagnostic and Statistical Manual of Mental Disorders (DSM-III-R)*.⁵⁷

The question (Q) numbers refer to those in the mental health section of the NPHS. There are three possible paths: "yes" to Q2, then answer Q3 to Q13; "no" to Q2, "yes" to Q16, then answer Q17 to Q26; and "no" to Q2 and "no" to Q16.

- | | |
|--|--|
| Q2 | During the past 12 months, was there ever a time when you felt sad, blue, or depressed for two weeks or more in a row? (yes - go to Q3; no - go to Q16) |
| Q16 | During the past 12 months, was there ever a time lasting two weeks or more when you lost interest in most things like hobbies, work, or activities that usually give you pleasure? (yes - go to Q17; no - end) |
| <p>For the next few questions, please think of the two-week period during the past 12 months when:</p> <p>Q3 these feelings were worst.</p> <p>Q17 you had the most complete loss of interest in things. During that time how long did these feelings usually last? (all day long; most of the day; about half of the day; less than half the day)</p> | |
| Q4 or Q18 | How often did you feel this way during those two weeks? (every day; almost every day; less often) |
| Q5 | During those two weeks did you lose interest in most things? (yes/no) |
| Q6 or Q19 | Did you feel tired out or low on energy all of the time? (yes/no) |
| Q7 or Q20 | Did you gain weight, lose weight, or stay about the same? (gained; lost; stayed about the same; was on a diet) |
| Q8 or Q21 | About how much did you gain/lose? |
| Q9 or Q22 | Did you have more trouble falling asleep than you usually do? (yes/no) |
| Q10 or Q23 | How often did that happen? (every night; nearly every night; less often) |
| Q11 or Q24 | Did you have a lot more trouble concentrating than usual? (yes/no) |
| Q12 or Q25 | At these times, people sometimes feel down on themselves, no good, or worthless. Did you feel this way? (yes/no) |
| Q13 or Q26 | Did you think a lot about death—either your own, someone else's, or death in general? (yes/no) |

A value of 1 was assigned to any "yes" answer to the "yes/no" questions. For Q8 and Q21, a score of 1 was assigned if the change in weight was at least 10 pounds (4.5 kilograms). For Q10 and Q23, a score of 1 was given to respondents who reported having trouble falling asleep every night or nearly every night. Those who replied "yes" to Q2, and whose symptoms lasted all day or most of the day, and had occurred every day or almost every day, had a maximum possible score of 8. For those who responded "yes" to Q16, and whose symptoms lasted all day or most of the day, and

had occurred every day or almost every day, the maximum possible was 7. Respondents who replied "no" to Q2 and Q16 scored 0.⁵⁸

Scores were totaled, and the results were transformed into a probability estimate of a diagnosis of MDE. For this analysis, if the estimate was 0.9 or more (90% likelihood of a positive diagnosis), the respondent was considered to have experienced an MDE in the previous 12 months. Respondents were classified as having experienced a new MDE if their scores indicated a depressive episode before their 1996/97, 1998/99 and/or 2000/01 interview, but not in the 12 months before their 1994/95 interview.

Self-perceived health reflects respondents' global evaluation of their overall health. They were asked, "In general, would you say your health is: excellent, very good, good, fair or poor?" For this analysis, self-perceived health was treated as a continuous variable, with scores ranging from poor (1) to excellent (5).

Physical activity was based on total accumulated energy expenditure (EE) during leisure time. EE was calculated from the reported frequency and duration of all of a respondent's leisure-time physical activities in the three months before the interview and the metabolic energy demand (MET value) of each activity, which was independently established.^{59,60}

$$EE = \sum(N_i * D_i * MET_i / 365 \text{ days}), \text{ where}$$

N_i = number of occasions of activity i in a year,
D_i = average duration in hours of activity i, and
MET_i = a constant value for metabolic energy cost of activity i.

For each respondent, daily EE was the sum of energy expenditures of all leisure-time activities, expressed as total kilocalories expended per kilogram of body weight per day (K/KD). An EE of 3 or more K/KD was defined as high; 1.5 to 2.9, moderate; and less than 1.5, low.⁵⁹ Respondents with high or moderate EE were considered physically active; those with low EE, inactive.

Based on their body mass index or BMI (calculated by dividing weight in kilograms by height in metres squared), respondents were grouped into two categories: *obese* (BMI 30 or more) and *not obese* (BMI less than 30). BMI was not calculated for pregnant women. The age- and sex-specific cut-offs defined by Cole et al.⁶¹ were used to determine if an adolescent was obese in 1994/95:

Obese is BMI greater than or equal to:

Age (years)	Boys	Girls
12.0	26.02	26.67
12.5	26.43	27.24
13.0	26.84	27.76
13.5	27.25	28.20
14.0	27.63	28.57
14.5	27.98	28.87
15.0	28.30	29.11
15.5	28.60	29.29
16.0	28.88	29.43
16.5	29.14	29.56
17.0	29.41	29.69
17.5	29.70	29.84
18+	30.00	30.00

Mid-year age points were chosen as the age criteria (for example, 13.5 for 13-year-olds). Based on these cut-offs, a 13-year-old girl who was 160 cm (5 feet, 3 inches) tall would be considered obese if she weighed at least 72.2 kg (161 pounds).

Table 2

Regression coefficients relating selected characteristics to self-concept, by sex and age group, household population aged 12 to 19, Canada excluding territories, 1994/95

	Total			Boys			Girls			12 to 15			16 to 19		
	B	se	beta	B	se	beta	B	se	beta	B	se	beta	B	se	beta
Age	0.01*	0.003	0.08*	0.01*	0.004	0.10*	0.00	0.004	0.04	...	...	...	...	...	...
Female	-0.05*	0.013	-0.13*	...	...	...	...	...	...	-0.04*	0.018	-0.12*	-0.05*	0.017	-0.15*
Household income															
Lowest/Lower-middle	-0.06*	0.023	-0.14*	-0.07*	0.021	-0.16*	-0.05	0.043	-0.11	-0.05*	0.022	-0.09*	-0.07*	0.033	-0.16*
Middle	-0.03*	0.011	-0.07*	-0.01	0.016	-0.03	-0.04*	0.020	-0.11*	-0.01	0.018	-0.04	-0.03*	0.014	-0.09*
Upper-middle/Highest†	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Living arrangements															
With one parent	0.00	0.016	0.01	0.01	0.019	0.02	-0.01	0.030	-0.01	0.01	0.022	0.03	-0.01	0.023	-0.01
Other	0.00	0.020	0.00	-0.03	0.025	-0.05	0.02	0.029	0.05	0.01	0.031	0.02	0.00	0.026	0.00
With both parents†	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Emotional support	0.08*	0.015	0.23*	0.06*	0.014	0.20*	0.10*	0.026	0.27*	0.07*	0.021	0.20*	0.08*	0.022	0.25*
Intercept	-0.36			-0.31			-0.44			-0.23			-0.25		
Model information															
R ²	0.09			0.08			0.10			0.07			0.11		
Adjusted R ²	0.09			0.07			0.09			0.05			0.10		
Degrees of freedom	9			8			8			8			8		
	1,500			734			758			575			917		
Dropped because of missing values	174			90			84			166			8		

Data source: 1994/95 National Population Health Survey, cross-sectional sample, Health file

Note: "Missing" categories for household income and living arrangements were included in each model to maximize sample size, but the coefficients are not shown.

† Reference category

* p < 0.05

... Not applicable

Table 3

Adjusted odds ratios relating incidence of a major depressive episode between 1994/95 and 2000/01 to selected characteristics in 1994/95, by sex and age group, household population aged 12 to 19 with no depressive symptoms in 1994/95, Canada excluding territories

Characteristics, 1994/95	Total		Boys		Girls		12 to 15		16 to 19	
	Adjusted odds ratio	95% confidence interval								
Age	1.02	0.91, 1.15	1.01	0.85, 1.21	1.03	0.87, 1.22	...	...	...	...
Female	2.20*	1.28, 3.79	...	...	...	...	2.65*	1.12, 6.23	2.40*	1.13, 5.14
Household income										
Lowest/Lower-middle	1.36	0.65, 2.81	1.28	0.36, 4.48	1.41	0.61, 3.25	2.82*	1.04, 7.64	0.90	0.33, 2.43
Middle	0.85	0.44, 1.64	1.10	0.36, 3.40	0.79	0.37, 1.71	0.39	0.13, 1.18	1.36	0.58, 3.20
Upper-middle/Highest†	1.00	...	1.00	...	1.00	...	1.00	...	1.00	...
Emotional support	0.93	0.60, 1.45	1.51	0.69, 3.27	0.65	0.35, 1.19	0.91	0.55, 1.51	1.03	0.52, 2.05
Self-concept	0.12*	0.02, 0.74	0.21	0.01, 2.90	0.08*	0.01, 0.83	0.02*	0.00, 0.28	0.41	0.03, 5.58
Model information										
Sample size	890		424		466		375		515	
Sample with depression	118		37		81		52		66	
Dropped because of missing values	122		61		61		121		1	

Data source: 1994/95 to 2000/01 National Population Health Survey, longitudinal sample, Health file

Note: A "missing" category for household income was included in each model to maximize sample size, but the odds ratios are not shown.

† Reference category

* p < 0.05

... Not applicable

Methods

Data source

The data for this article are from Statistics Canada's National Population Health Survey (NPHS), weighted to represent the population of the 10 provinces. The biennial NPHS, which began in 1994/95, covers household and institutional residents in all provinces and territories, except persons on Indian reserves, on Canadian Forces bases, and in some remote areas. This analysis is based only on household residents. The NPHS has both cross-sectional and longitudinal components.

Cross-sectional sample

The 1994/95 (cycle 1) cross-sectional sample consists of longitudinal respondents and other members of their households, as well as individuals selected as part of supplemental samples, or buy-ins, in some provinces. The 1994/95 non-institutional sample for the 10 provinces consisted of 27,263 households, of which 88.7% agreed to participate. After application of a screening rule to maintain the representativeness of the sample,⁶² 20,725 households remained in scope. In 18,342 of these households, the selected person was aged 12 or older. Their response rate to the in-depth health questions was 96.1%, or 17,626 respondents.

The data are stored in two files. The General file contains socio-demographic and some basic health information for each member of participating households. The Health file contains in-depth health information, which was collected for one randomly selected household member, as well as the information in the General file pertaining to that individual. Because of the detailed nature of the data in the Health file, this information had to be provided by the selected respondent; proxy response was accepted only under special circumstances (for example, a health problem prevented the selected respondent from providing information). In 1994/95, in each household, one knowledgeable person provided information about all household members for the General file. As well, one household member, not necessarily the same person, was randomly selected to provide in-depth health information about himself or herself for the Health file. In 1994/95, the majority of interviews were conducted in person.

Longitudinal sample

Of the 17,626 randomly selected respondents in 1994/95, 14,786 were eligible members of the longitudinal panel, along with 468 persons for whom only general information was collected. An additional 2,022 of the 2,383 randomly selected respondents younger than 12 were also eligible. Thus, the longitudinal sample is composed of the 17,276 respondents who were selected in cycle 1

and had completed at least the General component of the questionnaire. The response rates were 93.6% in the first cycle, 92.8% in the second, 88.9% in the third, and 84.8% in the fourth. The first three cycles had cross-sectional and longitudinal components, but starting in 2000/01 (cycle 4), the NPHS became strictly longitudinal. In 2000/01, one questionnaire was used. More detailed descriptions of the NPHS design, sample and interview procedures can be found in published reports.^{62,63}

The cross-sectional sample used for this article consists of 1,684 respondents (833 boys and 851 girls) aged 12 to 19 in 1994/95 (Appendix Table A). Respondents whose Health questionnaire data were provided by proxy were excluded from the analyses because information on self-concept and on some other variables was not available. The longitudinal analyses were based on 1,089 respondents aged 12 to 19 in 1994/95 for whom complete data were available for all four cycles: 511 boys and 578 girls (Appendix Table A).

Analytical techniques

The 1994/95 NPHS cross-sectional file was used to measure levels of self-esteem, mastery and self-concept among 12- to 19-year-olds, by sex and age group. The 1994/95 cross-sectional file was also used to examine associations between self-concept and household income, living arrangements and emotional support.

The longitudinal file was used to examine the six-year incidence of depression and changes in self-perceived health, physical activity and obesity between 1994/95 and 2000/01 in relation to self-concept scores in 1994/95, by sex and age group. Multiple logistic regression models were created for dichotomized dependent variables (depression, physical inactivity and obesity) and multiple linear regression models were constructed for the continuous dependent variables (self-perceived health). Based on a review of the literature, selected factors believed to mediate the relationship between self-concept and health were accounted for in these models: household income and emotional support.

In the regression models, continuous measures were used for self-concept, perceived emotional support, and health status variables. Other research suggests that collapsing these constructs into dichotomous variables reduces the sensitivity of these measures.^{64,65}

To account for survey design effects, standard errors and coefficients of variation were estimated with the bootstrap technique.⁶⁶⁻⁶⁸ The statistical significance threshold was set at $p < 0.05$.

concept is weak.⁶⁹ Thus, depression stemming from stress may be averted by a strong self-concept, whereas a low self-concept increases the probability of being depressed.^{5,70-73}

According to the results of the analysis of longitudinal NPHS data, a weak self-concept was predictive of depression among girls (Table 3). Those whose self-concept was weak, but who did not report symptoms of depression in 1994/95, were more likely to experience a depressive episode at some point in the next six years than were those with a stronger self-concept. By contrast, boys' self-concept in 1994/95 was not significantly related to depression over that period.

Girls' self-perceived health

Self-perceived health has been found to be a reliable and valid measure of health status and a sensitive predictor of morbidity and mortality.⁷⁴⁻⁷⁶ Regardless of sex or age group, adolescents' level of self-perceived health in 1994/95 was the strongest predictor of their self-perceived health status six years later in 2000/01. Yet even when self-perceived health in 1994/95 was taken into account, for girls, a strong self-concept at that time had a positive impact on self-

perceived health in 2000/01 (Table 4). For boys, on the other hand, self-concept in 1994/95 was not significantly related to self-perceived health six years later.

For both sexes, however, emotional support in 1994/95 had a positive effect on self-rated health in 2000/01. Clearly, internal (self-concept) and external (emotional support) psychological resources during adolescence can have an impact on future self-perceived health.

Inactivity and obesity

A strong self-concept and physical activity tend to go together,^{15,77,78} although the direction of the relationship is unclear. Some previous research suggests that a strong self-concept may be the result of physical activity.⁷⁹⁻⁸¹ Alternatively, a positive self-concept may provide the motivation that such activity requires.

The results of this analysis suggest that for boys, a strong self-concept is not merely a result of physical activity, but also a predictor of future physical activity. Among boys who were at least moderately active in 1994/95, a high self-concept significantly lowered their odds of being inactive in 2000/01 (Table 5).

Table 4
Regression coefficients relating self-perceived health in 2000/01 to selected characteristics in 1994/95, by sex and age group, household population aged 12 to 19 in 1994/95, Canada excluding territories

Characteristics, 1994/95	Total			Boys			Girls			12 to 15			16 to 19		
	B	se	beta	B	se	beta	B	se	beta	B	se	beta	B	se	beta
Age	0.04*	0.018	0.10*	0.04	0.025	0.11	0.04	0.025	0.09	...	...	...	...	...	...
Female	-0.14*	0.065	-0.09*	...	...	...	...	...	...	-0.12	0.091	-0.07	-0.14	0.092	-0.09
Household income															
Lowest/Lower-middle	-0.15	0.094	-0.07	-0.28*	0.134	-0.13*	0.03	0.130	0.02	-0.11	0.160	-0.04	-0.13	0.118	-0.06
Middle	-0.06	0.071	-0.03	-0.17	0.106	-0.09	0.05	0.102	0.03	-0.16	0.114	-0.09	0.01	0.095	0.01
Upper-middle/Highest	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
Emotional support	0.17*	0.051	0.11*	0.14*	0.070	0.10*	0.21*	0.074	0.12*	0.23*	0.076	0.14*	0.14	0.076	0.09
Self-perceived health	0.28*	0.045	0.28*	0.33*	0.068	0.32*	0.22*	0.054	0.23*	0.28*	0.066	0.29*	0.29*	0.062	0.29*
Self-concept	0.49*	0.244	0.08*	0.24	0.367	0.04	0.80*	0.317	0.14*	0.62	0.378	0.10	0.42	0.326	0.07
Intercept	1.58			1.52			1.50			1.93			2.36		
Model information															
R ²	0.16			0.17			0.14			0.16			0.14		
Adjusted R ²	0.15			0.16			0.13			0.15			0.13		
Degrees of freedom	8			7			7			7			7		
	950			438			505			385			558		
Dropped because of missing values	130			65			65			124			6		

Data source: 1994/95 to 2000/01 National Population Health Survey, longitudinal sample, Health file

Note: A "missing" category for household income was included in each model to maximize sample size, but the coefficients are not shown.

* p < 0.05

... Not applicable

Adolescent self-concept

Table 5

Adjusted odds ratios relating inactivity in 2000/01 to selected characteristics in 1994/95, by sex and age group, active/moderately active household population aged 12 to 19 in 1994/95, Canada excluding territories

Characteristics, 1994/95	Total		Boys		Girls		12 to 15		16 to 19	
	Ad- justed odds ratio	95% confidence interval								
Age	1.00	0.90, 1.12	1.00	0.87, 1.16	1.01	0.86, 1.20	...	...	...	...
Female	1.83*	1.17, 2.85	...	...	...	...	2.14*	1.11, 4.12	1.56	0.84, 2.90
Household income										
Lowest/Lower-middle	1.65	0.88, 3.08	1.83	0.78, 4.32	1.55	0.68, 3.50	1.45	0.59, 3.61	1.88	0.80, 4.42
Middle	0.87	0.51, 1.50	1.15	0.57, 2.32	0.69	0.31, 1.54	0.60	0.26, 1.36	1.28	0.62, 2.65
Upper-middle/Highest†	1.00	...	1.00	...	1.00	...	1.00	...	1.00	...
Emotional support	1.16	0.77, 1.74	1.54	0.91, 2.59	0.58	0.26, 1.31	0.91	0.51, 1.64	1.47	0.83, 2.61
Self-concept	0.05*	0.01, 0.28	0.03*	0.00, 0.27	0.10	0.01, 1.08	0.07*	0.01, 0.72	0.05*	0.01, 0.47
Model information										
Sample size	579		313		266		271		308	
Sample inactive in 2000/01	229		109		120		113		116	
Dropped because of missing values	93		56		37		84		9	

Data source: 1994/95 to 2000/01 National Population Health Survey, longitudinal sample, Health file

Note: A "missing" category for household income was included in each model to maximize sample size, but the odds ratios are not shown.

† Reference category

* p < 0.05

... Not applicable

Table 6

Adjusted odds ratios relating obesity in 2000/01 to selected characteristics in 1994/95, by sex and age group, non-obese household population aged 12 to 19 in 1994/95, Canada excluding territories

Characteristics, 1994/95	Total		Boys		Girls		12 to 15		16 to 19	
	Ad- justed odds ratio	95% confidence interval								
Age	1.05	0.89, 1.23	0.99	0.79, 1.23	1.17	0.92, 1.48	...	...	...	...
Female	0.41*	0.19, 0.88	...	...	...	...	0.15*	0.04, 0.55	0.65	0.27, 1.60
Household income										
Lowest/Lower-middle	1.58	0.65, 3.84	2.33	0.74, 7.33	0.86	0.23, 3.21	1.81	0.39, 8.40	1.40	0.48, 4.09
Middle	1.55	0.70, 3.46	2.93*	1.08, 7.96	0.49	0.13, 1.78	1.81	0.51, 6.45	1.57	0.56, 4.38
Upper-middle/Highest†	1.00	...	1.00	...	1.00	...	1.00	...	1.00	...
Emotional support	1.43	0.78, 2.62	1.36	0.73, 2.55	2.86	0.52, 15.59	0.98	0.41, 2.36	1.78	0.75, 4.20
Self-concept	0.05*	0.01, 0.36	0.04*	0.00, 0.88	0.06*	0.01, 0.46	0.04	0.00, 1.89	0.06*	0.01, 0.55
Model information										
Sample size	895		433		462		366		529	
Sample obese in 2000/01	62		35		27		20		42	
Dropped because of missing values	143		61		82		127		16	

Data source: 1994/95 to 2000/01 National Population Health Survey, longitudinal sample, Health file

Note: A "missing" category for household income was included in each model to maximize sample size, but the odds ratios are not shown.

† Reference category

* p < 0.05

... Not applicable

Limitations

Because the National Population Health Survey (NPHS) is a general health survey, information about factors related to self-concept is limited. The only environmental variables available were living arrangements and household income; factors such as community belonging, family and parental support, and peer group influences, which previous studies have shown to have significant effects on self-esteem and mastery,⁵⁴ could not be examined. Similarly, the NPHS does not collect information on individual characteristics relevant to adolescent self-concept, such as school performance, popularity and athletic ability.⁸²

In examining longitudinal results, the stability of self-concept over time may be more important than its level. For example, a decline in self-concept may be more important than a consistently low level. However, self-esteem and mastery questions were not asked in cycles 2 and 3 of the NPHS (self-concept information was available only for 1994/95 and 2000/01). Thus, it was not possible to construct a longitudinal model of the stability of self-concept.

NPHS data are subject to the problems inherent in self-reporting. For instance, recall errors may affect variables such as depression and physical activity. As well, some response bias may be involved in the substantial gender gap in self-concept, in that girls are inclined to be more modest than boys in describing their positive qualities.³³ Self-reported data tend to underestimate the prevalence of overweight and obesity,^{83,84} but there was no independent measurement of height and weight for the calculation of body mass index.

A measure of total energy expenditure rather than only that pertaining to leisure time would be more useful, as some individuals (notably men) may expend considerable amounts of energy in non-leisure time (at work, for instance).

The small sample size prevented a full analysis of some issues, and may have resulted in a failure to achieve statistically significant findings that would have emerged had the sample been larger.

People with a strong self-concept are more likely to be active, and they also tend to engage in self-care and avoid risky behaviour.^{10,12,85} This may explain the relationship between adolescent self-concept and obesity in young adulthood that emerged in the analysis of longitudinal NPHS data. Both boys and girls with strong self-concepts and who were not obese in 1994/95 had significantly lower odds of being obese six years later than did their counterparts whose self-concept was weak (Table 6).

Concluding remarks

According to the National Population Health Survey, the strength of self-concept in the teenage years had an impact on depression, self-perceived health, physical activity, and obesity in young adulthood. However, the lingering effects of self-concept differed for boys and girls and for younger and older adolescents.

Among girls, self-concept was relatively weak, and they were particularly susceptible to its effects. A weak self-concept in adolescence tended to put girls at risk of depression, poor self-perceived health and obesity in young adulthood. For boys, a weak self-concept was associated with subsequent obesity and becoming inactive. These negative effects, specifically on health behaviour, may persist beyond young

adulthood into later life when individuals are more prone to chronic illness. Thus, the impact of adolescent self-concept has the potential to be felt much longer than the six years covered by this analysis.

A strong self-concept, especially among girls, appears to be a key factor in developing good mental and physical health. Equally important is the positive impact of emotional support for all adolescents—boys and girls, younger and older.

The results of this analysis have implications for families and for professionals who work with teenagers. While parents, educators and practitioners are undoubtedly aware of the immediate effects of adolescent self-concept, they may be less cognizant of the longer term. Moreover, given such consequences, health promotion policies and health education programs might benefit from including mechanisms to enhance adolescent self-esteem and mastery.

The findings of the cross-sectional analysis would suggest the maximization of emotional support resources during adolescence as an intervention strategy, with special attention to the groups most likely to have a weak self-concept: girls and adolescents in lower-income households.

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Appendix

Table A
Distribution of selected characteristics, population aged 12 to 19, Canada excluding territories, 1994/95

	Sample size	Estimated population	
		'000	%
1994/95 cross-sectional file			
Total	1,684	3,022	100.0
Boys	833	1,552	51.4
Girls	851	1,470	48.6
Age group			
12 to 15	750	1,487	49.2
16 to 19	934	1,535	50.8
Household income			
Lowest/Lower-middle	367	544	18.0
Middle	490	964	31.9
Upper-middle/Highest	750	1,359	45.0
Missing	77	155	5.1
Living arrangements			
With one parent	318	441	14.6
Other	277	427	14.1
With both parents	1,075	2,125	70.3
Missing	14	30	1.0
1994/95 to 2000/01 longitudinal file			
Total	1,089	3,085	100.0
Boys	511	1,567	50.8
Girls	578	1,518	49.2
Age group			
12 to 15	517	1,583	51.3
16 to 19	572	1,502	48.7
Household income			
Lowest/Lower-middle	213	530	17.2
Middle	334	1,021	33.1
Upper-middle/Highest	490	1,361	44.1
Missing	52	174	5.6
Living arrangements			
With one parent	199	450	14.6
Other	154	381	12.4
With both parents	723	2,216	71.8
Missing	13	38	1.3

Date source: 1994/95 National Population Health Survey, cross-sectional sample, Health file; 1994/95 to 2000/01 National Population Health Survey, longitudinal sample, Health file

Note: Because of rounding, detail may not add to totals.

Witnessing violence— aggression and anxiety in young children

- One in twelve children aged 4 to 7 in 1998/99 had witnessed violence at home.
- Children who had seen violent behaviour were more likely than those who had not to be overtly aggressive.
- Levels of physical aggression remained high two and four years later for both sexes, and anxiety was high two years later for boys.

Abstract

Objectives

This article provides estimates of the percentage of children aged 4 to 7 who witnessed violence at home. Concurrent, short-term (2 years later) and longer-term (4 years later) associations between witnessing violence and overt aggression, indirect aggression, and anxiety are examined.

Data source

The data are from the cross-sectional and longitudinal components of the first three cycles of Statistics Canada's National Longitudinal Survey of Children and Youth.

Analytical techniques

The proportion of children who witnessed violence at home was estimated using weighted cross-sectional data from 1998/99. Multiple logistic regression analysis was used to examine concurrent, short-term and longer-term associations between witnessing violence and overt aggression, indirect aggression, and anxiety.

Main results

In 1998/99, an estimated 8% of children aged 4 to 7 were reported to have seen violent behaviour at home. Witnessing violence was concurrently associated with overt aggression for both sexes, indirect aggression among boys, and anxiety among girls. Witnessing violence was predictive of overt aggression two and four years later for both sexes. Girls also had high odds of exhibiting indirect aggression in 1996/97 and anxiety in 1998/99; for boys, elevated anxiety was observed in 1996/97.

Key words

child development, child behaviour, family relations, assaultive behaviour

Author

Kathleen Moss (613-951-1635; Kathleen.Moss@statcan.ca) is with the Health Statistics Division at Statistics Canada, Ottawa, Ontario, K1A 0T6.

Kathleen Moss

Exposure to violence in the home is now recognized as a form of child maltreatment.¹ Nonetheless, the findings of recent research on how witnessing violence may affect children are often unclear, contradictory and inconclusive.^{2,3}

Some studies have found that children exposed to family violence have more emotional or "internalizing" problems such as anxiety⁴⁻⁶ and behavioural or "externalizing" problems such as aggression than do children not exposed to family violence.⁷⁻⁹ Other studies have not always found such relationships.^{5,10,11} As well, some children experience negative effects in the short term, others have both short- and longer-term effects, and still others seem to experience no effects related to witnessing violence.¹² The immediate and longer-term associations between seeing violent behaviour and children's aggression and anxiety depend on the child's age and sex, the severity, intensity and chronicity of the violence, the child's perception of his or her role in the violence, and parental responses.¹³ However, much of the research has been based on data collected at one point in time;¹⁴ for example, retrospective accounts from adult survivors of family violence.¹⁵⁻¹⁷

With cross-sectional data from the 1998/99 National Longitudinal Survey of Children and Youth (NLSCY), this article presents prevalence estimates of witnessing violence at home for children aged 4 to 7 (see *Definitions*, *Limitations* and *Methods*). Both cross-sectional and longitudinal NLSCY data are used to study levels of aggression and anxiety in 1994/95, and two and four years later (in 1996/97 and 1998/99) among young children who, in 1994/95, were reported by a parent to have seen violent behaviour at home.

All associations are examined in multivariate models that control for the influence of other variables known to affect the outcomes—characteristics of the child and the parent, family type, and parenting style. Because boys and girls react differently to witnessing violence,^{2,18,19} separate analyses are conducted for each sex.

One in twelve

According to results of the 1998/99 NLSCY, 1 in 12 children (8%) aged 4 to 7 had witnessed violence at home—an estimated 120,000 (Table 1). Most of them (64%) had "seldom" seen violent behaviour. For about a third (30%), the experience had occurred "sometimes," and for 5%, "often." Boys and girls were equally likely to have seen violent behaviour.

Witnessing violence was more common among children with an older parent (35 or older) or with other siblings in the household.

Socio-economic status seemed to make a difference: children whose reporting parent had less than secondary graduation were more likely to have witnessed violence than those whose parent had a higher level of education. There was also a link with household income—children in low- or lower-middle

Definitions

In the National Longitudinal Survey of Children and Youth, the extent of violence witnessed by children in their homes was determined by asking a parent (the person most knowledgeable about the child or PMK), "How often does the child see adults or teenagers in the home physically fighting, hitting or otherwise trying to hurt others?" The response categories were "often," "sometimes," "seldom" and "never." For this analysis, children who were reported to have witnessed violence often, sometimes or seldom were classified as having witnessed violence. When no information about *witnessing violence* was provided, records were excluded.

In 88.8% of all cases, the PMK was the biological mother, and in another 8.7% of cases, the biological father. Therefore, in this article, the term "parent" is used rather than PMK.

The following age groups were established for the parent: younger than 35, and 35 or older.

Three *family types* were established: two biological/adoptive parents; two parents with at least one step-parent; and lone-parent. Children who did not live with a parent or who were living with foster parents were excluded from the analysis.

The number of *siblings in the household* was categorized as none or at least one (including full-, half-, step-, adopted and foster siblings).

The *parent's education* was classified as: less than secondary graduation, secondary graduation, or at least some postsecondary.

Employment status of the parent was either *employed* or not currently working.

Household income was determined according to total household income from all sources in the previous 12 months and the number of household members.

Household income group	People in household	Total household income
Lowest/Lower-middle	1 to 4 5 or more	Less than \$20,000 Less than \$30,000
Middle/Upper-middle/ Highest	1 to 4 5 or more	\$20,000 or more \$30,000 or more

To measure parents' perceived emotional support, they were asked to respond to the following statements on a four-point scale ranging from "strongly disagree" (score 0) to "strongly agree" (score 3):

- If something went wrong, no one would help me. (Reverse scored.)
- I have family and friends who help me feel safe, secure and happy.
- There is someone I trust whom I would turn to for advice if I were having problems.
- There is no one I feel comfortable talking about problems with. (Reverse scored.)
- I lack a feeling of closeness with another person. (Reverse scored.)
- There are people I can count on in an emergency.

The responses were summed, with potential values ranging from 0 to 18 (Cronbach's alpha = 0.82). Scores of 11 or less were considered to indicate *low emotional support*. This cut-off was established based on the lowest quartile of the weighted distribution of the 1994/95 cross-sectional data.

income households were almost twice as likely to have witnessed violence as children in middle- or higher-income homes.

Table 1
Prevalence of witnessing violence at home, by selected characteristics, household population aged 4 to 7, Canada excluding territories, 1998/99

	%
Both sexes	8.1
Boy [†]	8.2
Girl	8.0
Child's age	
4 or 5 [†]	8.3
6 or 7	7.9
Parent's age	
Younger than 35 [†]	6.8
35 or older	9.3*
Family type	
Two biological/adoptive parents [†]	7.5
Two parents (at least one step-parent)	6.9 ^{E2}
Lone parent	11.4*
Siblings in household	
None	4.7 ^{E1}
One+ [†]	8.7*
Parent's education	
Less than secondary graduation	11.9*
Secondary graduation	8.2
At least some postsecondary [†]	7.4
Parent employed	
Yes [†]	8.1
No	8.4 ^{E1}
Household income	
Lowest/Lower-middle	13.1*
Middle/Upper-middle/Highest [†]	7.3
Parent has low emotional support	
Yes	9.1
No [†]	8.0
Parenting style	
Low positive interaction	
Yes	10.8*
No [†]	7.3
Low consistency	
Yes	11.8*
No [†]	7.1
Hostile	
Yes	12.1*
No [†]	7.0
Punitive	
Yes	12.3*
No [†]	7.3

Data source: 1998/99 National Longitudinal Survey of Children and Youth, cross-sectional file

Note: Based on 11,484 records

[†] Reference category

E1 Coefficient of variation between 16.6% and 25.0%

E2 Coefficient of variation between 25.1% and 33.3%

* Significantly higher than reference category ($p < 0.05$, adjusted for multiple comparisons)

A relatively high proportion (11%) of children in lone-parent families had witnessed violence. The likelihood that children living with a step-parent would have seen violent behaviour at home was about the same as for children living with two biological/adoptive parents (around 7%).

This analysis of NLSCY data indicated that parenting style was a factor in witnessing violence, a finding consistent with other research.²⁰ Higher rates were reported for children whose parents gave little positive feedback, were inconsistent, or were quite hostile or punitive (see *Parenting style*).

For most children, witnessing violence at home was not a recurrent experience. Close to 60% of those reported to have witnessed violence in 1994/95 did not do so in the two subsequent survey cycles. Approximately one-quarter (24%) witnessed violence in 1996/97, and 29% in 1998/99.

Nonetheless, having witnessed violence in 1994/95 had both an immediate and longer-term association with children's aggression and anxiety (see *Aggression and anxiety*).

Overt aggression

Fighting, making threats, getting angry, and bullying are all signs of overt aggression. For both boys and girls, witnessing violence at home was associated with such behaviour in the short-term. Forty-three percent of boys who witnessed violence in 1994/95 were overtly aggressive, compared with 25% of boys who had not observed violence (Chart 1). The figures were lower among girls, but the gap remained: 27% versus 17%.

Of course, many other factors may have played a role in the children's aggressive behaviour; for example, family type, socio-economic status and parenting practices. Yet even when these and other potential confounders were taken into account, having witnessed violence was independently associated with overt aggression among both sexes in 1994/95 (Table 2, Appendix Table A). The high odds of overt aggression among girls is somewhat unexpected. Other studies have found that girls are more likely to react with internalizing behaviour such as anxiety, rather than externalizing behaviour such as aggression.²¹

For both sexes, levels of aggression remained elevated. Boys and girls who witnessed violence in 1994/95 were more likely than those who had not to exhibit overt aggression two (in 1996/97) and four (in 1998/99) years later. Previous research has also found that although children's reactions may be more pronounced immediately after they have been

Parenting style

Four scales were used to establish parenting style: positive interaction, consistent, hostile/ineffective, and punitive.

To measure *positive interaction*, the parent was asked to respond to five statements on a five-point scale: "never" (score 0), "about once a week or less" (1), "a few times a week" (2), "one or two times a week" (3) or "many times each day" (4).

- How often do you praise him/her, by saying something like "Good for you!" or "What a nice thing you did!" or "That's good going!"?
- How often do you and he/she talk or play with each other, focusing attention on each other for five minutes or more, just for fun?
- How often do you and he/she laugh together?
- How often do you do something special with him/her that he/she enjoys?
- How often do you play sports, hobbies or games with him/her?

The responses were summed with potential values ranging from 0 to 20 (Cronbach's alpha = 0.81). Scores of 11 or less (the lowest quartile of the weighted distribution of the 1994/95 cross-sectional data) were considered to indicate low positive interaction.

To measure *consistency*, the parent was asked to respond to five statements on a five-point scale: "never" (score 0), "less than half the time" (1), "about half the time" (2), "more than half the time" (3), or "all the time" (4).

- When you give him/her a command or order to do something, what proportion of the time do you make sure that he/she does it?
- If you tell him/her, he/she will get punished if he/she doesn't stop doing something, and he/she keeps doing it, how often will you punish him/her?
- How often does he/she get away with things that you feel should have been punished? (Reverse scored.)
- How often is he/she able to get out of a punishment when he/she really sets his/her mind to it? (Reverse scored.)
- How often when you discipline him/her, does he/she ignore the punishment? (Reverse scored.)

The responses were summed with potential values ranging from 0 to 20 (Cronbach's alpha = 0.66). Scores of 12 or less (the lowest quartile of the weighted distribution of the 1994/95 cross-sectional data) were considered to indicate low consistency.

To identify *hostile/ineffective* parenting, the parent was asked to respond to five statements on a five-point scale: "never" (score 0), "about once a week or less" (1), "a few times a week" (2), "one or two times a week" (3), or "many times each day" (4).

- How often do you get annoyed with him/her for saying or doing something he/she is not supposed to?
- How often do you get angry when you punish him/her?
- How often do you think the kind of punishment you give him/her depends on your mood?
- How often do you feel you have problems managing him/her in general?
- How often do you have to discipline him/her repeatedly for the same thing?

The parent was also asked to respond to two statements on a five-point scale: "never" (score 0), "less than half the time" (1), "about half the time" (2), "more than half the time" (3), or "all of the time" (4).

- Of all the times you talk to him/her about his/her behaviour, what proportion is praise? (Reverse scored.)
- Of all the times you talk to him/her about his/her behaviour, what proportion is disapproval?

The responses to these seven questions were summed, with potential values ranging from 0 to 28 (Cronbach's alpha = 0.71). Scores of 12 or more (the highest quartile of the weighted distribution of the 1994/95 cross-sectional data) were considered to indicate high hostility.

To identify *punitive* parenting, the parent was asked to respond to four statements on a five-point scale: "never" (score 0), "rarely" (1), "sometimes" (2), "often" (3), or "always" (4). When he/she breaks the rules or does things that he/she is not supposed to, how often do you:

- Raise your voice, scold or yell at him/her?
- Calmly discuss the problem? (Reverse scored.)
- Use physical punishment?
- Describe alternative ways of behaving that are acceptable? (Reverse scored.)

The responses were summed with potential values ranging from 0 to 16 (Cronbach's alpha = 0.57). Scores of 7 or more (the highest quartile of the weighted distribution of the 1994/95 cross-sectional data) were considered to indicate punitive parenting.

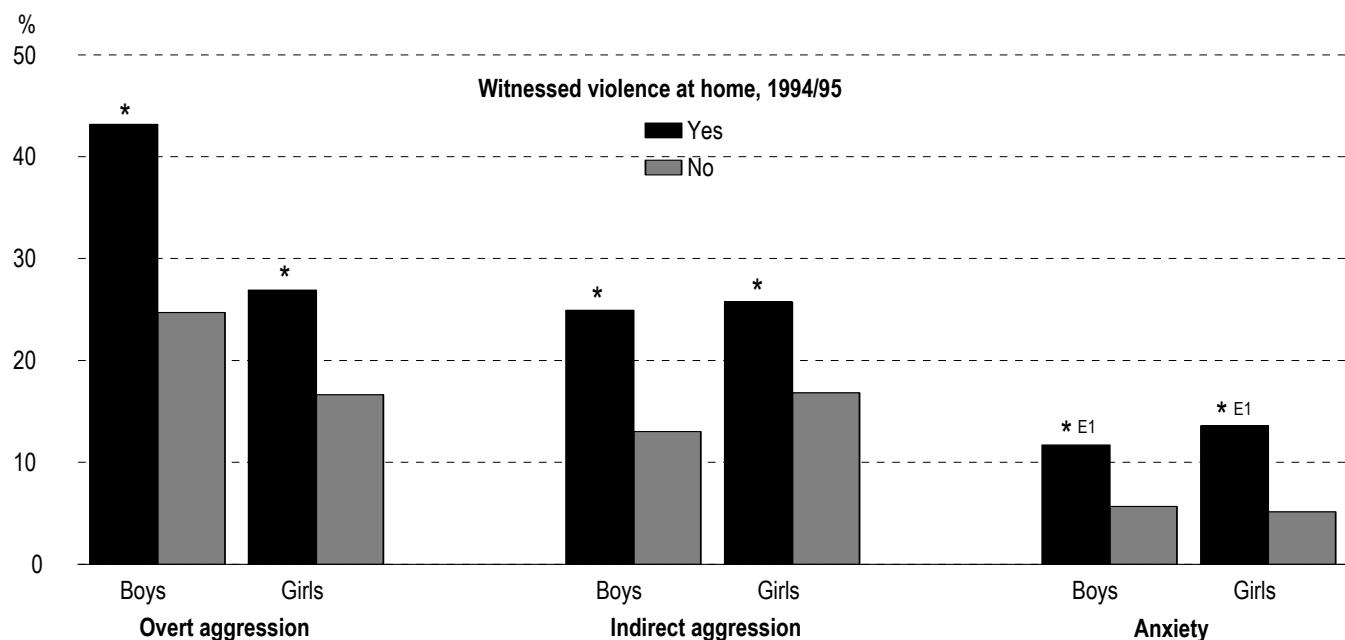
Indirect aggression

Aggression is not necessarily physical or overt. It may involve more subtle behaviour such as trying to get others to dislike or exclude a particular person, gossiping, and disclosing someone's secrets; in other words, indirect aggression.

exposed to violence, they can also display longer-term developmental and/or psychological problems, such as conduct disorder and antisocial or self-injurious behaviour.²² It has also been noted that conduct disorders such as aggression in childhood may be the single best predictor of future conduct disorders.²³

Chart 1

Overt aggression, indirect aggression, and anxiety, by sex and witnessing violence at home, household population aged 4 to 7, Canada excluding territories, 1994/95



Data sources: 1994/95 National Longitudinal Survey of Children and Youth, cross-sectional file

* Significantly higher than those who did not witness violence ($p < 0.05$)

E1 Coefficient of variation between 16.6% and 25.0%

Table 2

Adjusted odds ratios relating witnessing violence at home in 1994/95 to overt aggression, indirect aggression, and anxiety in 1994/95, 1996/97 and 1998/99, by sex, household population aged 4 to 7 in 1994/95, Canada excluding territories

	Boys						Girls					
	1994/95		1996/97		1998/99		1994/95		1996/97		1998/99	
	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI
Overt aggression												
Witnessed violence at home, 1994/95												
Yes	1.9*	1.2, 2.8	1.7*	1.1, 2.7	2.1*	1.0, 4.0	1.8*	1.1, 2.8	2.3*	1.3, 4.1	2.1*	1.2, 3.9
No†	1.0	...	1.0	...	1.0	...	1.0	...	1.0	...	1.0	...
Indirect aggression												
Witnessed violence at home, 1994/95												
Yes	1.6*	1.0, 2.4	1.1	0.6, 1.9	1.5	0.8, 2.8	1.4	0.8, 2.2	2.0*	1.2, 3.3	1.5	0.8, 2.5
No†	1.0	...	1.0	...	1.0	...	1.0	...	1.0	...	1.0	...
Anxiety												
Witnessed violence at home, 1994/95												
Yes	1.4	0.8, 2.6	1.9*	1.0, 3.6	1.0	0.5, 2.0	2.6*	1.4, 4.9	1.4	0.6, 3.1	2.2*	1.0, 4.6
No†	1.0	...	1.0	...	1.0	...	1.0	...	1.0	...	1.0	...

Data sources: 1994/95 National Longitudinal Survey of Children and Youth, cross-sectional file; 1994/95 to 1996/97 National Longitudinal Survey of Children and Youth, longitudinal file; 1994/95 to 1998/99 National Longitudinal Survey of Children and Youth, longitudinal file

Notes: Adjusted for: age of child; siblings in household; family type; household income; age, employment and emotional support of parent; and parenting style (Appendix Tables A to C). Because of rounding, some confidence intervals with 1.0 as lower limit are significant.

† Reference category

* Significantly different from reference category ($p < 0.05$)

... Not applicable

Aggression and anxiety

Three outcomes were considered in assessing the potential effects of witnessing violence on children: overt aggression, indirect aggression and anxiety.

To measure the child's level of *overt aggression*, the parent was asked to respond to six statements on a three-point scale: "never or not true" (score 0), "sometimes or somewhat true" (1), or "often or very true" (2). How often would you say that he/she:

- Gets into fights?
- When another child accidentally hurts him/her (such as by bumping into him/her), assumes that the other child meant to do it, and then reacts with anger and fighting?
- Physically attacks people?
- Threatens people?
- Is cruel, bullies or is mean to others?
- Kicks, bites, hits other children?

The responses were summed with potential values ranging from 0 to 12 (Cronbach's alpha = 0.77). Scores of 3 or more (the highest quartile of the weighted distribution of the 1994/95 cross-sectional data) were considered to indicate high overt aggression.

To measure *indirect aggression*, the parent was asked to respond to five statements on a three-point scale: "never or not true" (score 0), "sometimes or somewhat true" (1), or "often or very true" (2). How often would you say that when mad at someone he/she:

- Tries to get others to dislike that person?

- Becomes friends with another as revenge?
- Says bad things behind the other's back?
- Says to others: let's not be with him/her?
- Tells the other one's secrets to a third person?

The responses were summed with potential values ranging from 0 to 10 (Cronbach's alpha = 0.78). Scores of 3 or more (the highest quartile of the weighted distribution of the 1994/95 cross-sectional data) were considered to indicate high indirect aggression.

To measure the child's level of *anxiety*, the parent was asked to respond to eight statements using a three-point scale: "never or not true" (score 0), "sometimes or somewhat true" (1), or "often or very true" (2). How often would you say that he/she:

- Seems to be unhappy, sad or depressed?
- Is not as happy as other children?
- Is too fearful or anxious?
- Is worried?
- Cries a lot?
- Appears miserable, unhappy, tearful, or distressed?
- Is nervous, high strung or tense?
- Has trouble enjoying him/herself?

The responses were summed with potential values ranging from 0 to 16 (Cronbach's alpha = 0.79). Scores of 7 or more (the highest quartile of the weighted distribution of the 1994/95 cross-sectional data) were considered to indicate high anxiety.

In 1994/95, levels of indirect aggression tended to be high among children who were reported to have witnessed violence at home. Around a quarter of such boys and girls displayed indirect aggression, compared with 13% of boys and 17% of girls who had not witnessed violence (Chart 1). When other factors were taken into consideration, the relationship between witnessing violence and indirect aggression in 1994/95 remained for boys, although it was no longer significant for girls (Table 2, Appendix Table B). However, two years later (in 1996/97), girls who had witnessed violence in 1994/95 had high levels of indirect aggression.

Anxiety

A child classified as having high anxiety was, in the parent's opinion, unhappy, fearful and tense. Such characteristics were relatively common among children who had witnessed violence, compared with their contemporaries who had not done so. In 1994/95, 12% of boys who had witnessed violence had a high

level of anxiety, compared with 6% of those who had not; the corresponding percentages for girls were 14% and 5% (Chart 1). For boys, the relationship between witnessing violence and anxiety in 1994/95 did not persist when factors such as family type and parenting style were taken into account (Table 2, Appendix Table C). By contrast, for girls, even allowing for the effects of these other variables, the odds of high anxiety in 1994/95 were over two times greater for those who had witnessed violence, compared with those who had not.

Research has found that the earlier children exhibit anxiety, the more likely it will last and influence their future behaviour.³ Similarly, results of the analysis of NLSCY data show that for both sexes, witnessing violence in 1994/95 was significantly associated with anxiety in the future—two years later for boys, and four years later for girls. The high odds of anxiety among boys is somewhat surprising. Other studies have found that boys are more likely to react with externalizing behaviour such as physical aggression.²¹

Limitations

The National Longitudinal Survey of Children and Youth (NLSCY) is a general survey that was designed to monitor child development; therefore, questions about physical violence in the home are limited. The severity of the violence is unknown, and it is not possible to differentiate between children who were reported to have witnessed violence and those who may have been victims of physical violence themselves. The NLSCY asks only about violence that children see; no information is provided about the more covert ways in which children may be exposed to violence (heard the confrontation or experienced the aftermath). As well, the questions pertain only to physical violence and do not include emotional abuse such as verbal insults.

The analysis is based on information provided by a parent. Most notably, "violence in the home" is the parent's interpretation and depends on his or her willingness to disclose such information. Parents may intentionally minimize, deny or discount the extent of the violence because of embarrassment or fear of the consequences, or because they simply do not believe it is "violence." A 1994 study found that 10% of the children in a community-based sample reported witnessing inter-parental violence that neither parent had acknowledged.²⁴ As well, parents may falsely assume that their children are not aware of the violence. A Canadian study reported that many parents believed their children were sleeping or playing during a violent episode, yet these children were able to provide detailed accounts of the events that they supposedly did not witness.¹⁹

In addition to their reluctance to report that their child has witnessed violence, parents' wish to provide socially desirable answers may have influenced their descriptions of their parenting style and of their child's behaviour. The account of children's behaviour comes from only one source, typically the mother. When parents are the

Furthermore, these findings are particularly notable given that anxiety is less visible than aggression; therefore, it is more difficult to identify in younger children.²⁵⁻²⁷

Concluding remarks

In 1998/99, 1 in 12 children aged 4 to 7 was reported to have witnessed violence at home. For most of these young children, this was an infrequent occurrence that was not evident two and four years later. Even so, the experience was related to short- and longer-term behaviour and emotional problems.

perpetrators or victims of abuse, or the partners of child abusers, their ability to assess their children's behaviour may be compromised.⁶ For example, parents may project their own frustrations onto their children, and distressed parents are known to rate their children's behaviour more critically than would objective observers.²⁸

In some cases, the violence observed by children may have involved teenage siblings. However, it was not possible to determine who was involved in the violence, although this might influence the relationship between witnessing violence and the outcomes.

Although the NLSCY is longitudinal, small sample sizes precluded the possibility of examining the outcome variables in relation to repeated witnessing of violence.

Even with the longitudinal data, a temporal relation was not established, and causality cannot be inferred. The elevated levels of aggression and anxiety may have existed before witnessing violence. Furthermore, there may be variables associated with the outcomes that were not taken into account in the multivariate analyses. The importance of these variables as potential confounders is unknown.

Results of this study may differ from those of other studies because of differences in the scales used to measure overt aggression, indirect aggression, and anxiety.

Excluding children who lived in the Yukon, Nunavut and Northwest Territories, in institutions or on reserves, and those living with foster parents may have yielded different results than if the entire population of Canadian children had been included. As well, many studies examining the effects of exposure to violence on children are based on residents of women's shelters. Children living in such facilities would not be covered by the NLSCY.

The cross-sectional results indicate that for both sexes, witnessing violence was concurrently associated with high levels of overt aggression. For boys, the experience was also linked with indirect aggression, and for girls, with anxiety. Based on longitudinal data, boys and girls who witnessed violence in 1994/95 continued to be overtly aggressive two and four years later. Girls who witnessed violence in 1994/95 were also more likely to display indirect aggression in 1996/97 and anxiety in 1998/99, while for boys, elevated anxiety was observed in 1996/97.

Methods

Data source

The biennial National Longitudinal Survey of Children and Youth (NLSCY) is conducted by Statistics Canada and Human Resources Development Canada. The survey, which began in 1994/95, has longitudinal and cross-sectional components. It will follow a representative sample of Canadian children aged newborn to 11 in all provinces and territories into adulthood.

In each household, the person considered most knowledgeable (PMK) about the child completed a set of questions designed to provide socio-economic and general health information about him/herself and his/her spouse or partner and about the child, including the child's health and social environment.

In 1994/95 (cycle 1), a total of 15,579 households were selected to participate in the NLSCY. Of these, 13,439 responded, yielding an overall household response rate of 86.3%. In these responding households, up to 2 children were selected to follow over time. The response rate for these children was 92% in 1996/97 and 89% in 1998/99. The longitudinal response rates for the 1996/97 and 1998/99 (cycles 2 and 3), based on the respondents in cycle 1, were 92% and 89%, respectively.

This analysis focuses on a subsample of 7,268 children in the 10 provinces, who were aged 4 to 7 in 1994/95. Children who were not living with parents or who were living with foster parents were excluded. Sample sizes for the cross-sectional and longitudinal files can be found in the Appendix (Tables D to G).

Analytical techniques

The prevalence of witnessing violence was determined based on the 1998/99 NLSCY. Descriptive statistics based on the 1998/99 cross-sectional file were used to determine the prevalence of witnessing violence in relation to selected characteristics of the child,

This analysis has the advantage of population-based longitudinal data—something not available for most previous research on aggression and anxiety among children in relation to violence at home. As well, the ability to control for the many potentially confounding variables that are included in the National

parent and family.

The 1994/95 cross-sectional file was used to examine concurrent associations between witnessing violence and three outcomes: overt aggression, indirect aggression, and anxiety. Relationships between witnessing violence and these outcomes in 1994/95 were considered in a series of multivariate models that controlled for demographic, socio-economic, family and parenting characteristics believed to play a role in the relationship.

The longitudinal file was used to measure associations between witnessing violence in 1994/95 and high levels of overt aggression, indirect aggression and anxiety two years later (1996/97) and four years later (1998/99). Again, associations were examined in multivariate regression models. In all regression models, the continuous scales used to measure the three outcome variables were dichotomized due to highly skewed distributions.

Because the NLSCY does not measure the three outcomes when the child is older than 11, the analysis was restricted to children aged 4 to 7 in 1994/95 to ensure that they were not older than 11 in 1998/99 at the time of the cycle 3 interviews.

Children who were not living with parents or who were living in a foster home were excluded from the analyses. This amounted to the removal of less than half a percent of child records.

The 1994/95 cross-sectional and longitudinal data were weighted to reflect the population of the 10 provinces in 1994/95. The 1998/99 cross-sectional file was weighted to reflect population levels in 1998/99. The bootstrap technique was used to account for the design effect of the survey in variance estimations and significance tests.^{29,30} The significance level was set at $p < 0.05$. In September 2003, revisions were made to the NLSCY weights. This analysis was based on the weights prior to those revisions.

Longitudinal Survey of Children and Youth enhances the analysis. The results add to the emerging evidence that witnessing violence is associated with aggression and anxiety in young children, and that these problems persist in both the short- and longer-term. ■

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Appendix

Table A

Adjusted odds ratios relating witnessing violence at home in 1994/95 to overt aggression in 1994/95, 1996/97 and 1998/99, by sex and selected characteristics in 1994/95, household population aged 4 to 7, Canada excluding territories

Characteristics in 1994/95	Boys Overt aggression in:						Girls Overt aggression in:					
	1994/95		1996/97		1998/99		1994/95		1996/97		1998/99	
	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI
Witnessed violence at home, 1994/95												
Yes	1.9*	1.2, 2.8	1.7*	1.1, 2.7	2.1*	1.0, 4.0	1.8*	1.1, 2.8	2.3*	1.3, 4.1	2.1*	1.2, 3.9
No [†]	1.0	...	1.0	...	1.0	...	1.0	...	1.0	...	1.0	...
Child's age												
4 or 5 [†]	1.0	...	1.0	...	1.0	...	1.0	...	1.0	...	1.0	...
6 or 7	0.8	0.7, 1.0	1.0	0.7, 1.4	1.0	0.6, 1.4	0.7*	0.6, 1.0	0.6*	0.4, 0.9	1.1	0.8, 1.6
Parent's age												
Younger than 35	1.2	1.0, 1.6	1.3	1.0, 1.9	1.2	0.8, 1.7	1.3	0.9, 1.7	1.1	0.7, 1.6	2.1*	1.4, 3.2
35 or older [†]	1.0	...	1.0	...	1.0	...	1.0	...	1.0	...	1.0	...
Siblings in household												
None	0.7	0.5, 1.0	0.9	0.5, 1.5	0.8	0.5, 1.4	0.6	0.4, 1.1	0.5*	0.3, 0.8	0.5	0.2, 1.2
One+ [†]	1.0	...	1.0	...	1.0	...	1.0	...	1.0	...	1.0	...
Family type												
Two biological/adoptive parents [†]	1.0	...	1.0	...	1.0	...	1.0	...	1.0	...	1.0	...
Two parents (at least one step-parent)	0.8	0.5, 1.3	0.8	0.4, 1.6	0.5	0.2, 1.3	0.7	0.3, 1.3	2.6*	1.2, 5.6	0.7	0.2, 2.7
Lone parent	1.8*	1.3, 2.5	1.2	0.7, 1.9	1.6	1.0, 2.8	1.6	0.9, 2.6	1.9*	1.0, 3.4	1.2	0.6, 2.2
Parent's education												
Less than secondary graduation	1.1	0.7, 1.5	0.9	0.5, 1.4	1.4	0.8, 2.2	0.9	0.6, 1.2	1.2	0.7, 2.0	0.9	0.5, 1.6
Secondary graduation	0.8	0.6, 1.0	1.0	0.7, 1.4	0.7*	0.5, 1.0	0.7	0.5, 1.2	1.1	0.7, 2.0	1.0	0.6, 1.6
At least some postsecondary [†]	1.0	...	1.0	...	1.0	...	1.0	...	1.0	...	1.0	...
Parent employed												
Yes [†]	1.0	...	1.0	...	1.0	...	1.0	...	1.0	...	1.0	...
No	1.0	0.7, 1.3	1.1	0.8, 1.5	0.8	0.5, 1.2	1.2	0.9, 1.6	0.9	0.6, 1.3	1.0	0.6, 1.4
Household income												
Lowest/Lower-middle	0.8	0.6, 1.1	1.0	0.6, 1.7	1.3	0.8, 2.0	0.7	0.5, 1.1	0.6	0.4, 1.0	1.2	0.7, 2.1
Middle/Upper-middle/Highest [†]	1.0	...	1.0	...	1.0	...	1.0	...	1.0	...	1.0	...
Parent has low emotional support												
Yes	0.8	0.5, 1.2	1.3	0.8, 2.0	1.4	0.8, 2.4	1.0	0.6, 1.6	1.9*	1.1, 3.3	1.3	0.6, 2.6
No [†]	1.0	...	1.0	...	1.0	...	1.0	...	1.0	...	1.0	...
Parenting style												
Low positive interaction	1.0	0.8, 1.4	0.8	0.6, 1.2	1.0	0.6, 1.5	1.0	0.7, 1.4	1.7*	1.0, 2.8	1.2	0.7, 1.9
Low consistency	1.2	0.9, 1.5	1.4	0.9, 2.0	1.1	0.8, 1.7	1.0	0.7, 1.4	0.9	0.6, 1.4	0.9	0.6, 1.5
Hostile	3.3*	2.6, 4.3	2.2*	1.6, 3.1	2.1*	1.4, 3.1	3.9*	2.8, 5.3	2.6*	1.6, 4.1	2.3*	1.5, 3.5
Punitive	1.4*	1.1, 2.0	1.3	0.9, 1.8	1.5*	1.0, 2.3	1.4	1.0, 2.0	1.5	1.0, 2.4	1.2	0.7, 1.9
Model information												
Sample size	3,496		2,193		1,899		3,433		2,196		1,901	
Sample with high physical aggression	1,006		505		435		643		314		288	
Records dropped because of missing values	190		114		235		149		93		218	

Data sources: 1994/95 National Longitudinal Survey of Children and Youth, cross-sectional file; 1994/95 to 1996/97 National Longitudinal Survey of Children and Youth, longitudinal file; 1994/95 to 1998/99 National Longitudinal Survey of Children and Youth, longitudinal file

Notes: When not noted, reference category is absence of characteristic; for example, reference category for "hostile" is "not hostile." Because of rounding, some confidence intervals with 1.0 as lower/upper limit are significant.

[†] Reference category

* Significantly different from reference category ($p < 0.05$)

... Not applicable

Table B

Adjusted odds ratios relating witnessing violence at home in 1994/95 to indirect aggression in 1994/95, 1996/97 and 1998/99, by sex and selected characteristics in 1994/95, household population aged 4 to 7, Canada excluding territories

Characteristics in 1994/95	Boys Indirect aggression in:						Girls Indirect aggression in:					
	1994/95		1996/97		1998/99		1994/95		1996/97		1998/99	
	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI
Witnessed violence at home, 1994/95												
Yes	1.6*	1.0, 2.4	1.1	0.6, 1.9	1.5	0.8, 2.8	1.4	0.8, 2.2	2.0*	1.2, 3.3	1.5	0.8, 2.5
No [†]	1.0	...	1.0	...	1.0	...	1.0	...	1.0	...	1.0	...
Child's age												
4 or 5 [†]	1.0	...	1.0	...	1.0	...	1.0	...	1.0	...	1.0	...
6 or 7	2.1*	1.5, 2.9	1.4*	1.0, 2.0	1.0	0.6, 1.5	2.3*	1.6, 3.2	1.4*	1.0, 2.0	1.0	0.7, 1.5
Parent's age												
Younger than 35	1.1	0.7, 1.6	1.8*	1.2, 2.7	1.0	0.7, 1.6	1.4	1.0, 1.9	0.8	0.6, 1.2	1.5*	1.0, 2.2
35 or older [†]	1.0	...	1.0	...	1.0	...	1.0	...	1.0	...	1.0	...
Siblings in household												
None	1.0	0.6, 1.7	1.1	0.6, 2.0	1.0	0.5, 1.7	0.8	0.4, 1.3	1.0	0.6, 1.6	0.7	0.4, 1.1
One+ [†]	1.0	...	1.0	...	1.0	...	1.0	...	1.0	...	1.0	...
Family type												
Two biological/adoptive parents [†]	1.0	...	1.0	...	1.0	...	1.0	...	1.0	...	1.0	...
Two parents (at least one step-parent)	1.3	0.6, 2.7	0.9	0.4, 1.8	0.6	0.2, 1.5	1.6	0.8, 3.2	2.5*	1.2, 4.9	0.6	0.2, 1.9
Lone parent	1.3	0.9, 2.0	1.6	0.9, 2.9	1.6	0.9, 2.9	2.3*	1.4, 3.9	2.2*	1.3, 3.8	1.6	0.9, 2.6
Parent's education												
Less than secondary graduation	1.1	0.7, 1.8	1.2	0.7, 2.0	2.4*	1.4, 4.1	1.0	0.7, 1.5	0.8	0.5, 1.2	1.2	0.7, 2.0
Secondary graduation	0.8	0.5, 1.1	1.3	0.8, 2.0	1.2	0.8, 1.9	1.0	0.7, 1.5	0.9	0.5, 1.4	1.2	0.7, 1.9
At least some postsecondary [†]	1.0	...	1.0	...	1.0	...	1.0	...	1.0	...	1.0	...
Parent employed												
Yes [†]	1.0	...	1.0	...	1.0	...	1.0	...	1.0	...	1.0	...
No	0.7	0.4, 1.1	1.3	0.9, 2.0	0.7	0.4, 1.1	1.1	0.8, 1.6	1.1	0.8, 1.5	0.6*	0.4, 1.0
Household income												
Lowest/Lower-middle	1.6*	1.0, 2.6	1.1	0.6, 1.9	1.0	0.6, 1.6	0.7	0.5, 1.2	0.8	0.5, 1.4	1.0	0.6, 1.6
Middle/Upper-middle/Highest [†]	1.0	...	1.0	...	1.0	...	1.0	...	1.0	...	1.0	...
Parent has low emotional support												
Yes	1.4	0.8, 2.3	1.1	0.6, 1.9	1.3	0.7, 2.6	1.0	0.6, 1.7	1.1	0.6, 1.8	1.0	0.5, 2.1
No [†]	1.0	...	1.0	...	1.0	...	1.0	...	1.0	...	1.0	...
Parenting style												
Low positive interaction	1.2	0.9, 1.8	1.1	0.7, 1.7	1.3	0.7, 2.2	1.3	0.9, 1.8	1.5	1.0, 2.3	1.5	1.0, 2.3
Low consistency	1.6*	1.1, 2.2	1.5*	1.0, 2.2	1.6	1.0, 2.6	1.4*	1.0, 2.0	1.3	0.9, 2.0	1.5	1.0, 2.3
Hostile	2.3*	1.7, 3.1	1.5*	1.0, 2.3	2.9*	1.9, 4.4	2.2*	1.5, 3.1	2.1*	1.3, 3.2	1.6	1.0, 2.6
Punitive	1.1	0.8, 1.6	1.2	0.8, 1.9	1.1	0.7, 1.8	1.6*	1.1, 2.3	1.1	0.7, 1.5	1.5	1.0, 2.4
Model information												
Sample size	3,414		2,082		1,788		3,342		2,107		1,809	
Sample with high indirect aggression	498		330		272		543		443		397	
Records dropped because of missing values	272		225		346		240		182		310	

Data sources: 1994/95 National Longitudinal Survey of Children and Youth, cross-sectional file; 1994/95 to 1996/97 National Longitudinal Survey of Children and Youth, longitudinal file; 1994/95 to 1998/99 National Longitudinal Survey of Children and Youth, longitudinal file

Notes: When not noted, reference category is absence of characteristic; for example, reference category for "hostile" is "not hostile." Because of rounding, some confidence intervals with 1.0 as lower/upper limit are significant.

[†] Reference category

* Significantly different from reference category ($p < 0.05$)

... Not applicable

Table C

Adjusted odds ratios relating witnessing violence at home in 1994/95 to anxiety in 1994/95, 1996/97 and 1998/99, by sex and selected characteristics in 1994/95, household population aged 4 to 7, Canada excluding territories

Characteristics in 1994/95	Boys Anxiety in:						Girls Anxiety in:					
	1994/95		1996/97		1998/99		1994/95		1996/97		1998/99	
	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI
Witnessed violence at home, 1994/95												
Yes	1.4	0.8, 2.6	1.9*	1.0, 3.6	1.0	0.5, 2.0	2.6*	1.4, 4.9	1.4	0.6, 3.1	2.2*	1.0, 4.6
No [†]	1.0	...	1.0	...	1.0	...	1.0	...	1.0	...	1.0	...
Child's age												
4 or 5 [†]	1.0	...	1.0	...	1.0	...	1.0	...	1.0	...	1.0	...
6 or 7	2.4*	1.5, 3.8	1.1	0.7, 1.6	0.8	0.5, 1.3	1.6	1.0, 2.6	1.3	0.8, 2.2	1.0	0.5, 1.8
Parent's age												
Younger than 35	1.3	0.8, 2.2	1.7	1.0, 2.7	1.2	0.7, 1.8	1.5	0.9, 2.3	1.6	1.0, 2.7	2.6*	1.4, 4.7
35 or older [†]	1.0	...	1.0	...	1.0	...	1.0	...	1.0	...	1.0	...
Siblings in household												
None	0.9	0.4, 1.8	0.6	0.3, 1.1	2.6*	1.4, 4.9	0.6	0.3, 1.3	1.0	0.5, 2.0	0.4*	0.2, 0.9
One+ [†]	1.0	...	1.0	...	1.0	...	1.0	...	1.0	...	1.0	...
Family type												
Two biological/adoptive parents [†]	1.0	...	1.0	...	1.0	...	1.0	...	1.0	...	1.0	...
Two parents (at least one step-parent)	1.4	0.6, 3.2	1.7	0.7, 3.9	0.9	0.4, 2.2	0.9	0.4, 2.0	2.2	0.8, 5.9	1.0	0.4, 2.5
Lone parent	2.4*	1.4, 4.1	2.6*	1.6, 4.4	2.1*	1.1, 3.9	1.3	0.6, 2.9	1.5	0.7, 3.2	1.6	0.9, 2.9
Parent's education												
Less than secondary graduation	0.8	0.4, 1.6	0.9	0.5, 1.7	0.7	0.4, 1.5	0.9	0.4, 1.8	1.4	0.8, 2.4	0.9	0.5, 1.7
Secondary graduation	0.9	0.5, 1.5	1.0	0.6, 1.7	0.5*	0.3, 1.0	1.2	0.7, 2.1	0.7	0.3, 1.5	0.5	0.2, 1.1
At least some postsecondary [†]	1.0	...	1.0	...	1.0	...	1.0	...	1.0	...	1.0	...
Parent employed												
Yes [†]	1.0	...	1.0	...	1.0	...	1.0	...	1.0	...	1.0	...
No	0.8	0.5, 1.4	1.2	0.8, 2.0	1.1	0.7, 1.8	1.5	1.0, 2.5	0.5*	0.3, 0.8	0.7	0.5, 1.2
Household income												
Lowest/Lower-middle	1.3	0.7, 2.3	0.9	0.6, 1.5	1.4	0.8, 2.3	0.9	0.4, 1.9	0.9	0.5, 1.6	1.3	0.8, 2.1
Middle/Upper-middle/Highest [†]	1.0	...	1.0	...	1.0	...	1.0	...	1.0	...	1.0	...
Parent has low emotional support												
Yes	1.1	0.6, 2.1	0.7	0.3, 1.6	1.1	0.5, 2.6	0.6	0.3, 1.2	1.2	0.6, 2.4	1.1	0.5, 2.5
No [†]	1.0	...	1.0	...	1.0	...	1.0	...	1.0	...	1.0	...
Parenting style												
Low positive interaction	0.7	0.4, 1.3	1.0	0.5, 1.8	1.1	0.7, 1.7	1.3	0.7, 2.3	1.2	0.7, 2.1	1.4	0.7, 2.7
Low consistency	1.2	0.8, 1.8	0.9	0.5, 1.4	1.2	0.6, 2.1	1.2	0.7, 1.9	0.9	0.5, 1.5	1.1	0.6, 1.8
Hostile	4.3*	2.8, 6.5	3.2*	2.0, 5.2	3.7*	2.4, 5.9	3.7*	2.3, 6.1	1.9*	1.0, 3.6	1.7	0.9, 3.3
Punitive	1.2	0.7, 1.9	0.9	0.5, 1.4	0.8	0.5, 1.3	0.9	0.5, 1.4	1.3	0.7, 2.4	1.2	0.5, 2.8
Model information												
Sample size	3,501		2,196		1,899		3,441		2,198		1,906	
Sample with high anxiety	237		208		215		206		179		161	
Records dropped because of missing values	185		111		235		141		91		213	

Data sources: 1994/95 National Longitudinal Survey of Children and Youth, cross-sectional file; 1994/95 to 1996/97 National Longitudinal Survey of Children and Youth, longitudinal file; 1994/95 to 1998/99 National Longitudinal Survey of Children and Youth, longitudinal file

Notes: When not noted, reference category is absence of characteristic; for example, reference category for "hostile" is "not hostile." Because of rounding, some confidence intervals with 1.0 as lower/upper limit are significant.

[†] Reference category

* Significantly different from reference category ($p < 0.05$)

... Not applicable

Table D

Cross-sectional file sample sizes for witnessing violence at home, by sex, household population aged 4 to 7, Canada excluding territories, 1998/99

	Boys			Girls		
	Sample size	Estimated population	Sample size	Estimated population		
	'000	%	'000	%		
Total	5,871	781	100	5,613	744	100
Witnessed violence at home						
Yes	434	61	8	407	56	8
No	5,268	684	88	5,032	649	87
Not stated	169	35	4	174	39 ^{E1}	5

Data source: 1998/99 National Longitudinal Survey of Children and Youth, cross-sectional file

Note: Because of rounding, detail may not add to totals.

E1 Coefficient of variation between 16.6% and 25.0%

Table E

Cross-sectional file sample sizes for witnessing violence at home and for aggression/anxiety outcomes, by sex, household population aged 4 to 7, Canada excluding territories, 1994/95

	Boys			Girls		
	Sample size	Estimated population	Sample size	Estimated population		
	'000	%	'000	%		
Total	3,686	800	100	3,582	762	100
Witnessed violence at home						
Yes	303	60	8	307	60	8
No	3,279	721	90	3,201	686	90
Not stated	104	19	2	74	17 ^{E1}	2
High overt aggression						
Yes	1,023	203	25	649	129	17
No	2,552	575	72	2,851	614	80
Not stated	111	21	3	82	19 ^{E1}	3
High indirect aggression						
Yes	510	105	13	553	128	17
No	2,970	648	81	2,850	597	78
Not stated	206	47	6	179	38	5
High anxiety						
Yes	243	48	6	209	43	6
No	3,338	732	92	3,303	705	92
Not stated	105	20	2	70	14 ^{E1}	2

Data source: 1994/95 National Longitudinal Survey of Children and Youth, cross-sectional file

Note: Because of rounding, detail may not add to totals.

E1 Coefficient of variation between 16.6% and 25.0%

Table F

Longitudinal file sample sizes for witnessing violence at home and for aggression/anxiety outcomes in 1996/97, by sex, household population aged 4 to 7 who witnessed violence in 1994/95, Canada excluding territories

	Boys			Girls		
	Sample size	Estimated population	Sample size	Estimated population		
	'000	%	'000	%		
Total	2,307	801	100	2,289	761	100
Witnessed violence at home, 1994/95						
Yes	169	55	7	183	61	8
No	2,109	738	92	2,076	684	90
Not stated	29	9 ^{E1}	1	30	16 ^{E2}	2
High overt aggression, 1996/97						
Yes	520	182	23	319	106	14
No	1,759	609	76	1,941	640	84
Not stated	28	10 ^{E2}	1	29	15 ^{E2}	2
High indirect aggression, 1996/97						
Yes	341	123	15	460	168	22
No	1,822	632	79	1,710	551	72
Not stated	144	46	6	119	43	6
High anxiety, 1996/97						
Yes	214	74	9	184	75	10
No	2,068	718	90	2,078	673	88
Not stated	25	9 ^{E2}	1	27	13 ^{E2}	2

Data source: 1994/95 to 1996/97 National Longitudinal Survey of Children and Youth, longitudinal file

Note: Because of rounding, detail may not add to totals.

E1 Coefficient of variation between 16.6% and 25.0%

E2 Coefficient of variation between 25.1% and 33.3%

Table G

Longitudinal file sample sizes for witnessing violence at home and for aggression/anxiety outcomes in 1998/99, by sex, household population aged 4 to 7 who witnessed violence in 1994/95, Canada excluding territories

	Boys			Girls			
	Sample size	Estimated population			Sample size	Estimated population	
			'000	%			
Total	2,134	757	100		2,119	708	100
Witnessed violence at home, 1994/95							
Yes	152	58	8		170	62	9
No	1,822	636	84		1,777	589	83
Not stated	160	63	8		172	57	8
High overt aggression, 1998/99							
Yes	454	151	20		291	80	11
No	1,521	541	71		1,666	568	80
Not stated	159	66	9		162	60	9
High indirect aggression, 1998/99							
Yes	278	91	12		411	147	21
No	1,580	553	73		1,451	468	66
Not stated	276	113	15		257	93	13
High anxiety, 1998/99							
Yes	222	79	11		166	58	8
No	1,753	616	81		1,796	597	84
Not stated	159	62	8		157	53	8

Data source: 1994/95 to 1998/99 National Longitudinal Survey of Children and Youth, longitudinal file

Note: Because of rounding, detail may not add to totals.