

# Physical activity in youth

## Prevalence, risk indicators, and solutions

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### Abstract

**Objective** To determine the unadjusted and adjusted associations between developmental, environmental, psychological, social, or demographic factors and meeting the Health Canada physical activity standard.

**Design** Survey.

**Setting** Saskatoon, Sask.

**Participants** Every student in grades 5 to 8 in Saskatoon was asked to complete the Saskatoon School Health Survey; 4197 students did so.

**Main outcome measures** Whether students met the Health Canada standard for daily physical activity and associated risk factors for not meeting the standard.

**Results** Among the 4197 youth who participated in the survey, only 7% met the Health Canada standard of daily physical activity longer than 1 hour of somewhat hard intensity or higher. Although there were 23 unadjusted factors associated with youth meeting the Health Canada standard, only 5 were significant after multivariate adjustment: 1) their fathers were employed (odds ratio [OR] 2.29,  $P=.027$ ), 2) their parents watched them participate in physical activities or sports every day (OR 1.23,  $P<.001$ ), 3) their friends encouraged them to do physical activities or sports every day (OR 1.19,  $P<.001$ ), 4) their friends or classmates did not tease them for not doing well at physical activities or sports every day (OR 1.20,  $P=.001$ ), and 5) they played sports or physical activities with coaches or instructors more than 4 times a week (OR 1.44,  $P<.001$ ).

**Conclusion** Given the low rates of physical activity among youth, we believe that a reduced list of independent risk indicators is required to focus our limited human and financial resources for successful intervention in the community.

### EDITOR'S KEY POINTS

- Health Canada indicates that youth require daily physical activity for longer than 1 hour per day at a somewhat hard intensity or higher. Previous research has shown that only 15% of boys and 5% of girls 11 to 14 years of age met national physical activity guidelines.
- In this study, only 7% of youth 9 to 15 years of age in grades 5 to 8 met the Health Canada standard for physical activity.
- Most of the independent risk indicators associated with physical inactivity in youth identified in this study are preventable through appropriate social policy implementation and support. In response to an open-ended question about how their school could help kids their age become more physically active, 44% of respondents requested more or longer gym time, 17.5% requested more or better sport programs at school, and 10.9% requested better equipment or facilities.

# Les jeunes et l'activité physique

## Prévalence, indicateurs de risque et solutions

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### Résumé

**Objectif** Déterminer les associations ajustées et non ajustées entre les facteurs environnementaux, psychologiques, sociaux, démographiques et relatifs à la croissance, et le fait de respecter les normes en matière d'activité physique de Santé Canada.

**Type d'étude** Enquête.

**Contexte** Saskatoon, Saskatchewan.

**Participants** On a demandé à tous les élèves des années scolaires 5 à 8 de répondre au Saskatoon School Health Survey; 4197 élèves l'ont fait.

**Principaux paramètres étudiés** Proportion d'élèves répondant aux normes en matière d'activité physique quotidienne de Santé Canada et facteurs de risque associés au fait de ne pas s'y conformer.

**Résultats** Sur les 4197 jeunes qui ont participé à l'étude, seulement 7 % respectaient les normes en matière de Santé Canada recommandant plus d'une heure d'activité physique quotidienne d'intensité moyennement à très élevée. Même s'il y avait 23 facteurs non ajustés associés au fait de respecter les normes de Santé Canada, seulement 5 d'entre eux étaient significatifs après ajustement multifactoriel: 1) leurs pères avaient un emploi (rapport de cotes [RC] 2,29,  $P=,027$ ); 2) leurs parents les surveillaient lorsqu'ils faisaient de l'activité physique ou des sports quotidiennement (RC 1,23,  $P=,001$ ); 3) leurs amis les encourageaient à faire de l'activité ou des sports chaque jour (RC 1,19,  $P=,001$ ); 4) leurs amis ou confrères de classe ne les agaçaient pas lorsqu'ils n'étaient pas bons dans les activités physiques ou les sports tous les jours (RC 1,20,  $P=,001$ ); et 5) ils s'adonnaient à des sports ou à de l'activité physique avec des entraîneurs ou des instructeurs plus de 4 fois par semaine (RC 1,44,  $P=,001$ ).

**Conclusion** Compte tenu du faible taux d'activité physique chez les jeunes, nous croyons qu'il faut utiliser une liste réduite d'indicateurs de risque indépendants si l'on veut que nos ressources humaines et financières limitées conduisent à des interventions efficaces dans la communauté.

### POINTS DE REPÈRE DU RÉDACTEUR

- Santé Canada indique que les jeunes ont besoin de plus d'une heure d'activité physique chaque jour à une intensité modérément à très élevée. Les recherches antérieures ont montré qu'à peine 15 % des garçons et 5 % des filles entre 11 et 14 ans respectaient les recommandations canadiennes pour l'activité physique.
- Dans cette étude, seulement 7 % des jeunes de 9 à 15 ans des années scolaires 5 à 8 respectaient les normes de Santé Canada en matière d'activité physique.
- La plupart des indicateurs de risque indépendants relatifs à l'inactivité physique identifiés dans cette étude peuvent être prévenus par l'instauration et le soutien de politiques sociales appropriées. En réponse à une question ouverte concernant la façon dont leur école pourrait amener les jeunes à faire plus d'activité physique, 44 % des répondants ont demandé des heures d'éducation physique plus nombreuses ou plus longues, 17,5 % des programmes de sport meilleurs ou plus nombreux à l'école et 19,9 % des meilleurs équipements ou installations sportives.

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Health Canada indicates that youth require daily physical activity at somewhat hard intensity or greater for 1 hour or longer.<sup>1</sup> The term *somewhat hard intensity* has not been defined by Health Canada. Despite this recommendation, the Active Healthy Kids Canada Report Card indicated that only 15% of boys and 5% of girls 11 to 14 years of age met national physical activity guidelines.<sup>2</sup> Similarly, in the United States, a national survey of youth found that only 11.9% of boys and 3.4% of girls aged 12 to 15 years met the US public health recommendation of moderate to vigorous physical activity for 60 minutes per day at least 5 days per week.<sup>3</sup>

Additionally, the World Health Organization reports that long-term physical inactivity causes 16% of all cases of diabetes and 22% of all cases of heart disease worldwide.<sup>4</sup> The World Health Organization also reports that long-term physical inactivity is associated with breast cancer, low back pain, osteoporosis, depression, and anxiety.<sup>4</sup> Another study recalculated causes of death by including risk factors and concluded that chronic physical inactivity was the second leading cause of mortality and was directly responsible for 16.6% of all deaths.<sup>5</sup> In the short term, physical inactivity in youth is associated with detrimental effects on bone strength and development, and with impaired mental health. It is also an important predictor of adult physical inactivity.<sup>6</sup>

A literature review of risk indicators for physical inactivity in youth described 3 general categories of determinants with 14 general subcategories; obviously, not all of these risk factors were independently associated with physical inactivity in youth after statistical adjustment for other variables.<sup>7</sup> As such, our main objective was to determine the unadjusted and adjusted associations between developmental, environmental, psychological, social, and demographic factors in meeting the Health Canada physical activity standard. This study was completed in Saskatoon, Sask, among children attending school in grades 5 to 8.

## METHODS

Every student in the city of Saskatoon in grades 5 to 8 was asked to complete the Saskatoon School Health Survey in February 2008. In 2008, there were 9825 youth registered in grades 5 to 8 between the public and Catholic school boards; 200 were ineligible to participate in the survey.

The School Health Action, Planning and Evaluation System (SHAPES) survey was used to measure the prevalence of physical activity.<sup>8-10</sup> The SHAPES survey was originally developed for youth in grades 5 to 12. The survey asks youth to document how many minutes

of moderate physical activity they performed in each of the past 7 days, including during physical activity classes, at lunch and recess, after school, during the evening, and during spare time. Participants answer the questions based on 15-minute activity intervals (0, 15, 30, 45, or 60 minutes) and by moderate or hard physical activity intensity levels. The survey's validity (Spearman  $\rho=0.44$ ) and reliability (mean  $\kappa$  coefficient=0.57) were formally tested and deemed to be acceptable.<sup>11</sup> The SHAPES survey was used to determine what percentage of youth met Health Canada's physical activity standard.<sup>1</sup>

The Physical Activity Stages questionnaire was used to determine the effects of environmental, psychological, parental-influence, role modeling, and peer-influence variables, among other factors, on meeting the physical activity standard.<sup>12-14</sup> The Physical Activity Stages questionnaire's reliability has been formally tested.<sup>15,16</sup>

The National Longitudinal Survey of Children and Youth developed by Statistics Canada was used to determine the effects of developmental limitations (grade, self-reported health, and body mass index) and psychological (self-reported mental health and self-esteem), social, and demographic influences (socioeconomic status, sex, and age) on meeting the physical activity standard.<sup>17</sup> Depressed mood was measured with the Center for Epidemiological Studies Depression Scale.<sup>18</sup> This scale has good internal consistency and content validity, with a Cronbach  $\alpha$  of .85.<sup>18,19</sup> Questions for the self-esteem scale used in the National Longitudinal Survey of Children and Youth come from the Self Description Questionnaire, which has an  $\alpha$  coefficient reliability range of .80 to .94.<sup>20</sup>

Using census data, postal codes, and existing municipal boundaries for neighbourhoods, we divided Saskatoon into 2 areas: 6 contiguous low-income neighbourhoods (as defined by Statistics Canada using low-income cutoffs) and the rest of Saskatoon.<sup>21</sup>

A 5-stage informed-consent protocol was used, including school boards, principals, teachers, parents, and the children themselves. Ethics approval was obtained from the University of Saskatchewan Behavioural Research Ethics Board.

Cross-tabulations were performed initially between the variable of whether the youth met the standard of being physically active and all potential explanatory variables. After these initial cross-tabulations, logistic regression was used to examine the independent relationships between the outcome variable of meeting the physical activity standard and all covariates. The unadjusted effect of each covariate was determined and then entered 1 step at a time based on changes in the -2 log likelihood and the Wald test.<sup>22</sup>

Finally, youth were also asked an open-ended question about what they thought their school could do to help kids their age become more physically active.

## RESULTS

Of 9625 youth eligible to participate, 4197 completed the questionnaire (43.6%). The demographic characteristics of the survey participants compared with data from the 2006 census are presented in **Table 1**. We are only able to compare data from Saskatoon adults with the reported parent's socioeconomic status because the census does not have socioeconomic information specifically on parents.<sup>23</sup> The only considerable difference not explained by the survey method is the potential underrepresentation of youth living in low-income neighbourhoods.

We found that only 7.0% of the youth completing our survey met Health Canada's physical activity standard. Given the low percentage, we further reviewed the results based on youth participation in physical activity for more than 1 hour per day at somewhat hard intensity or higher for at least 5 days per week (as opposed to 7) and found that only 10.0% of youth met this reduced definition (**Table 2**).

Before statistical adjustment, the variables of school grade ( $P=.024$ ), sex ( $P<.001$ ), cultural status ( $P=.001$ ), and father's employment status ( $P=.014$ ) had statistically significant associations with meeting the physical activity standard (**Table 3**). For example, 7.6% of children whose fathers were employed met the physical activity standard, compared with 3.4% of children whose fathers were not employed.

Before statistical adjustment, both sibling-influence variables, all 4 parental-influence variables, all 5 peer-influence variables, and 6 of 7 environmental-influence variables had statistically significant ( $P\leq.006$ ) associations with meeting the physical activity standard (**Tables 4 and 5**). For example, 15.8% of youth whose parents watched them participate in sports or physical activities every day met the physical activity standard, compared with 4.2% of youth whose parents watched 2 days a week or less.

Logistic regression was used to describe the independent relationships between the outcome variable of meeting the physical activity standard and all potential explanatory variables. After statistical adjustment, youth were more likely to meet the standard if the following factors were present: their fathers were employed (OR 2.29,  $P=.027$ ), their parents watched them participate in physical activities or sports every day (OR 1.23,  $P<.001$ ), their friends encouraged them to do physical activities or sports every day (OR 1.19,  $P<.001$ ), their friends or classmates did not tease them

**Table 1. Demographic information for Saskatoon School Health Survey respondents: Data from the 2006 census are also presented, if available.**

DEMOGRAPHIC INFORMATION	N (%)*	CENSUS DATA, %
Grade in school		
• 5	974 (23.2)	NA
• 6	1059 (25.2)	NA
• 7	1153 (27.5)	NA
• 8	985 (23.5)	NA
• No response	26 (0.6)	NA
Age, y		
• 9-10	902 (21.5)	NA
• 11	1044 (24.9)	NA
• 12	1124 (26.8)	NA
• 13-15	1096 (26.1)	NA
• No response	31 (0.7)	NA
Sex		
• Male	2039 (48.6)	51.0
• Female	2138 (50.9)	49.0
• No response	20 (0.5)	0.0
Cultural status		
• White	3222 (76.8)	82.7
• First Nations or Metis	422 (10.1)	10.0
• Other	474 (11.3)	7.3
• No response	79 (1.9)	0.0
Father is employed		
• Yes	3811 (90.8)	NA
• No	247 (5.9)	5.7
• No response	139 (3.3)	NA
Father's education level		
• Less than high school	195 (4.6)	22.5
• High school graduate	1139 (27.1)	29.2
• College or university graduate	2061 (49.1)	48.4
• No response	802 (19.1)	0.0
Father's occupation		
• Professional (manager or employment requiring degree)	1039 (24.8)	21.0
• Non-professional	2489 (59.3)	79.0
• No response	669 (15.9)	0.0
Mother is employed		
• Yes	3532 (84.2)	NA
• No	590 (14.1)	5.3
• No response	75 (1.8)	NA
Mother's education level		
• Less than high school	126 (3.0)	20.4
• High school graduate	1081 (25.7)	25.8
• College or university graduate	2357 (56.2)	46.3
• No response	633 (15.1)	0.0
Mother's occupation		
• Professional (manager or employment requiring degree)	1027 (24.5)	32.4
• Non-professional	2319 (55.3)	67.6
• No response	851 (20.3)	0.0
Neighbourhood income level of school		
• School in 1 of 6 low-income neighbourhoods	183 (4.4)	9.9
• School in other neighbourhood	4014 (95.6)	90.1

NA—not available.

\*N = 4197 Saskatoon youth in grades 5 to 8.

**Table 2. Percentage of youth meeting the PA standard and reduced PA definition: *N* = 4197.**

STANDARD	N (%)
PA standard (physically active 7 d/wk, moderate intensity or higher, 60 min at a time)	
• Meets standard	295 (7.0)
• Does not meet standard	3717 (88.6)
• No response	185 (4.4)
Reduced PA definition (physically active 5 d/wk, moderate intensity or higher, 60 min at a time)	
• Meets definition	420 (10.0)
• Does not meet definition	3598 (85.7)
• No response	179 (4.3)

PA—physical activity.

for not doing well at physical activities or sports every day (OR 1.20,  $P = .001$ ), and they played sports or physical activities with coaches or instructors more than 4 times a week (OR 1.44,  $P < .001$ ). These results are presented in **Table 6**.

Youth were asked an open-ended question regarding what they thought their school could do to help kids their age become more physically active. Of the 4197 respondents, 3501 offered potential solutions. The answers were grouped into general categories. Overall, 44% requested more or longer gym time, 17.5% requested more or better sport programs at school, and 10.9% requested better equipment or facilities.

## DISCUSSION

In August 2008, the provincial ministers responsible for sports, physical activity, and recreation set a goal to increase the percentage of children and youth meeting physical activity guidelines from 10% in 2005 to 17% in 2015.<sup>2</sup>

In our study, only 7% of youth 9 to 15 years of age in grades 5 to 8 met the Health Canada standard for physical activity. This finding is consistent with a national report that found only 15% of boys and 5% of girls 11 to 14 years of age met national physical activity guidelines.<sup>2</sup>

Before statistical adjustment, we found 2 developmental, 6 environmental, 1 psychological, 11 social, 2 demographic, and 1 socioeconomic risk factor associated with not meeting the physical activity standard. The developmental risk factors included self-reported poor health, and maturation or grade level. The environmental risk factors included lack of supplies or equipment; distance to playgrounds, parks, or gyms; lack of safety in neighbourhoods to walk or jog; lack of access to sports or physical activities without instructors; lack of access to sports or physical activities with instructors; and lack of access to individual activities

**Table 3. Percentage of youth meeting the PA standard by demographic characteristics and socioeconomic status**

CHARACTERISTIC	PERCENTAGE MEETING PA STANDARD	P VALUE
Grade in school		.024
• 5	5.2	
• 6	7.0	
• 7	7.9	
• 8	8.8	
Age, y		.171
• 9–10	5.5	
• 11	7.1	
• 12	7.8	
• 13–15	8.4	
Sex		< .001
• Male	9.2	
• Female	5.6	
Cultural status		.001
• White	8.2	
• First Nations or Metis	4.6	
• Other	4.2	
Father is employed		.014
• Yes	7.6	
• No	3.4	
Father's education level		.446
• Less than high school	7.5	
• High school graduate	7.1	
• College or university graduate	8.4	
Father's occupation		.158
• Professional	8.8	
• Non-professional	7.3	
Mother is employed		.068
• Yes	7.8	
• No	5.6	
Mother's education level		.433
• Less than high school	5.0	
• High school graduate	7.9	
• College or university graduate	8.2	
Mother's occupation		.133
• Professional	9.0	
• Non-professional	7.6	
Neighbourhood income level of school		.129
• School in 1 of 6 low-income neighbourhoods	7.5	
• School in other neighbourhood	4.2	
Who do you live with?		.086
• Mother and father	7.8	
• Someone other than both mother and father	6.2	

PA—physical activity.

like dance or gymnastics. The psychological risk factor was self-reported poor mental health. The 11 social risk factors included 2 sibling-, 4 parental-, and 5 peer-influence variables. The demographic risk factor was female sex. Finally, the socioeconomic risk factor associated with not meeting the physical activity standard was having a father who was unemployed.



**Table 4. Percentage of youth meeting the PA standard by sibling, parental, and peer influence**

QUESTIONS	PERCENTAGE MEETING PA STANDARD			P VALUE
	EVERY DAY	3-6 D/WK	0-2 D/WK	
Sibling influence				
In a typical week, how often ...				
• do your brother(s) or sister(s) encourage you to do sports or PAs?	15.7	6.5	5.9	<.001
• do your brother(s) or sister(s) do PAs or sports with you?	14.5	7.5	5.9	<.001
Parental influence				
In a typical week, how often does a member of your household (ie, father, mother) ...				
• watch you participate in PAs or sports?	15.8	8.5	4.2	<.001
• encourage you to do sports or PAs?	12.0	5.8	4.6	<.001
• provide transportation to a place where you can do PAs or sports?	11.0	6.6	3.9	<.001
• do PAs or sports with you?	18.1	7.6	5.4	<.001
Peer influence				
During a typical week, how often ...				
• do your friends encourage you to do sports or PAs?	17.8	8.9	4.9	<.001
• do your friends do PAs or sports with you?	14.1	7.0	4.2	<.001
• do your friends or classmates tease you for not being good at PAs or sports?	7.1	9.4	18.9	<.001
• do your friends ask you to walk or bike to school or a friend's house?	14.7	9.4	5.2	<.001
• do your friends tell you that you are doing well in PAs or sports?	14.8	7.6	4.9	<.001
PA—physical activity.				

PA—physical activity.

**Table 5. Percentage of youth meeting the PA standard by environmental influence: A) Questions regarding agreement with statements; B) Questions regarding frequency per week.**

A) QUESTIONS	PERCENTAGE MEETING PA STANDARD				P VALUE
	STRONGLY AGREE	SOMEWHAT AGREE	SOMEWHAT DISAGREE	STRONGLY DISAGREE	
How much do you agree with the following statement?					
• At home, there are enough supplies and sports equipment to use for PA	9.1	6.8	5.8	5.5	<.001
• It is difficult to walk or jog in my neighbourhood because of things like traffic, no sidewalks, gangs, and so on	10.1	6.1	6.0	5.8	.119
• There are playgrounds, parks, or gyms close to my home or that I can get to easily	8.9	5	2.1	3.1	<.001
• It is safe to walk or jog in my neighbourhood during the day	8.3	5.4	4.7	4.5	.006
B) QUESTIONS	PERCENTAGE MEETING PA STANDARD				P VALUE
	MORE THAN 4 TIMES PER WEEK	1-3 TIMES PER WEEK	LESS THAN ONCE PER WEEK		
How often have you played sports or PAs without a coach or instructor?	11.7	4.8	3.7		<.001
How often have you played sports or PAs with a coach or instructor other than in gym class?	11.1	5.4	3.9		<.001
How often have you taken part in dance, gymnastics, karate, or group lessons other than in gym class?	10.9	6.3	5.1		<.001

PA—physical activity.

Our study is unique to the literature because we used multivariate regression analysis to reduce the list from 23 unadjusted risk factors to 5 independent or adjusted risk indicators. In our study, youth were more likely to

meet the physical activity standard if the following variables were present: their father was employed, their parents watched them participate in physical activities or sports every day, their friends encouraged them to

**Table 6. Logistic regression model for risk indicators associated with meeting the PA standard**

INDEPENDENT VARIABLES	OR	95% CI	P VALUE
Demographic or socioeconomic status			
• Father is employed	2.29	1.10-4.77	.027
Parental influence			
• Parents watch youth participate in PAs or sports every day	1.23	1.16-1.29	<.001
Peer influence			
• Friends encourage youth to do sports or PAs every day	1.19	1.11-1.25	<.001
• Friends or classmates do not tease youth for not being good at PAs or sports every day	1.20	1.10-1.30	.001
Environmental influence			
• Youth played sports or PAs with a coach or instructor other than in gym class more than 4 times per week	1.44	1.32-1.54	<.001

OR—odds ratio, PA—physical activity.

do physical activities or sports every day, their friends or classmates did not tease them for not doing well at physical activities or sports every day, and they played sports or physical activities with coaches or instructors more than 4 times a week.


From an evidence-based point of view, our results suggest that policy interventions that are consistent with the academic literature are needed. One literature review of physical activity promotion found that interventions had limited effectiveness unless they directly or indirectly addressed socioeconomic status, and that school settings and physical activity curriculum changes were the best ways to promote physical activity in youth.<sup>24</sup> This finding is supported by a second literature review, which found that adding or extending physical activity classes was highly effective and confirmed the need for coaches and instructors.<sup>25</sup> Both of these literature reviews suggest that modifying the amount of physical activity available in the public school system is an effective way to indirectly counteract low socioeconomic status of parents (unemployment of the father in our study). The second literature review also found that social support interventions were highly effective, reinforcing our findings of the potential benefit of parental observation and peer encouragement.<sup>25</sup> Additionally, this literature review concludes that adapting physical activity programs to individual levels of skill is effective in promoting activity, which is consistent with

our finding that children should not be put in a situation where they will be teased for a lack of ability.<sup>25</sup> Finally, a third literature review concludes that a multi-level approach combining a school-based intervention with family and peer involvement would be the best approach. This also supports our finding of the benefit of parental observation and peer encouragement.<sup>26</sup>

## Limitations

Our study had 3 limitations that need to be addressed. First, it was cross-sectional and, as such, causation could not be determined. Second, the survey had an overall response rate of 43.6%. However, response rates are generally low in surveys involving youth in North American schools and are sometimes not even reported. The 5-stage consent protocol required in studies with youth in school undoubtedly affected and substantially reduced participation rates. Third, there was a selection bias in response rate by neighbourhood income because fewer students from low-income neighbourhoods completed the survey.

## Conclusion

Most of the independent risk indicators associated with physical inactivity in youth identified in this study are preventable through appropriate social policy implementation and support. Given the dismal rate of physical activity in Canadian youth, we hope that generating this reduced list of independent risk indicators will help to focus our limited human and financial resources for successful intervention in the community. 

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**Mrs Rogers** and **Mr Thompson** are researchers for the Saskatoon Tribal Council. **Dr Moraros** is Assistant Professor in the School of Public Health at the University of Saskatchewan.

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## Contributors

All authors contributed to the concept and design of the study; data gathering, analysis, and interpretation; and preparing the manuscript for submission.

## Competing interests

None declared

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