Smoking, Physical Activity and Breakfast Consumption Among Secondary School Students in a Southwestern Ontario Community

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ABSTRACT

Objectives: To determine the prevalence of smoking, low levels of physical activity, and missing breakfast among students (n=318) in grades 9 through 12 in three schools in southwestern Ontario; to see if these behaviours were associated; and, whether there were gender differences.

Methods: A self-administered survey was conducted in grade 10 English classes.

Results: The response rate was 87.1%. The prevalence of smoking was 36.2%; there was no gender difference. Only 42.8% of students ate breakfast daily; 48.8% of boys and 36.1% of girls ($\chi^2 = 5.2$; $p<0.05$). A higher proportion of boys (77.1%) were active for at least 30 minutes ≥ 3 times/week compared to girls (66.0%) ($\chi^2 = 4.8$; $p<0.05$). Students who were active ≥ 3 times/week were more likely to eat breakfast daily and, among boys, 60.4% of non-smokers ate breakfast daily compared to 31.9% of those currently smoking ($\chi^2 = 13.3$; $p<0.001$). There were no differences among girls. More girls (63.9%) were concerned about gaining weight compared to boys (36.1%) ($\chi^2 = 37.7$; $p<0.001$). Among girls, a higher proportion of those who were concerned about gaining weight were less likely to engage in physical activity or smoke, and more likely to skip breakfast compared to those who were not concerned.

Discussion: Weight concern was not associated with frequency of physical activity, smoking, or breakfast consumption among boys. The high prevalence rates for these behaviours suggests that interventions in high schools should include daily physical activity, promotion of breakfast eating (either at home or in the school), and encouragement to quit smoking.

La traduction du résumé se trouve à la fin de l'article.

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Acknowledgements: This research was supported by the National Cancer Institute of Canada and the Socio-Behavioural Cancer Research Network with funds from the Canadian Cancer Society.

The presence of risk factors for cardiovascular disease and cancer among adolescents is well established.[1-5] Low levels of physical activity and smoking predispose adolescents to the development of other risk factors. For example, among adolescents in Quebec, decreasing levels of both physical fitness and frequency of physical activity were associated with elevated blood pressure and an unfavourable lipid profile.[6] In Ontario, only 54% of male and 36% of female adolescents were active enough to achieve cardiovascular benefit.[7] Declining levels of physical activity,[8] and, in particular, time spent watching television[9] have been linked to the rising prevalence of overweight among children and adolescents.[10] Obesity in adulthood is a major risk factor for heart disease.[11,12] The tendency for overweight children to remain overweight as adults[13,14] argues for increasing physical activity during adolescence.

The impact of smoking on morbidity, particularly the risk of lung cancer and respiratory diseases, is well known.[15] Yet, despite health promotion efforts, many Canadian adolescents still smoke.[16] Daily breakfast consumption is important because individuals who do not eat breakfast are less likely to meet their daily nutrient requirements.[17] In a recent national survey, 43% of boys and 58% of girls did not consume at least juice and toast or cereal for breakfast daily.[18]

Smoking, activity, and eating patterns develop at a young age and track through adolescence[19] to adulthood, when changing deeply ingrained habits becomes increasingly difficult. Adolescence, therefore, is a critical time to encourage the development of health-promoting behaviours. The first step, however, is to document the prevalence of specific behaviours among the target group. Our objectives were to determine: 1) the percentage of secondary school students who currently smoked, had low levels of physical activity, or did not eat breakfast every day; 2) whether there were gender differences in the prevalence of these behaviours; and 3) whether there were inter-relationships among these behaviours.[20]

METHODS

We established an advisory group for the project consisting of representatives from

school boards and public health. The school board representatives recruited three schools in Perth and Huron counties (Stratford, Ontario and environs) for the survey. Teachers administered the survey to students in grade 10 English classes. All Ontario students must take grade 10 English before graduation; this strategy ensured that the students came from different scholastic backgrounds. The schools draw students from rural and small towns and a largely Caucasian population.

The School Health Survey included questions on smoking, eating behaviours and physical activity. Students' smoking status was measured using the School Smoking Profile.[21] We defined students as "currently smoking" if they answered "yes" to: "Have you ever tried cigarette smoking (even just one puff)?", "yes" to: "Have you ever smoked again since the first time you tried a cigarette?", and "no" to: "At this time, have you quit smoking?"[22] Questions on eating behaviours inquired whether students ate breakfast every day and/or followed a vegetarian diet. Students reported the number of times per week they were involved in at least 30 minutes of vigorous or moderate activity using questions from the Student Physical Activity Survey,[23] including whether they were concerned about gaining weight.

Following approval from the school boards, an information letter describing the study was sent home with students. Passive consent was used and students were assured that completion of the survey was entirely voluntary.

We used chi-square analysis to test for differences in behaviours by gender and grade; differences at $p<0.05$ are reported.

RESULTS

The response rate was 87.1%; 318 students (170 males, 148 females) completed the survey. Although all students were in Grade 10 English, the distribution of grades across the schools varied (Table I). School 2 had grades 9 and 10 students only; this affected some of the findings and is discussed below. We compared the proportion of boys and girls who smoked, had low levels of physical activity (≤2 times/week vs ≥3 times/week) and did not eat breakfast daily (Table II).

TABLE I

Proportion of Males and Females in Each Grade

Grade	School 1		School 2		School 3	
	Males	Females	Males	Females	Males	Females
9	15.4 (10)	16.9 (13)	54.2 (13)	65.0 (13)	0	0
10	23.1 (15)	36.4 (28)	45.8 (11)	35.0 (7)	64.2 (52)	68.6 (35)
11	21.5 (14)	32.5 (25)	0	0	24.7 (20)	19.6 (10)
12	40.0 (26)	14.3 (11)	0	0	11.1 (9)	11.8 (6)
Total	100.0 (65)	100.0 (77)	100.0 (24)	100.0 (20)	100.0 (81)	100.0 (51)

TABLE II

Prevalence (%, n) of Smoking, Low Physical Activity, and Missing Breakfast Among Boys (n=170) and Girls (n=148)

Behaviour	Boys	Girls
Smoking	40.6 (69)	31.1 (46)
Low activity	22.9 (39)	34.0 (50)*
Breakfast < daily	51.2 (87)	63.9 (94)

* $p<0.05$, boys versus girls

TABLE III

Daily Breakfast Consumption, Smoking, and Physical Activity (%, n) Among Girls (n=146) According to their Concern About Gaining Weight

	Concerned	Not Concerned
Frequency of Physical Activity*		
≤2 times/week	39.6 (40)	22.2 (10)
≥3 times/week	60.4 (61)	77.8 (35)
Breakfast Consumption*		
Daily	30.7 (31)	48.9 (22)
< daily	69.3 (70)	51.1 (23)
Smoking*		
No	74.3 (75)	55.6 (25)
Yes	25.7 (26)	44.4 (20)

* $p<0.05$

The overall smoking rate was 36.2% (n=115) with no gender difference (Table II) or across the schools. Smoking rates increased among boys from 21.7% (n=23) in grade 9 to 54.3% (n=34) in grade 12 ($\chi^2 = 9.4$; $p<0.05$); the corresponding rates for girls were 23.1% (n=26) and 47.1% (n=16) ($\chi^2 = 13.6$; $p<0.01$).

Less than half (42.8%, n=136) of the students ate breakfast every day. Daily breakfast consumption varied by school ($\chi^2 = 9.1$; $p<0.01$); however, the rates were similar when the analysis was restricted to students in grades 9 and 10. Missing breakfast was more common among girls (Table II) and rose from 44.9% in grade 9 to 65.3% in grade 12. Although only 2.4% (n=4) of boys and 8.8% (n=13) of girls said that they were vegetarian, an additional 2.4% (n=4) and 18.2% (n=27) respectively, indicated that they followed this dietary pattern sometimes.

Overall, 49.7% (n=158) were taking physical education, including 85.7% of the students in grade 9. Frequency of physical activity varied by school ($\chi^2 = 6.5$; $p<0.05$) with 86.4% of the students in school 2 participating ≥3 times/week. Again, there was no difference among the schools when the analysis included only those in grades 9 and 10. Boys had higher levels of participation in regular physical activity compared to girls (Table II). The most popular reasons for physical activity among boys were "for fun and enjoyment" (68.8%), "to get in good shape" (61.8%), and "to improve my health"(54.1%). Girls had the same top three reasons (77.0%, 75.7%, and 67.6% respectively).

There was no difference in daily breakfast consumption between girls who smoked (30.4%, n=14) and non-smokers (38.2%, n=39), but 60.4% (n=61) of boys who did not smoke ate breakfast compared to 31.9% (n=22) of those who smoked ($\chi^2 = 13.3$; $p<0.001$). Students who ate breakfast daily were more likely to participate in physical activity ≥ 3 times /week compared to the non-breakfast eaters (85% vs 69.0%, $\chi^2 = 6.6$, $p<0.001$ for boys; 77.4% vs 59.6%, $\chi^2 = 4.8$, $p<0.05$ for girls). Activity levels of students who smoked and those who did not were comparable. Almost two thirds (63.9%) of girls were concerned about gaining weight compared to 36.1% of boys ($\chi^2 = 37.7$; $p<0.001$). This

concern was not associated with frequency of physical activity, smoking, or breakfast consumption among boys. It was strongly related to these behaviours among girls, with a higher proportion of those who were concerned about gaining weight less likely to engage in physical activity or smoke, and more likely to skip breakfast compared to those not concerned (Table III).

DISCUSSION

Cigarette smoking, low levels of physical activity and breakfast skipping were prevalent among the students in this study. The prevalence of smoking (36.2%) was higher than the rate (25%) for teenagers across Canada.[16] Similar to some other reports,[16,24,25] rates increased with increasing grades and did not differ between boys and girls. Comparing the results from a survey of elementary school students in the same geographic area to those of the present study, the transition from middle to high school appears to be associated with an increase in the prevalence of smoking. The smoking rate was 13% among students in grade 8;[26] by grade 9 in the present survey, the rate had almost doubled, contributing to the belief that smoking prevention programs must target elementary school age children.

Not eating breakfast every day may be a marker for unhealthy eating behaviours. Inadequate consumption of fruit and dairy products among adolescents is common;[27] such practices reduce the likelihood that current recommendations for folate and calcium can be met. A breakfast of juice, cereal and milk would provide at least one serving each of fruit and dairy products which are important food sources of these nutrients. In the elementary school survey, 18% of grade 4 students did not eat breakfast every day; this increased to 38% in grade 8,[26] suggesting that this practice is well established before high school. The lack of a difference in breakfast consumption among girls based on smoking status is surprising. Among 18-year-old Australian females, the smoking rate for breakfast skippers was over twice that of breakfast eaters.[28] Skipping breakfast may be a weight control strategy among girls;[29] this is indirectly supported by our finding that those who were concerned about their weight tended to miss breakfast.

Adolescents who follow a vegetarian diet are at increased risk for insufficient intakes of several nutrients.[30] Careful planning is necessary to ensure that energy and nutrient recommendations are met;[31] with over 25% of the girls following vegetarian practices at least part of the time, this may be an important area for nutrition education.

Our finding that boys were more active than girls is consistent with other research.[32-34] It has been estimated[34] that 75% of girls and 60% of boys are not active enough. In the long term, physical activity may reduce the risk of several chronic diseases.[35] While adolescence offers opportunities to establish an active lifestyle that can carry over into adulthood,[35] this is unlikely to be an effective selling point with this age group. The frequency of regular physical activity appeared to decline with increasing grades for both boys and girls in our survey and others.[33,36] Whether the major decline in physical activity occurs when physical education ceases to be a requirement[33] is not clear, although participation in physical education programs has a positive impact on overall activity patterns.[36] A lack of time is a major barrier[37] to physical activity in adolescence. In this age group, it is more a matter of choice than it is at a younger age, when the school curriculum helps to influence activity levels.[32] Any intervention needs to account for different motivations among girls and boys. In our study, the level of physical activity among girls and concern about weight gain were related but not, however, in the expected direction. Others have reported that a focus on weight and/or body image is more common among girls and may be the reason many participate in physical activity.[38] Promoting physical activity as a way to improve body image may be a feasible approach among girls. Because declining energy expenditure rather than increasing energy intake appears to be a primary contributor to the increasing prevalence of overweight in adolescents, it is essential to encourage the development of an active lifestyle.[34,36]

Regarding associations among behaviours, some were unexpected and others confirm earlier work. Lytle et al.[20] also found that exercise and healthy eating were linked, and that smokers had poorer eating habits compared to non-smokers. Contrary to Burke et al.,[28] level of physical activity and smoking status were not associated, which may reflect the younger age of the students in our study. Smoking was related to concerns about weight among girls in our study but in the opposite direction to what has been reported previously,[39] suggesting that smoking was not being taken up as a means of weight control.

Our study was cross-sectional which precludes establishing any cause and effect relationships. While our surveys were anonymous, we acknowledge that responses may have been influenced by social desirability. Our response rate was high and by choosing a class required by all students, we had a group that was representative of students in the area. Some of our results do not coincide with other research on the health behaviours of adolescents, suggesting areas for further exploration. For example, concern about weight gain among girls is related to skipping breakfast, but not higher frequency of activity or smoking. Future work should include measures of weight and height and an assessment of dietary intake to examine the association between weight status and/or eating patterns and various behaviours.

Our results confirm the need for concern about adolescent health behaviours. The Comprehensive School Health Model[40] reflects successful models of intervention. It suggests involving all stakeholders, including community partners and students, in the process of identifying needs and developing solutions. It considers solutions in areas of changing the environment (e.g., policy to ensure daily physical activities), programs, providing health services (e.g., breakfast clubs) and building social support.

REFERENCES

1. Webber L, Srinivasan S, Wattigney W, Berenson G. Tracking of serum lipids and lipoproteins from childhood to adulthood: The Bogalusa Heart Study. *Amer J Epidemiol* 1991;133:884-99.
2. Berenson G, Srinivasan S, Bao W, Newman W, Tracy R, Wattigney W. Association between multiple cardiovascular risk factors and atherosclerosis in children and young adults. *N Engl J Med* 1998;338:1650-56.
3. Boreham C, Twisk J, van Mechelen W, Savage M, Strain J, Cran G. Relationships between the development of biological risk factors for coronary heart disease and lifestyle parameters during adolescence: The Northern Ireland Young Hearts Project. *Public Health* 1999;113:7-12.
4. McGill H, McMahan C, Herderick E, Malcolm G, Tracy R, Strong J. Origin of atherosclerosis in

childhood and adolescence. *Am J Clin Nutr* 2000;72(suppl):1307S-1315S.
5. Freedman D, Dietz W, Srinivasan S, Berenson G. The relation of overweight to cardiovascular risk factors among children and adolescents: The Bogalusa Heart Study. *Pediatrics* 1999;103:1175-82.
6. Katzmarzyk P, Malina R, Bouchard C. Physical activity, physical fitness, and coronary heart disease risk factors in youth: The Quebec Family Study. *Prev Med* 1999;29:555-62.
7. Hedley M, Chambers L, Tomasik H, Randall E, Woolcott D, Brown H, et al. 1990 Ontario Health Survey Nutrition Report. Working Paper #10. Nutrition Report. Ministry of Health. 1995.
8. Berkey C, Rockett H, Field A, Gillman M, Frazier L, Camargo C, et al. Activity, dietary intake, and weight changes in a longitudinal study of preadolescent and adolescent boys and girls. *Pediatrics* 2000;105(4). URL: http://www.pediatrics.org/cgi/content/full/105/4/e56.
9. Gortmaker S, Must A, Sobol A, Peterson K, Colditz G, Dietz W. Television viewing as a cause of increasing obesity among children in the United States, 1986-1990. *Arch Pediatr Adolesc Med* 1996;150:356-62.
10. Tremblay M, Willms D. Secular trends in the body mass index of Canadian children. *CMAJ* 2000;163:1429-35.
11. Calle E, Thun M, Petrelli J, Rodriguez C, Heath C. Body-mass index and mortality in a prospective cohort of U.S. adults. *N Engl J Med* 1999;341:1097-105.
12. Must A, Spadano J, Coakley E, Field A, Colditz G, Dietz W. The disease burden associated with overweight and obesity. *JAMA* 1999;282:1523-29.
13. Dietz W. Childhood weight affects adult morbidity and mortality. *J Nutr* 1998;128:411S-414S.
14. Freedman D, Khan L, Dietz W, Srinivasan S, Berenson G. Relationship of childhood obesity to coronary heart disease risk factors in adulthood: The Bogalusa Heart Study. *Pediatrics* 2001;108:712-18.
15. United States Department of Health, Education, and Welfare. Smoking and Health: Report of the Advisory Committee to the Surgeon General of the Public Health Service. Washington, DC: Government Printing Office, 1964.
16. Health Canada. Canadian Tobacco Use Monitoring Survey (CTUMS). Wave 1, February – June 2000. http://www.hc-sc.gc.ca/hpb/lcdc/bc/ctums/index.htm.
17. Nicklas T, O'Neil C, Berenson G. Nutrient contribution of breakfast, secular trends, and the role of ready-to-eat cereals: A review of data from the Bogalusa Heart Study. *Am J Clin Nutr* 1998;67(suppl):757S-763S.
18. Health Canada. Trends in the health behaviours of Canadian Youth. 2000. http://www.hc-sc.gc.ca/hppb/childhood-youth/spsc/trends.htm.
19. Kelder S, Perry C, Klepp K, Lytle L. Longitudinal tracking of adolescent smoking, physical activity, and food choice behaviors. *Am J Public Health* 1994;84:1121-26.
20. Lytle L, Kelder S, Perry C, Klepp K. Covariance of adolescent health behaviors: The Class of 1989 study. *Health Educ Res Theory Pract* 1995;10(2):133-46.
21. Brown KS, Jolin MA, Madill C. School Smoking Profile: Test-Retest Reliabilities. Unpublished report. Waterloo, ON: University of Waterloo, 2001.
22. Cameron R, Brown KS, Best A, Pelkman C, Madill C, Manske S, et al. Effectiveness of a social influences smoking prevention program as a function of provider type, training method and school risk. *Am J Public Health* 1999;89:1827-31.
23. Bercovitz K. Student Physical Activity Survey. Unpublished report. Health Behaviour Research Group. Waterloo, ON: University of Waterloo, 1999.
24. Adlaf E, Bondy S. Smoking behaviour. In: Stephens T, Morin M (Eds.), *Youth Smoking Survey, 1994: Technical Report.* Ottawa: Minister of Supply and Services Canada, 1996 (Catalogue No. H49-98/1-1994E).
25. World Health Organization. Health and Health Behaviour Among Young People. Health Policy for Children and Adolescents Issue 1. International Report. http://www.ruhbc.ed.ac.uk/hbsc, 2000.
26. Evers S, Taylor J, Manske S, Midgett C. Eating and smoking behaviours of school children in southwestern Ontario and Charlottetown, PEI. *Can J Public Health* 2001;92(6):433-36.
27. Neumark-Sztainer D, Story M, Resnick M, Blum R. Lessons learned about adolescent nutrition from the Minnesota Adolescent Health Survey. *J Am Diet Assoc* 1998;98:1449-56.
28. Burke V, Milligan R, Beilin L, Dunbar D, Spencer M, Balde E, et al. Clustering of health-related behaviours among 18-year-old Australians. *Prev Med* 1997;26:724-33.
29. Shaw M. Adolescent breakfast skipping: An Australian study. *Adolescence* 1998;33:851-61.
30. Donovan UM, Gibson RS. Dietary intakes of adolescent females consuming vegetarian, semi-vegetarian, and omnivorous diets. *J Adolesc Health* 1996;18:292-300.
31. Haddad E. Development of a vegetarian food guide. *Am J Clin Nutr* 1994;59(suppl):1248S-1254S.
32. Dovey S, Reeder A, Chalmers D. Continuity and change in sporting and leisure time physical activities during adolescence. *Br J Sports Med* 1998;32:53-57.
33. Allison K, Adlaf E. Age and sex differences in physical inactivity among Ontario teenagers. *Can J Public Health* 1997;88(3):177-80.
34. Canadian Fitness and Lifestyle Research Institute (CFLRI). 1998 Physical Activity Monitor. http://www.cflri.ca/pdf/e/pamrep.pdf. 2000.
35. Centers for Disease Control and Prevention (CDC). Physical Activity and Health: A Report of the Surgeon General. Available online at: http:\\www.cdc.gov/nccdphp/sgr.htm. 1997.
36. Gordon-Larsen P, McMurray R, Popkin B. Determinants of adolescent physical activity and inactivity patterns. *Pediatrics* 2000;105(4). URL: http://www.pediatrics.org/cgi/content/full/105/6/e83.
37. Allison K, Dwyer J, Makin S. Perceived barriers to physical activity among high school students. *Prev Med* 1999;28:608-15.
38. Story M, Neumark-Sztainer D, Sherwood N, Stang J, Murray D. Dieting status and its relationship to eating and physical activity behaviours in a representative sample of US adolescents. *J Am Diet Assoc* 1998;98:1127-32.
39. Tomeo C, Field A, Berkey C, Colditz G, Frazier L. Weight concerns, weight control behaviors, and smoking initiation. *Pediatrics* 104:918-24.
40. Health Canada. The Comprehensive School Health Model. http://www.hc-sc.gc.ca/hppb/children/english/sec1-1.htm. 2000b

Received: January 10, 2002
Accepted: July 23, 2002

RÉSUMÉ

Objectifs : Déterminer la prévalence du tabagisme, des faibles niveaux d'activité physique et de l'absence de petit déjeuner chez les élèves (n=318) de la 9e à la 12e année dans trois écoles du Sud-Ouest de l'Ontario pour voir si ces comportements sont associés et s'ils présentent des différences selon le sexe.

Méthode : Distribution d'un formulaire auto-administré dans les classes d'anglais de 10e année.

Résultats : Le taux de réponse était de 87,1 %. La prévalence du tabagisme était de 36,2 %, sans différence selon le sexe. Seuls 42,8 % des élèves prenaient quotidiennement un petit déjeuner : 48,8 % des garçons et 36,1 % des filles ($\chi^2 = 5,2$; $p<0,05$). Une proportion supérieure de garçons (77,1 %) que de filles (66,0 %) pratiquait une activité physique au moins 30 minutes, trois fois par semaine ($\chi^2 = 4,8$; $p<0,05$). Les élèves actifs trois fois par semaine étaient plus susceptibles de prendre un petit déjeuner quotidien, et chez les garçons, 60,4 % des non-fumeurs consommaient quotidiennement le petit déjeuner, contre 31,9 % des fumeurs actuels ($\chi^2 = 13,3$; $p<0,001$). On n'a observé aucune différence entre les filles. Davantage de filles (63,9 %) que de garçons (36,1 %) craignaient de faire de l'embonpoint ($\chi^2 = 37,7$; $p<0,001$). Chez les filles, une proportion supérieure de celles qui craignaient de faire de l'embonpoint était moins susceptible de pratiquer une activité physique ou de fumer, et plus susceptible de sauter le petit déjeuner, que celles qui n'étaient pas préoccupées par leur poids.

Débat : Chez les garçons, la crainte de faire de l'embonpoint n'est pas associée à la fréquence de l'activité physique, au tabagisme ou à la consommation du petit déjeuner. Étant donné les taux de prévalence élevés de ces comportements, les interventions à l'école secondaire devraient miser sur l'activité physique quotidienne et la consommation du petit déjeuner (à la maison ou à l'école) et inciter les élèves à cesser de fumer.