

# A Province-wide School Nutrition Policy and Food Consumption in Elementary School Children in Prince Edward Island

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## ABSTRACT

**Objective:** Although the majority of Canadian provinces have indicated that they have adopted new school nutrition policies, there have been few if any systematic evaluations of these policies. In Prince Edward Island, a nutrition policy for elementary schools was adopted province-wide in 2006. In the present study, we assessed the nutritional benefits of the new policy by examining changes in student food consumption prior to and one year following implementation of the policy.

**Methods:** We surveyed fifth and sixth grade children from 11 elementary schools in Prince Edward Island in 2001/02 (pre-policy implementation) and fifth and sixth grade children from the same 11 schools in 2007 (post-policy implementation). Food consumption was assessed using a self-administered validated food frequency questionnaire. We applied multilevel logistic regression to compare pre-/post-policy implementation differences in the proportion of students meeting Canada's Food Guide recommendations for vegetables and fruit (VF) and milk and alternatives (MA) and in the proportion of students consuming <3 servings of low nutrient dense foods (LNDF) daily.

**Results:** Relative to students in 2001/02, students surveyed in 2007 were 2.14 (95% CI 1.62-2.82) times more likely to report consuming less than three daily servings of LNDF and were more likely to meet recommendations for VF (OR 1.44, 95% CI 1.00-2.07) and MA (OR 1.27, 95% CI 0.98-1.64).

**Conclusion:** The present study is the first in Canada to show favourable changes in student food consumption that parallel the introduction of a school nutrition policy.

**Key words:** Nutrition; nutrition policy; nutrition surveys; dietary habits; school health; obesity

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

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Concerns regarding the quality of children's diets and rising rates of childhood obesity have received considerable attention in recent years.<sup>1-4</sup> As of 2004, about 1.1 million (18%) Canadian boys and girls aged 2 to 17 years old were overweight, and another half million (8%) were obese.<sup>5</sup> School-age children in Prince Edward Island (PEI) have the second highest rate of overweight (22%) in the country.<sup>5</sup> These trends signify an important public health issue, given that recent reports indicate that obesity in childhood and adolescence persists or tracks into adulthood<sup>6,7</sup> and is associated with chronic diseases and increased mortality.<sup>8,9</sup> Canadian studies indicate that children's diets are not meeting current dietary recommendations, with low intakes of Vegetables and Fruit, Milk and Alternatives and Grain Products.<sup>10-12</sup> Dietary surveys suggest that children in PEI have lower intakes of vegetables and fruit and higher intakes of low nutrient density foods (low nutrients relative to energy content, such as soft drinks or candy)<sup>13</sup> compared to Ontario children.<sup>14</sup> Since poor diet quality and inadequate physical activity have been identified as key determinants of the observed increase in childhood overweight and obesity, there is an urgent need to implement preventive policies and programs designed to improve diet and physical activity in Canadian children.<sup>15,16</sup>

The school food environment is increasingly recognized as having a significant influence over children's eating behaviours because of the amount of time spent at school and the large percentage of food intake consumed while at school.<sup>4,15</sup> Some studies have demonstrated the effectiveness of policies in improving students'

dietary intake by modifying the school food environment.<sup>16-22</sup> One Canadian study provided persuasive evidence, for the first time, that comprehensive health promotion and wellness programs can have benefits for students.<sup>18,23</sup> Students attending health-promoting schools in Nova Scotia were less likely to be obese, had healthier diets and were more physically active. The majority of Canadian provinces have indicated that they have adopted new nutrition

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policies, but there have been few if any systematic evaluations of these nutrition policies.<sup>24</sup>

In 2006, all PEI elementary and consolidated schools across the province adopted school nutrition policies (SNP).<sup>25,26</sup> While policies are adopted at the school district level, they are practically identical and will be referred to in this paper as the "PEI school nutrition policy" (PEI SNP). The PEI SNP addresses such issues as the quality of food available in the school environment, student access to food, food used in school fundraising initiatives, food safety, and nutrition education.<sup>25,26</sup> This adoption of the PEI SNP provided an opportunity for a "natural experiment" whereby we could examine whether this nutrition policy is effective in enabling children to attain diets that are more adequate according to Canada's Food Guide.<sup>27</sup> The present study examines the temporal changes in food consumption of fifth and sixth grade students prior to and following the implementation of the school nutrition policy.

## METHODS

In Prince Edward Island, there are a total of 52 elementary (grades one to six) and consolidated (grades one to eight) schools, all of which had recently implemented the 2006 school nutrition policy.<sup>25,26</sup> In 2001/02, elementary schools in PEI were invited to participate in a study that assessed food consumption among fifth and sixth grade students; 11 schools (n=971, survey participation rate of 90%) agreed to take part. The present study compares data collected in 2001/02 and again in 2007 (n=555, survey participation rate of 59%) in 11 schools common to both surveys, allowing us to assess changes in food consumption associated with the introduction of the policy. This is part of a larger study assessing children's dietary intake as well as body weight over a five-year period starting in 2007. Food consumption data were collected using a self-administered validated food frequency questionnaire<sup>28</sup> designed to assess the frequency of consumption of 27 different groups of foods to help identify areas of concern, such as low consumption of Vegetables and Fruits (VF) or Milk and Alternatives (MA), or high intake of "low nutrient dense" foods (high in energy, often from fat, but providing few nutrients). The number of servings of foods in the VF group of Canada's Food Guide<sup>27</sup> per day was calculated by adding responses to the frequency of consumption of potatoes (other than french fries), salad, other vegetables, fruit, and fruit juices as follows: "at least twice a day" = 2, "once a day" = 1, "4 to 6 times a week" = 0.71 and "1 to 3 times/week" = 0.28. The number of servings of MA was calculated by adding responses to the frequency of consumption of milk, cheese, yogurt/frozen yogurt, and ice cream using a similar scoring system. Finally, the number of servings of LNDF was estimated in the same manner (summing the number of servings of french fries; cakes/cookies/pie/doughnuts; potato chips/tortilla/nacho chips/cheesies/pretzels and other snack foods; candy/chocolate bars; and regular (not diet) soft drinks), but was not compared to CFGHE since there are no recommended number of servings for this group of foods. The numbers of daily servings for the Meat and Alternatives and the Grain Products groups were not estimated due to the limited number of foods from these groups which were included in the questionnaire. The Eating Behaviour Study (EBS) has been previously validated for use with Prince Edward Island and Ontario school-aged children 9-12 years and was found to provide a valid estimate of mean intakes most likely to be inadequate in the diets

**Table 1.** Grade and Sex Distribution of Students Participating in the Food Consumption Surveys in 2001/2002 and 2007 in Prince Edward Island

	Survey Year	
	2001/02 (n=971)	2007 (n=562)
Grade		
Gr. 5	50.1%	49.8%
Gr. 6	49.9%	50.2%
Sex		
Boy	51.6%	49.9%
Girl	48.4%	50.1%

**Table 2.** Number of Daily Food Group Servings among Prince Edward Island Students in 2001/2002 and 2007

Food Group	Survey Year	
	2001/02 Mean (SD)*	2007 Mean (SD)
Vegetables and Fruit	3.97 (1.87)	3.59 (1.89)
Milk and Alternatives	2.99 (1.30)	2.88 (1.29)
Low-nutrient Density Foods	2.98 (1.89)	2.06 (1.45)
Total Daily Servings	15.3	13.4

\* SD: Standard Deviation

of school children (e.g., fat, calcium, folate) when compared to 24-hour recall data.<sup>28</sup>

We applied multilevel linear regression to compare pre-/post-policy implementation differences in the consumption of Vegetables and Fruit, Milk and Alternatives, and low-nutrient density foods with survey year as a fixed effect and students nested in schools (random factor). The observed number of daily servings of LNDF was subjected to a square root transformation to achieve normally distributed data. We applied multilevel logistic regression to compare the pre-/post-probability of meeting Canada's Food Guide recommendations<sup>27</sup> for VF ( $\geq 6$  servings), MA ( $\geq 3$  servings), and consuming less than 3 servings of LNDF daily. All analyses were adjusted for the confounding potential of gender and grade level. We further adjusted for the decline in the total number of daily food servings from 2001/02 to 2007 (15.3 versus 13.4 servings, respectively) by including it in the logistic regression models.

## RESULTS

There was an even distribution of students between grade 5 and 6 and between girls and boys (Table 1). Table 2 shows that the mean daily intakes of all food groups decreased between 2001/02 and 2007, with a decline of almost one serving for LNDF. Modest declines for VF and MA were also observed. The mean number of food servings declined from 15.3 servings in 2001/02 to 13.4 servings in 2007 (Table 2). In Table 3, we adjusted our analyses for this temporal change in food servings to represent changes in dietary intake proportional to total intake. Table 3 shows a statistically significant temporal decrease in the proportion of low-nutrient density foods servings while the proportion of Milk and Alternatives increased between 2001/02 and 2007, respectively. Girls reported consuming proportionally more Vegetables and Fruit and less low-nutrient density foods relative to boys (Table 3).

As shown in Table 4, students in 2007 were twice as likely to report consuming less than three servings of low-nutrient density foods, and were also more likely to consume the recommended servings of Vegetables and Fruit than students in 2001/02.

**Table 3.** Changes in Servings of Vegetables and Fruit, Milk and Alternatives, and Square Root-transformed Servings of Low-nutrient Density Foods between 2001/02 and 2007 among Prince Edward Island Students

	<b>Vegetables and Fruit β (95% CI)*</b>	<b>Milk and Alternatives β (95% CI)</b>	<b>Low-nutrient Density Foods β (95% CI)</b>
Grade 6 (versus grade 5)	-0.05 (-0.18,0.08)	0.07 (-0.03,0.16)	0.02 (-0.03,0.06)
Girls (versus boys)	0.32 (0.19,0.45)	0.05 (-0.05,0.15)	-0.09 (-0.13,-0.05)
2007 (versus 2001/02)	0.10 (-0.03,0.23)	0.18 (0.08,0.28)	-0.18 (-0.23,-0.14)

\* Positive values for survey year represent increased intake in 2007 relative to 2001/02. β coefficients and 95% confidence intervals are estimated through multivariable multilevel linear regression, mutually adjusted and further adjusted for the total number of daily food servings.

**Table 4.** Relative Odds of Meeting the Recommended Intake of Vegetables and Fruit, Milk and Alternatives, and Low-nutrient Density Foods by Grade Level, Gender and Survey Year among Prince Edward Island Students

	<b>Vegetables and Fruit OR (95% CI)*</b>	<b>Milk and Alternatives OR (95% CI)</b>	<b>Low-nutrient Density Foods OR (95% CI)</b>
Grade 6 (versus grade 5)	0.90 (0.64,1.27)	1.08 (0.84,1.38)	1.06 (0.82,1.36)
Girls (versus boys)	1.40 (1.00,1.96)	1.07 (0.84,1.37)	1.47 (1.14,1.90)
2007 (versus 2001/02)	1.44 (1.00,2.07)	1.27 (0.98,1.64)	2.14 (1.62,2.82)

\* Odds ratios and 95% confidence intervals are estimated through multivariable multilevel logistic regression, mutually adjusted and further adjusted for the total number of daily food servings.

## DISCUSSION

This is the first study in Canada to assess the association between the introduction of a province-wide nutrition policy and improvements in students' food consumption. The introduction of this new province-wide school nutrition policy, as well as the contained and small population of PEI that has poor dietary habits and high overweight and obesity prevalence rates among both children and adults, make PEI an ideal natural setting for this evaluative research. Our findings are promising: when we compared student dietary intakes prior to and following the introduction of a school nutrition policy, we found a marked decrease in the likelihood that students would consume LNDF such as potato chips, candy and pop. Students surveyed in 2007 were consuming almost a full serving less of low-nutrient density foods than students at the same schools prior to the policy. Even when the overall decline in the number of food servings was controlled for, students in 2007 were still more likely to report consuming fewer servings of LNDF. They were also more likely to have diets with more Vegetables and Fruit and that meet Canada's Food Guide recommendation for Milk and Alternatives, although these changes are more modest. These changes parallel changes in the PEI school food environment over the same time period, with decreases in low-nutrient dense foods such as potato chips, hot dogs, soft drinks and fruit drinks (Taylor et al., unpublished).

Our findings are consistent with other studies that have demonstrated an improvement in diet quality associated with the introduction of school nutrition policies,<sup>16-23</sup> as well as a reduction in the prevalence of overweight.<sup>23</sup> The consistency with the Nova Scotia-based study is particularly relevant given the similarities in age, socio-economic status and Maritime context.

One Canadian study had suggested that comprehensive, multifaceted approaches to school nutrition programs have a larger impact on students' diets than a single nutrition program or policy.<sup>23</sup> While our observations of a reduction in unhealthy food choices are promising, a larger impact may be expected from continued and broader, multifaceted preventive programs where healthy choices are made readily available and nutrition education becomes part of the core curriculum.

The quasi-experimental design of the present study precludes conclusions related to causality. Given the challenges of applied nutrition research in school settings, and the nature of policy

implementation in PEI, one cannot employ a randomized controlled experimental design. It was not possible to randomize schools or include control schools for evaluation purposes since all elementary and consolidated schools in PEI had already fully implemented the policy as of September 2006. With the growing evidence and awareness of the importance of school environments for children's food intake, weight status and future health,<sup>15,18</sup> it would have been unethical to ask schools to function as a control school and refrain from using preventive programs and policies. These early analyses of our PEI-based research program included only those 11 schools that participated in both the 2001/02 and 2007 surveys. The lower student enrolment rates and survey participation rates due to differences in study protocol and consent procedures of the 2001/02 and 2007 surveys may be a basis for selection bias. Our findings, therefore, will need to be interpreted with caution. Future analyses on temporal trends from 2007 onwards will include all 44 PEI schools and measurements of heights and weights. An additional limitation of the present study is that socio-economic status, an established determinant of dietary intake, was not measured in 2001/02 and was not considered in the present analyses.<sup>16</sup>

In summary, the present study demonstrated improvements in food consumption parallel to the introduction of a province-wide nutrition policy. These findings underscore the potential benefits of school nutrition policies and the need for ongoing evaluation.

## REFERENCES

- Anderson RE. The spread of the childhood obesity epidemic [commentary]. *CMAJ* 2000;163(11):1461-62.
- Spear BA, Barlow SE, Ervin C, Ludwig DS, Saelens BE, Schetzina KE, et al. Recommendation for the treatment of child and adolescent overweight and obesity. *Pediatrics* 2007;120:S254-S288.
- Kumanyika SK, Obarzanek E, Stettler N, Bell R, Field AE, Fortmann SP, et al. Population based prevention of obesity: The need for comprehensive promotion of healthful eating, physical activity, and energy balance. *J Am Heart Assoc (Circulation)* 2008;118:428-64.
- Institute of Medicine (IOM). Progress in prevention: Childhood obesity: How do we measure up? 2006. Available at: <http://www.rwjf.org/pr/product.jsp?ia=138&id=15294> (Accessed May 15, 2008).
- Shields M. Health Reports: Overweight and obesity among children and youth. *Stat Can* 2006;17(3):27-42.
- Field AE, Cook NR, Gillman MW. Weight status in childhood as a predictor of becoming overweight or hypertensive in early adulthood. *Obes Res* 2005;13(1):163-69.
- Brunt H, Lester N, Davies G, Williams R. Childhood overweight and obesity: Is the gap closing the wrong way? *J Public Health* 2008;30:145-52.
- Weiss R, Kaufman FR. Metabolic complications of childhood obesity: Identifying and mitigating the risk. *Diabetes Care* 2008;31:S310-S316.

9. Cali AM, Caprio S. Obesity in children and adolescents. *J Clin Endocrinol Metab* 2008;93(11):S31-S36.
10. Kalin K. Energy, nutrient and food intake of eight year old children in low income communities [Unpublished master's thesis]. Guelph, ON: University of Guelph, 2002.
11. Hanning RM, Woodruff SJ, Lambraki I, Jessup L, Driezen P, Murphy CC. Nutrient intakes and food consumption patterns among Ontario students in grade six, seven, and eight. *Can J Public Health* 2007;98:12-16.
12. Health Canada. Young People in Canada: Their Health and Well-being. Ottawa: Public Health Agency of Canada, 2004. Available at: <http://www.phac-aspc.gc.ca/dca-dea/publications/hbcs-2004/index-eng.php> (Accessed March 9, 2007).
13. Drewnowski A. Concept of a nutritious food: Toward a nutrient density score. *Am J Clin Nutr* 2005;82:721-32.
14. 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;92:433-36.
15. Raine K. Overweight and Obesity in Canada. A Population Health Perspective. Ottawa: Canadian Population Health Initiative, Canadian Institute for Health Information, 2004.
16. Budd GM, Volpe SL. School based obesity prevention: Research, challenges, and recommendations. *J Sch Health* 2006;76(10):485-95.
17. Foster GD, Sherman S, Borradaile KE, Grundy KM, Vander Veur SS, Nachmann J, et al. A policy-based school intervention to prevent overweight and obesity. *Pediatrics* 2008;121(4):794-802.
18. Veugelers PJ, Fitzgerald AL, Johnston E. Dietary intake and risk factors for poor diet quality among children in Nova Scotia. *Can J Public Health* 2005;96:212-16.
19. Lissau L, Poulson J. Nutrition policy, food and drinks at school and after school care. *Int J Obes* 2005;29:S58-S61. Available at: <http://www.nature.com/ijo/journal/v29/n2s/abs/0803101a.html> (Accessed March 5, 2008).
20. Weber Cullen K, Watson K, Zakeri I. Improvements in middle school student dietary intake after implementation of the Texas Public School Nutrition Policy. *Am J Public Health* 2008;98(1):111-17.
21. Wojcicki JM, Heyman MB. Healthier choices and increased participation in a middle school lunch program: Effects of nutrition policy changes in San Francisco. *Am J Public Health* 2006;96(9):1542-47.
22. Finkelstein DM, Hill EL, Whitaker RC. School food environments and policies in US public schools. *Pediatrics* 2008;122:e251-e259.
23. Veugelers PJ, Fitzgerald A. Effectiveness of school programs in preventing childhood obesity. *Am J Public Health* 2005;95:432-35.
24. Dietitians of Canada. The inside story: An overview of school nutrition policies in Canada, 2008. Available at: [http://www.bitsandbytes.ca/resources/school\\_nutrition\\_policies\\_Sept\\_08.pdf](http://www.bitsandbytes.ca/resources/school_nutrition_policies_Sept_08.pdf) (Accessed January 2, 2009).
25. Eastern School District. School Nutrition: Administrative Regulation. Prince Edward Island, 2005. Available at: [http://www.edu.pe.ca/esd/main/policies\\_by\\_title\\_Q\\_Z.htm](http://www.edu.pe.ca/esd/main/policies_by_title_Q_Z.htm) (Accessed December 12, 2008).
26. Western School Board of Prince Edward Island. Elementary and Consolidated School Nutrition Policy, 2005. Available at: <http://www.edu.pe.ca/wsb/schoolboard/policies/policies.htm> (Accessed December 12, 2008).
27. Health Canada. Eating Well with Canada's Food Guide, 2007. Available at: [www.healthcanada.gc.ca/foodguide](http://www.healthcanada.gc.ca/foodguide) (Accessed January 8, 2008).
28. Midgett C, Evers S, Taylor J. Development of Dietary Behaviour Survey for senior elementary school students. Presented at the Fourth International Conference on Dietary Assessment Methods, Tucson, AZ, September 2000.
29. Ransley JK, Greenwood DC, Cade JE, Blenkinsop S, Schagen I, Teeman D, et al. Does the school fruit and vegetable scheme improve children's diet? A non-randomised controlled trial. *J Epidemiol Community Health* 2007;61:699-703.

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## RÉSUMÉ

**Objectifs :** La majorité des provinces canadiennes ont adopté de nouvelles politiques nutritionnelles en milieu scolaire, mais ces politiques n'ont pas été systématiquement évaluées, ou très peu. À l'Île-du-Prince-Édouard, une politique nutritionnelle dans les écoles primaires a été adoptée à l'échelle de la province en 2006. Nous avons cherché à évaluer les avantages nutritionnels en examinant les changements dans les aliments consommés par les élèves avant et un an après sa mise en œuvre.

**Méthode :** Nous avons sondé les élèves de cinquième et de sixième année de 11 écoles primaires de l'Île-du-Prince-Édouard en 2001-2002 (avant la mise en œuvre de la politique) et les élèves de cinquième et de sixième année des mêmes écoles en 2007 (après la mise en œuvre). Pour évaluer la consommation d'aliments, nous avons utilisé un questionnaire auto-administré et validé sur la fréquence de consommation des produits alimentaires. Une analyse de régression logistique multiniveaux a permis de comparer les différences, avant et après la mise en œuvre de la politique, dans la proportion d'élèves qui respectaient les recommandations du Guide alimentaire canadien pour les fruits et légumes et pour le lait et ses substituts, et dans la proportion d'élèves qui consommaient <3 portions d'aliments à faible valeur nutritive (AFVN) par jour.

**Résultats :** Comparativement aux élèves de 2001-2002, les élèves sondés en 2007 étaient 2,14 fois (IC 95% 1,62-2,82) plus susceptibles de dire avoir consommé moins de trois portions quotidiennes d'AFVN, et ils étaient plus susceptibles de respecter les recommandations pour les fruits et légumes (RC 1,44, IC 95% 1,00-2,07) et pour le lait et ses substituts (RC 1,27, IC 95% 0,98-1,64).

**Conclusion :** Notre étude est la première au Canada à faire état de changements positifs dans les aliments consommés par les élèves avec l'introduction d'une politique nutritionnelle dans les écoles.

**Mots clés :** nutrition; politique nutritionnelle; enquêtes sur la nutrition; habitudes alimentaires; services hygiène scolaire; obésité