The impact of school policies and practices on students' diets, physical activity levels and body weights: A province-wide practice-based evaluation

Jessie-Lee D. McIsaac, PhD,[1,2] Yen Li Chu, PhD,[2] Chris Blanchard, PhD,[3] Melissa D. Rossiter, PhD, RD,[4] Patricia L. Williams, PhD, PDt,[5] Kim D. Raine, PhD, RD,[2] Sara F.L. Kirk, PhD,[1] Paul J. Veugelers, PhD[2]

ABSTRACT

OBJECTIVES: To assess what health promotion policies and practices were adopted by schools in Nova Scotia and the extent that these policies and practices affected the diet quality, physical activity (PA) and weight status of students.

METHODS: We developed and administered a 'school practice assessment tool' to assess the presence of 72 different school-based health promotion policies and practices. Surveys were conducted in 2003 and 2011 to assess diet, PA and weight status in approximately 10,000 grade 5 students. We used multilevel regression methods to examine changes in these outcomes across schools with varying levels of health promotion policies and practices between the two time-points.

RESULTS: Between 2003 and 2011 the diet quality of students improved, PA decreased and the prevalence of childhood obesity increased. Although we did not find consistent or significant favourable benefits resulting from higher implementation levels, we did observe fewer negative trends among schools at higher levels of implementation.

CONCLUSION: Our results build on the current gap in knowledge on the impact of Health Promoting Schools (HPS) implementation through population health interventions, but there is a continued need for further evaluation and monitoring of school policies to understand how HPS practices are supporting healthier eating and PA for students.

KEY WORDS: Public health; schools; health promotion; health behaviour; prevention

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

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Establishing healthy eating and physical activity (PA) behaviours among children is important for prevention of chronic diseases later in life[1] and promotion of health and well-being throughout the lifespan.[2,3] Over the past few decades, there have been increases in the consumption of energy-dense and nutrient-poor foods, reductions in PA, and increases in sedentary behaviours.[4] Schools have been recognized as an essential point of intervention to support healthy behaviours as they have inherent opportunities to foster and maintain active lifestyles and proper nutrition.[3,5] Studies have demonstrated that school-based interventions are most likely to have an impact on health outcomes if they are comprehensive and multifaceted.[2,6,7] Many Canadian school jurisdictions have adopted health promotion strategies to support healthier behaviours among children and youth using a Health Promoting Schools (HPS) framework.[8] HPS (also known as Comprehensive School Health or Coordinated School Health) is an international framework that supports health in schools through the development of policies or practices that create supportive environments (e.g., serving and promoting only healthy food, integrating PA in the classroom and during school-wide events), with involvement and leadership from the entire school community to align health and education goals.[9,10]

A growing number of studies provide insight on the 'real-world' impact of HPS and school policies and practices. A Prince Edward Island-based evaluation revealed modest improvements in students' diets following the implementation of a provincial school nutrition policy.[11] In Ontario, a PA policy, nutrition guidelines and support for HPS have also propelled action

Author Affiliations

1. School of Health and Human Performance, Dalhousie University, Halifax, NS
2. School of Public Health, University of Alberta, Edmonton, AB
3. Department of Medicine, Dalhousie University, Halifax, NS
4. Department of Applied Human Sciences, University of Prince Edward Island, Charlottetown, PE
5. Department of Applied Human Nutrition, Mount Saint Vincent University, Halifax, NS

Correspondence: Paul J. Veugelers, PhD, Population Health Intervention Research Unit, School of Public Health, University of Alberta, 3-50 University Terrace, 8303 112 St, Edmonton, AB T6G 2T4, Tel: ☎780-492-9095, E-mail: Paul.Veugelers@ualberta.ca

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within schools. An objective measurement for PA found that students attending a school that offered daily physical education or provision of an alternative room for PA were more active than students attending a school without these resources.[12] Recent research has also shed light on specific school actions that help to support healthier behaviours. For example, students were more likely to report being active in schools that reported using activity as a reward and not as discipline,[13] those that had established community partnerships[13] and those that offered interschool PA opportunities.[14] While these studies are important in providing evidence of effectiveness of different school-level practices, they provide little insight into how the combination of various practices affects health behaviours and health of students. Furthermore, HPS implementation is tailored to school contexts,[8] thereby increasing the complexity of planning and impact evaluation.[9,15,16] Various planning and evaluative methods have been developed but their applicability to variations in jurisdictional boundaries has not been well documented.[17]

The province of Nova Scotia (NS) offers a unique opportunity to study the impact of HPS practices on student health. Research from 2003 showed that HPS can improve diet quality, increase physical activity and prevent childhood obesity.[7] In 2006, following these findings, the Provincial Government provided support for the development of regional HPS partnerships and frameworks that considered local assets and needs through a provincial HPS initiative. Enhancing physical activity and supporting implementation of the provincial nutrition policy were key priorities for the province; however, each regional partnership (led by school boards and district health authorities) developed their own priorities and approaches for school-level implementation. The objective of the current study is to assess what health promotion policies and practices were adopted by schools in NS and the extent that these policies and practices affected the diet quality, PA and weight status of students.

METHODS

Study design

The Children's Lifestyle And School-performance Study (CLASS) is a large, cross-sectional, provincial study that investigated the relationship among diet, PA, health and school performance outcomes of grade 5 students in NS in 2003 and 2011. The vast majority of the grade 5 student population in NS (10–11 years old) attends public schools and all public schools were invited to take part in both data collection cycles. In 2003, 282 of 291 schools (96.9%) agreed to participate and 5,517 parents provided their consent, resulting in an average response rate of 51.1% per school. The 2011 cycle of data collection provides a comparable sample with 269 of 286 schools (94.1%) participating and informed consent from 5,913 parents. The study was approved by the Health Research Ethics Boards at the University of Alberta and Dalhousie University, the NS Department of Education, and participating school boards and schools.

Data collection

Trained research assistants visited schools to administer surveys on diet and PA to students and to complete anthropometric measurements. Parents also completed a survey collecting information on socio-demographic factors, the home environment and food security. Principals were asked to complete a survey on the school environment.

Student outcomes

The Harvard Youth Adolescent Food Frequency Questionnaire (YAQ), adapted for Canadian settings, was used to gather information on usual dietary intake and habits pertaining to mealtime behaviours.[18] Students' diet quality was measured using the Diet Quality Index – International (DQI-I) score, a composite score ranging from 0 to 100 that includes aspects of diet adequacy, variety, balance and moderation.[19] This score was calculated based on student responses on the YAQ and from information on the Canadian Nutrient File.[20] To provide comparability across the two time points, a surrogate measure from the parent survey was used to estimate changes in unstructured PA levels over time (PA without coach). Parent-reported screen time was derived by combining time spent watching television and time spent playing video games (as a proxy for sedentary behaviour). Student standing height was measured to the nearest 0.1 cm after students had removed their shoes and body weight to the nearest 0.1 kg on calibrated digital scales. Body mass index (BMI) was used to define weight status based on the age- and gender-specific cut-off points of the International Obesity Task Force.[21]

School outcomes

In 2003 (prior to the NS HPS initiative), principals completed a brief survey on school characteristics and resources, but the information was limited. To improve our assessment of the school environment, we developed a 'school practice assessment tool' for the 2011 data collection cycle to assess HPS actions in schools across NS. We developed this tool building on our previous work in school-level assessment,[22] following a review of the literature and available tools and a NS policy scan;[23] we used this information to build a framework that characterized the critical components of HPS for the province. In consultation with national and local stakeholders, key components were assessed for their contribution to the HPS framework and relevance to the unique policy context of NS schools. These components were contextualized into school practices that were organized into four sequential stages (beginning implementation at level 1 to full implementation at level 4); this "rubric" format was pragmatic for schools and is similar to previous work in HPS assessment.[22] We consulted with policy-makers, school district staff, and principals to establish face validity and incorporated their feedback into the final version of the tool. Overall, 72 practices, 14 categories and 4 themes relating to health and physical education, PA, healthy eating and health promotion were included in the final evaluation tool (Table 1). The final items in the tool are also available on our project website (www.nsclass.ca). In 2011, all school principals taking part in CLASS were asked to administer the tool with either a team of key stakeholders or the person most responsible for HPS-related practices.

Table 1. Health Promoting School (HPS) policies and practices in elementary schools in Nova Scotia (n = 236)

HPS theme (average practice frequency)	HPS category (average practice frequency, median level of implementation)	HPS policy or practice	Percent of schools implementing HPS policy or practice
Health and physical education (71.6%)	Health education (71.8%, level 4)	Health education is inclusive to all students	79.7
		Health education adheres to curriculum	80.1
		Health education resources are used	78.4
		Mental health is integrated in health education	60.6
		Classroom teachers attend professional development	55.5
		Classroom discussions encourage respect	83.5
		Curriculum is integrated into other subjects	64.4
		Learning activities accommodate diverse learning needs	72.5
	Physical education (71.3%, level 3)	Physical education is inclusive to all students	79.7
		Physical education adheres to curriculum	80.1
		Physical education resources are used	77.5
		Physical education professional development is attended	85.2
		Curriculum is integrated into other subjects	33.9
Physical activity (56.9%)	Organized physical activity (64.7%, level 3)	Organized activities are inclusive to all students	76.3
		Organized activities are provided at no cost	72.9
		Organized activities are non-competitive	67.4
		Transportation is provided to support attendance	43.6
		Non-traditional activities are offered	69.5
		Programs are offered regularly to students	58.5
	Active free play (69.5%, level 3)	Active play is scheduled during the day	78.4
		Various spaces are available for play	77.5
		Different equipment is available for play	64.4
		Indoor space is available during poor weather	57.6
	Active transportation (35.9%, level 2)	Crosswalks and guards are available	39.4
		Storage provided for active transportation equipment (e.g., bike racks, helmets)	66.5
		Active transportation is promoted	27.5
		School has an active transportation policy	10.2
	School activity environment (57.4%, level 3)	School takes part in active school-wide activities	78.0
		School takes part in active living initiatives	80.9
		Students are leaders for activities	67.8
		Staff model physical activity	64.0
		Daily physical activity is provided	22.0
		Activity is incorporated in classroom	31.8
Healthy eating (59.8%)	Subsidized food programs (63.1%, level 3)	Food program is universally accessible to students	64.0
		Programs adhere to the nutrition policy	72.9
		Parents and students are aware of subsidized programs	73.7
		Parents contribute to food programs	53.8
		Education is included in food programs	50.9
	Food for purchase, n = 198† (65.7%, level 3)	Food for purchase adheres to nutrition policy	82.3
		Most foods are maximum nutrition	64.7
		Only healthy beverages are available	81.3
		Healthy foods are competitively priced	59.1
		Proper portion sizes considered for age of students	69.7
		Space is considered (i.e., healthy food at eye level)	54.0
		Local food products are used	48.5
	School nutrition environment (64.1%, level 3)	Clean water is available	82.2
		Food safety is practiced	80.1
		Healthy nutrition initiatives are organized	61.9
		Food is not used as reinforcement	68.6
		Healthy eating is modeled by staff	73.3
		Students are involved in food menu planning	25.0
		Healthy food is promoted at school functions	57.6
	Fundraising with food, n = 85† (46.5%, level 2)	Minimum nutrition foods are not used to fundraise	47.1
		Moderate nutrition foods are sometimes used to fundraise	62.4
		Maximum nutrition foods are sometimes used to fundraise	41.2
		Only healthy foods or activity used to fundraise	35.3

continues...

Table 1, continued

HPS theme (average practice frequency)	HPS category (average practice frequency, median level of implementation)	HPS policy or practice	Percent of schools implementing HPS policy or practice
Health promotion (64.2%)	School community engagement (71.3%, level 4)	Parents and students are engaged with health promotion	73.3
		Students are offered opportunities for leadership	61.4
		Community partners are engaged and involved	73.7
		Funding is sought to support health promotion	76.7
	School mental health (73.7%, level 4)	School respects and values diverse perspectives	80.1
		Positive learning interactions are promoted	73.3
		Bullying prevention program is established	62.7
		Student accomplishments are recognized	78.8
	Healthy school environment (66.4%, level 3)	Positive effective student behaviours are supported	79.7
		Cross-cultural understanding is supported	71.6
		Safe places are provided for students to express concern	69.9
		School has a policy for health promotion	44.5
	School support (45.5%, level 2)	Support for health promotion is provided by school administration	83.9
		School has a diverse team for health promotion	41.1
		Data are collected to support health promotion outcomes	33.9
		Health is integrated into school improvement goals	22.9

†Schools that did not offer food for purchase or did not use food for fundraising were excluded.

Covariates

Parents completed home surveys that included information on parental education attainment levels and household income levels. Place of residency (urban/rural) was determined using postal codes collected from parent surveys.

Data analysis

Schools that participated in both survey years (data were collected at similar times of the year) and had complete data for the school assessment tool in 2011 were included in the analysis to determine associations between HPS policies and practices and health outcomes. Schools were assumed to have no policy or practice implementation in 2003; grade 5 students in 2011 would have been exposed to the provincial policies since they started school. In 2011, schools were classified into two groups, limited implementation (below the median) or moderate/intense implementation (above the median), according to the number of implemented practices within each category and theme. Analysis was conducted using multilevel regression methods to account for the clustering of students within schools. Limited implementation schools in 2011 were used as the reference category for all analyses. This allows for comparisons to be made before and after implementation of policies (2003 vs. 2011), and also for comparisons to be made between schools with limited and schools with moderate to intense policy implementation. All analyses were adjusted for confounding effects of gender, household income, parental education attainment, and place of residency. All analyses involving dietary outcomes were additionally adjusted for energy intake; students with outlying observations of energy intake of <500 or >5,000 kcal/day were excluded from analyses. Schools that had no foods available for purchase or that reported not using food for fundraising were excluded from analyses related to these practices.

RESULTS

School-level implementation

In 2011, 246 of the 269 participating schools returned the completed 'school practice assessment tool' (91.4%) and 10 (4.2%) schools were excluded as a result of incomplete data, yielding a final sample of 236 (87.7%) schools. Table 1 provides an overview of the average practice frequency and median level of implementation across the HPS themes, categories and practices. A higher percentage of schools reported implementing practices related to health and physical education (71.6%) and health promotion (64.2%), compared to PA (56.9%) and healthy eating (59.8%). With respect to the categories, the highest reported implementation of practices related to mental health (73.7%), health and physical education (71.8% and 71.3%) and community engagement (71.3%). The lowest percentage implementation of practices related to active transportation (35.9%), fundraising (46.5%), school support (45.5%) and school activity environment (57.4%). Median implementation was Level 3 for most categories, with the exception of health education, school community engagement and mental health (all at Level 4) and active transportation, fundraising with food and school support (all at Level 2). Figure 1 depicts the school-level implementation across the 14 practice categories.

Student-level outcomes

The characteristics of 4,461 grade 5 students who participated in 2003 and 5,140 students who participated in 2011 are shown in

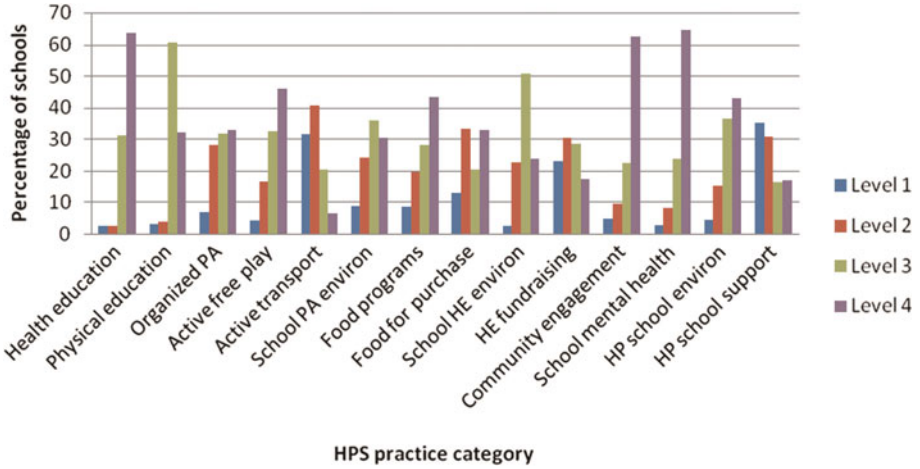

Figure 1. Implementation level of Health Promoting School (HPS) policies and practices by practice category in elementary schools in Nova Scotia. PA = physical activity, HE = healthy eating; HP = health promotion.

Table 2. Characteristics of grade 5 children in Nova Scotia†

Characteristic	2003 (*n* = 4461)	2011 (*n* = 5140)	*P* value*
Gender			0.25
Girls	50.8	52.0	
Boys	49.3	48.0	
Household income			<0.001
<$20,000	13.1	8.8	
$20,000–$40,000	22.9	18.8	
$40,001–$60,000	25.9	18.1	
>$60,000	38.1	54.4	
Parental education			<0.001
Secondary or less	31.3	19.9	
College	37.9	44.1	
University or above	30.7	36.0	
Place of residence			0.10
Urban	61.8	58.2	
Rural	38.2	41.8	
Overweight (excluding obese)	22.5	23.4	0.39
Obese	10.2	12.4	0.01
DQI-I (mean ± SE)	56.7 ± 0.3	56.5 ± 0.3	0.64
Physical activity, times per month (mean ± SE)	11.8 ± 0.1	8.1 ± 0.1	<0.001
Screen time, hours per day (mean ± SE)	2.1 ± 0.04	2.1 ± 0.03	0.11

**P* values determined using the Rao-Scott chi-square test for categorical variables, and using a *t*-test for difference between means for continuous variables.
†Numbers weighted to represent provincial estimates and to adjust for non-response. All numbers are presented as percent of total unless otherwise stated.

Table 2. Parents of grade 5 students in 2011 had significantly higher levels of education and higher overall household income than parents of students in 2003. At the provincial level, both DQI-I and hours of screen time remained fairly consistent from 2003 to 2011; however, we observed a significant decrease in reported PA (11.8 to 8.1 times per month). The prevalence of overweight (excluding obesity) remained relatively unchanged at 22.4% in 2003 compared with 23.4% in 2011, whereas there was a significant increase in the prevalence of obesity (10.2% to 12.4%) over the same time period.

Associations between HPS policies/practices and student health outcomes

The associations between the 14 HPS categories and students' diet quality, PA levels, screen time and weight status in 2003 and 2011 are described in Table 3; similar trends were observed at the thematic level (data not shown). With respect to dietary outcomes, we observed a favourable trend in diet quality, with students in 2003 having significantly lower DQI-I scores compared to students in 2011 who attended schools with limited implementation in health education and across healthy eating and health promotion themes. However, among students in schools with moderate/intense implementation, there was a non-significant negative trend in diet quality compared to schools with limited implementation among these same categories. We observed less favourable outcomes for PA, with a significant undesirable trend being observed in student PA levels and sedentary behaviours across all categories in the themes of health and physical education, physical activity and health promotion. Overall, compared to students in 2011 attending schools with limited implementation in these categories, students in 2003 were significantly more active and had less screen time for the vast majority of relevant categories. For students attending schools with moderate/intense implementation in 2011, an undesirable trend was also observed for PA and screen time behaviours; however, significance was only observed for screen time behaviours in health education, community engagement, and school environment categories. Finally, a negative trend emerged with weight status, in that students were less likely to be overweight and obese in 2003 compared to students in 2011 attending schools with limited implementation. However, this negative trend was also observed among students attending schools with moderate/intense implementation, although statistical significance was only observed with obesity in the food programs category.

DISCUSSION

The purpose of this study was twofold: to assess the nature of and degree to which HPS practices and policies were implemented by schools in NS and to assess their impact on diet quality, PA and weight status in students. Between 2003 and 2011, we observed improvements in diet quality but declines in PA and an increase in the prevalence of childhood obesity. We did not observe

Table 3. Associations of Health Promoting School (HPS) policies and practices with diet quality, physical activity levels, screen time, and weight status among grade 5 children in Nova Scotia†

HPS theme	HPS category‡	DQI-I		Physical activity (times per month)		Screen time (hours per day)		Overweight (excluding obese)		Obese	
		β	95% CI	β	95% CI	β	95% CI	OR	95% CI	OR	95% CI
Health and physical education	Health education										
	2003	**−2.38**	**(−3.01, −1.75)**	**3.75**	**(3.27, 4.23)**	**−0.16**	**(−0.29, −0.04)**	**0.82**	**(0.69, 0.97)**	0.73	(0.57, 0.95)
	2011 limited	–	–	–	–	–	–	–	–	–	–
	2011 moderate to intense	−0.35	(−1.01, 0.32)	0.09	(−0.41, 0.58)	**−0.18**	**(−0.31, −0.05)**	0.98	(0.82, 1.16)	1	(0.77, 1.29)
	Physical education										
	2003	–	–	**3.66**	**(3.18, 4.13)**	−0.12	(−0.24, 0)	**0.84**	**(0.71, 0.99)**	0.78	(0.6, 1)
	2011 limited	–	–	–	–	–	–	–	–	–	–
	2011 moderate to intense	–	–	−0.03	(−0.52, 0.46)	−0.13	(−0.25, 0)	1	(0.85, 1.19)	1.08	(0.83, 1.4)
Physical activity	Organized physical activity										
	2003	–	–	**3.63**	**(3.17, 4.08)**	−0.11	(−0.22, 0.01)	0.85	(0.72, 1)	**0.76**	**(0.6, 0.97)**
	2011 limited	–	–	–	–	–	–	–	–	–	–
	2011 moderate to intense	–	–	−0.08	(−0.55, 0.4)	−0.11	(−0.23, 0.02)	1.03	(0.87, 1.21)	1.05	(0.82, 1.35)
	Active free play										
	2003	–	–	**3.64**	**(3.14, 4.14)**	−0.1	(−0.23, 0.02)	**0.83**	**(0.69, 0.99)**	**0.74**	**(0.56, 0.96)**
	2011 limited	–	–	–	–	–	–	–	–	–	–
	2011 moderate to intense	–	–	−0.05	(−0.57, 0.46)	−0.1	(−0.23, 0.04)	0.99	(0.82, 1.18)	1	(0.77, 1.31)
	Active transportation										
	2003	–	–	**3.73**	**(3.37, 4.09)**	−0.05	(−0.14, 0.04)	**0.82**	**(0.72, 0.93)**	**0.74**	**(0.61, 0.89)**
	2011 limited	–	–	–	–	–	–	–	–	–	–
	2011 moderate to intense	–	–	0.1	(−0.32, 0.53)	−0.04	(−0.16, 0.07)	0.95	(0.82, 1.1)	1.01	(0.81, 1.27)
	School environment										
	2003	–	–	**3.55**	**(3.09, 4)**	−0.09	(−0.2, 0.03)	**0.81**	**(0.69, 0.95)**	**0.77**	**(0.6, 0.99)**
	2011 limited	–	–	–	–	–	–	–	–	–	–
	2011 moderate to intense	–	–	−0.18	(−0.66, 0.29)	−0.08	(−0.2, 0.05)	0.96	(0.81, 1.13)	1.07	(0.83, 1.37)
Healthy eating	Food programs										
	2003	**−2.57**	**(−3.16, −1.98)**	–	–	–	–	0.93	(0.79, 1.1)	0.96	(0.74, 1.24)
	2011 limited	–	–	–	–	–	–	–	–	–	–
	2011 moderate to intense	−0.62	(−1.26, 0.01)	–	–	–	–	1.16	(0.98, 1.37)	**1.42**	**(1.09, 1.84)**
	Food available for purchase										
	2003	**−2.52**	**(−3.08, −1.97)**	–	–	–	–	**0.8**	**(0.68, 0.93)**	**0.78**	**(0.62, 0.99)**
	2011 limited	–	–	–	–	–	–	–	–	–	–
	2011 moderate to intense	−0.6	(−1.21, 0.01)	–	–	–	–	0.93	(0.79, 1.09)	1.09	(0.86, 1.38)
	School environment										
	2003	**−2.35**	**(−3.01, −1.68)**	–	–	–	–	0.85	(0.71, 1.02)	**0.75**	**(0.57, 0.98)**
	2011 limited	–	–	–	–	–	–	–	–	–	–
	2011 moderate to intense	−0.29	(−0.99, 0.41)	–	–	–	–	1.02	(0.85, 1.23)	1.02	(0.78, 1.34)
	Fundraising										
	2003	**−2.19**	**(−2.58, −1.8)**	–	–	–	–	**0.84**	**(0.75, 0.94)**	**0.76**	**(0.64, 0.91)**
	2011 limited	–	–	–	–	–	–	–	–	–	–
	2011 moderate to intense	−0.42	(−1.13, 0.29)	–	–	–	–	1.01	(0.84, 1.22)	1.18	(0.9, 1.55)
All health promotion activities	Community engagement										
	2003	**−2.51**	**(−3.12, −1.9)**	**3.57**	**(3.1, 4.03)**	**−0.13**	**(−0.25, −0.02)**	0.87	(0.73, 1.02)	0.83	(0.64, 1.07)
	2011 limited	–	–	–	–	–	–	–	–	–	–
	2011 moderate to intense	−0.53	(−1.18, 0.13)	−0.15	(−0.64, 0.33)	**−0.14**	**(−0.27, −0.02)**	1.05	(0.88, 1.24)	1.17	(0.9, 1.52)
	Mental health										
	2003	**−2.08**	**(−2.74, −1.42)**	**3.62**	**(3.12, 4.12)**	**−0.13**	**(−0.26, −0.01)**	0.87	(0.73, 1.04)	0.8	(0.61, 1.05)
	2011 limited	–	–	–	–	–	–	–	–	–	–
	2011 moderate to intense	0.04	(−0.65, 0.73)	−0.08	(−0.59, 0.43)	−0.14	(−0.27, 0)	1.05	(0.88, 1.26)	1.12	(0.85, 1.47)
	School environment										
	2003	**−2.15**	**(−2.79, −1.51)**	**3.64**	**(3.15, 4.13)**	**−0.14**	**(−0.27, −0.02)**	0.87	(0.73, 1.03)	0.81	(0.62, 1.05)
	2011 limited	–	–	–	–	–	–	–	–	–	–
	2011 moderate to intense	−0.04	(−0.72, 0.63)	−0.06	(−0.55, 0.44)	**−0.15**	**(−0.28, −0.02)**	1.05	(0.88, 1.25)	1.13	(0.86, 1.47)
	School support										
	2003	**−2.22**	**(−2.69, −1.75)**	**3.53**	**(3.17, 3.9)**	−0.06	(−0.15, 0.03)	**0.82**	**(0.72, 0.94)**	**0.81**	**(0.66, 0.99)**
	2011 limited	–	–	–	–	–	–	–	–	–	–
	2011 moderate to intense	−0.2	(−0.77, 0.36)	−0.28	(−0.7, 0.14)	−0.06	(−0.17, 0.05)	0.96	(0.83, 1.11)	1.19	(0.96, 1.49)

†HPS policies and practices are determined as number of implemented policies within each HPS category. All schools are assumed to have no practice/policy implementation in 2003. In 2011, schools are categorized to have limited or moderate to intense implementation according to the number of practices implemented within each category, where limited implementation = less than half the practices within each category, and moderate to intense implementation = half or more of practices within each category. **Bolded** values indicate statistically significant difference.

‡Reference category is limited implementation group in 2011.

– = reference category.

consistent or significant favourable benefits resulting from higher implementation levels as assessed with our 'school practice assessment tool' but we did observe fewer negative trends in overweight and obesity among schools at higher levels of implementation. This suggests that any positive changes observed in diet quality may not have been enough to mitigate the impact of reported reductions in PA levels.

We previously reported improvements in diet quality between 2003 and 2011 in NS grade 5 students.[24] The current study adds to that finding by suggesting that school-level changes from 2003 to 2011 may have had a larger impact on student diet quality than on PA. Our findings further advance the current literature by shedding light on the types of HPS actions that may be more likely to support positive health outcomes among children. HPS practice categories of health education, healthy eating and health promotion practices were significantly associated with positive trends in diet quality from 2003 to 2011. In the context of improving diets but declining PA, we observed an increase in childhood obesity. This suggests that investments in promotion of PA are needed to curb the increasing trends in the prevalence of obesity. HPS programs have been shown to improve PA among students in Alberta both during and outside of school hours, which underlines the potential for school interventions to have a broader impact on behaviours.[25]

The observed associations with implementation and diet quality are consistent with the provincial policy focus of NS schools. In 2006, a provincial nutrition policy was mandated across all public schools to increase access to healthy, safe and affordable food and beverages in NS.[26] While the vast majority of schools reported adhering to the policy, fewer reported that they had adopted *all* policy requirements (e.g., considering portion sizes for different ages and competitive pricing for healthy foods). These results corroborate the impact of school-level barriers reported in our previous qualitative study.[27] The lack of a provincially mandated policy related to PA beyond the curricular requirement for physical education may have negatively influenced implementation at the school level and may help explain the worsening trends in PA among students. It is important to note that, following the 2011 data collection cycle, a provincial childhood obesity prevention strategy (Thrive! A plan for a healthier NS) was launched.[28] This strategy identifies specific actions related to enhancing PA and healthy eating opportunities for children and has the potential to curb the negative PA trends.

Considering the holistic nature of the HPS approach, the overall reported 'functioning' (i.e., comprehensiveness) of practices/policies at the school level is also an important element to consider in interpreting the results related to students' behaviours. Although practices consistent with a HPS approach were reportedly at a high level of implementation, differences across themes, categories and individual practices suggest that practices relating to curriculum were more frequently implemented than those that aimed to advance educational policies through changes in the school environment. This suggests that some practices were easier to implement than others, with the less frequently reported practices being those that promoted supportive environments to model health behaviours and thus could have greater population health impact. This variability in comprehensive implementation of practices may explain the limited positive trends in student outcomes that were observed in the results – a policy approach is not likely to be effective if not fully implemented and monitored. This is not surprising given the widely acknowledged challenges in implementing upstream population-based interventions that address the social–structural determinants of obesity.[29] An emphasis on curriculum practices also suggests a lack of understanding of HPS that has been reported in previous literature.[30–32] Our qualitative research has suggested that competing demands on the school system may limit the adoption of health promotion practices in schools.[27] Schools need to have time and capacity to allow them to move beyond their traditional classroom responsibilities and make sustainable changes to their environment. Providing capacity through the form of a school health facilitator has been shown to be an effective intervention for improving diet, PA and weight status in Alberta.[33] A supportive school and community culture was also reported in our qualitative research as a key factor in overcoming barriers to health promotion.[27]

It is important to note the potential limitations of our study. The cross-sectional design offered two time points to assess student outcomes before and after policy implementation, but it may take more time for changes in school environments to influence student behaviours, which was beyond the scope of this study. PA and sedentary behaviour were determined based on parent responses to three questions, which may not fully capture these behaviours and may be prone to error. However, we have previously shown that parent report was able to provide an accurate assessment of child physical activity levels in this age group.[34] While the adoption of supportive HPS practices might be a result of the changing policy climate in NS, they may have also been present prior to the introduction of the policies. Our baseline principal survey collected limited information and we improved our assessment of the school environment in 2011; as a result, it is difficult to ascertain if early implementation of policies (i.e., before provincial policies) influenced the results given the varied nature of school practices based on individual circumstance. Considering the dynamic and ongoing processes of health promotion strategies in schools and the difficulty in capturing the impact of household and community contextual factors (i.e., budget cuts, change in government), it is important to consider evaluative tools that provide a method to track the progression of change.[35] The evaluation tool developed in this study used the form of a rubric, which is a familiar assessment tool used in schools. The rubric was consistent with local jurisdictional priorities and considered different stages of readiness by describing practical solutions along a continuum of implementation. We also sought feedback from a national panel of experts to assist with item selection, however it is possible that some items related to HPS were missed. Also, the specificity of practices relevant to the NS policy context may reduce the generalizability of results to other jurisdictions. The self-reported nature of our tool may also have introduced response biases from schools. In particular,

previous research has suggested that there are differences within and between schools in how HPS is perceived and defined.[31] The tools were completed by the person/people deemed most responsible for HPS-related practices and should have had the best knowledge on HPS; however, our results are limited by the information provided from schools and may have missed information on supportive policies outside of the school setting that influence NS communities.

Our findings build upon the growing literature on the impact of school-level implementation of HPS approaches on student behaviours and weight status. Although we did not find consistent or significant favourable benefits resulting from higher implementation levels, we did observe fewer negative trends in overweight and obesity among schools at higher levels of implementation. This does not suggest that HPS is ineffective, but rather highlights the challenges of implementing HPS at a provincial level where it may take longer to observe an impact on student outcomes. Importantly, our results build on the current gap in knowledge on the impact of HPS implementation through population health interventions, but there is a continued need to advance the literature and better articulate the dose required for policy/practice implementation in schools to have an impact on students. This insight will help shed light on the policies/practices that are the most successful in supporting healthier behaviours among children and youth, which will help to inform health promotion policy development and advance health promotion uptake across other jurisdictions. Further policy development, and a greater focus on implementation and monitoring, could help with the adoption of HPS practices that support both healthier eating and PA for students. Broadening current practices and policies in schools will require continuing discussion about the meaning and purpose of HPS to seek a more realistic understanding of what can be achieved through school interventions[31] and to move beyond a focus solely on educational outcomes toward more sustainable and integrated health and educational priorities in schools.[31,36]

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RÉSUMÉ

OBJECTIFS : Évaluer les politiques et les pratiques de promotion de la santé adoptées dans les écoles de la Nouvelle-Écosse et leur effet sur la qualité du régime, l'activité physique (AP) et le statut pondéral des élèves.

MÉTHODES : Nous avons élaboré et administré un « outil d'évaluation des pratiques scolaires » pour évaluer la présence de 72 politiques et pratiques distinctes de promotion de la santé à l'école. Des sondages ont été menés en 2003 et en 2011 pour évaluer le régime, l'AP et le statut pondéral d'environ 10 000 élèves de 5e année. Nous avons utilisé des méthodes de régression multiniveaux pour examiner les changements dans les résultats obtenus par les écoles ayant adopté divers niveaux de politiques et de pratiques de promotion de la santé entre les deux dates.

RÉSULTATS : Entre 2003 et 2011, la qualité du régime des élèves s'est améliorée, l'AP a diminué, et la prévalence de l'obésité juvénile a augmenté. Nous n'avons pas trouvé d'avantages systématiques ou significatifs résultant de niveaux de mise en œuvre supérieurs, mais nous avons observé moins de tendances négatives dans les écoles aux niveaux de mise en œuvre supérieurs.

CONCLUSION : Nos résultats comblent une partie des lacunes actuelles dans les connaissances sur l'effet de la mise en œuvre d'interventions en santé des populations dans les « écoles faisant la promotion de la santé » (EPS), mais il existe encore un besoin d'évaluer et de surveiller les politiques scolaires afin de comprendre comment les pratiques des EPS appuient l'alimentation saine et l'AP chez les élèves.

MOTS CLÉS : santé publique; écoles; promotion de la santé; comportement sanitaire; prévention