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Research Article

Assessing an innovative approach to school food programming: A process evaluation of the New Brunswick School Food Pilot Project

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Abstract

The New Brunswick School Food Pilot Project (NBSFPP) was developed to improve students' diet and academic outcomes. This process evaluation described the reach, effectiveness, adoption, implementation, and maintenance of the NBSFPP using the RE-AIM framework in eleven schools across the province of New Brunswick, Canada. Teacher and school questionnaires, administrative data, and the School Food Coordinator's notes provided quantitative and qualitative data. Descriptive statistics, paired t-test, and Wilcoxon signed-rank tests analyzed the quantitative data; qualitative data were thematically analyzed. On average, schools implemented three distinct food programs, including breakfast, lunch, snack, after-school, cooking cart, and school garden programs. They were delivered by school staff, volunteers, and sometimes students. Key facilitators to implementation included the NBSFPP grant and support from the School Food Coordinator. Key challenges included COVID-19-related restrictions, delays, and time constraints. Program sustainability was largely dependent on receiving funding. School administrators reported positive impacts of the NBSFPP on program optimization and satisfaction, student leadership skills, food literacy, and eating behaviours. However, no significant effect was found on teachers' perceptions of students' diet or academic outcomes. Findings suggest that the NBSFPP provided crucial support to schools in developing and implementing individualized school food programs that addressed schools' specific needs.

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Résumé

Le projet pilote d'alimentation scolaire du Nouveau-Brunswick (PPASNB) a été conçu pour améliorer l'alimentation des élèves et leurs résultats scolaires. Cette évaluation des processus au moyen du cadre RE-AIM décrit la portée, l'efficacité, l'adoption, la mise en œuvre et le maintien du PPASNB dans 11 écoles du Nouveau-Brunswick, au Canada. Les questionnaires remplis par les corps enseignants et les écoles, les données administratives et les notes de la personne coordonnatrice en alimentation scolaire ont fourni des données quantitatives et qualitatives. Des statistiques descriptives, des tests t pour données appariées et des tests de Wilcoxon ont permis d'analyser les données quantitatives ; quant aux données qualitatives, elles ont fait l'objet d'une analyse thématique. En moyenne, les écoles ont adopté trois types de programmes alimentaires, par exemple des programmes pour le déjeuner, le dîner, la collation, les activités parascolaires, avec une cuisine mobile, un potager scolaire. Leur fonctionnement reposait sur le personnel des écoles, des bénévoles et parfois des élèves. Parmi les facteurs favorables à leur mise en œuvre, notons la subvention du PPASNB et le soutien d'une personne coordonnatrice en alimentation scolaire. En revanche, les restrictions liées à la COVID-19, des retards et des contraintes de temps ont été les principales difficultés. La pérennité des programmes dépendait principalement du financement. Les administrations scolaires ont rapporté des effets positifs du PPASNB sur l'optimisation des programmes et la satisfaction, sur les capacités de leadership des élèves, la littératie alimentaire et les comportements alimentaires. Cependant, aucun effet significatif n'a été observé sur la perception qu'a le corps enseignant de l'alimentation des élèves ni sur les résultats scolaires. Les résultats suggèrent que le PPASNB a constitué un soutien primordial aux écoles pour la création et la mise en œuvre de programmes alimentaires adaptés aux besoins particuliers de chacune.

Introduction

The link between adequate nutrition and health is well established (World Health Organization, 2020). Diet-related chronic diseases, such as heart disease, diabetes, and certain cancers, are considered one of the leading causes of premature death in Canada (Health Canada, 2019). Since many eating behaviours are acquired early in life, adopting healthy eating behaviours in childhood could increase children's odds of maintaining them throughout their life (Birch et al., 2007; Black & Hurley, 2013). Moreover, adequate nutrition during childhood is crucial for optimal growth and development and reduces the risk of developing chronic diseases in adulthood (Black & Hurley, 2013; Jääskeläinen et al., 2012; Kaikkonen et al., 2013). Yet, unhealthy eating behaviours are common among Canadian school-aged children (Garriguet, 2004). In New Brunswick (NB), student wellness surveys have shown that students frequently consume ultra-processed foods and that fewer than 60% consume vegetables and fruit at least five times a day (New Brunswick Health Council, 2025). Breakfast

skipping is also common, with only 36 percent of students in grades 6 to 12 reporting eating breakfast every day (New Brunswick Health Council, 2025).

In addition to its health benefits, some studies have linked healthy eating behaviours with better academic performance in children (Centers for Disease Control and Prevention, 2014; Correa-Burrows et al., 2015; Florence et al., 2008; Northstone et al., 2012; Purtell & Gershoff, 2015). Consuming breakfast, for example, has been found to have positive effects on cognitive performance, with these effects more apparent among undernourished or nutritionally vulnerable children (Adolphus et al., 2016; Hoyland et al., 2009; Taras, 2005). In Canada, it is estimated that one in three (33 percent) children under 18 are impacted by food insecurity (PROOF, 2025). In NB, this percentage stands at 40 percent (PROOF, 2025). Students who come to school hungry experience greater difficulty concentrating and poorer problem-solving skills, negatively impacting their academic performance (Kleinman et al., 2002; Taras, 2005). Considering that NB students have among the lowest test scores in the country in reading, mathematics, and science (Elez et al., 2023), ensuring that they have access to healthy and nutritious food at school could help improve their academic outcomes and their health (Colley et al., 2019; Everitt et al,, 2020; Haines & Ruetz, 2019; Hernandez et al,, 2018).

Since Canadian children spend most of their waking time at school and consume approximately one-third of their daily calories during those hours (Tugault-Lafleur et al., 2017), schools are an ideal environment for promoting healthy eating (Food and Agriculture Organization of the United Nations, 2020; Haines & Ruetz, 2019). Many schools across Canada have implemented school food programs to improve their food environment, provide better access to healthy foods or promote food literacy (Colley et al., 2019; Everitt et al., 2020; Hernandez et al., 2018; Government of Alberta, 2017). Very few of these programs have undergone formal evaluations. However, among those that have, positive impacts on students' health and overall well-being have been reported, such as increased vegetable and fruit intake, improved nutrition and food knowledge and higher school attendance (Colley et al., 2019; Everitt et al., 2020; Haines & Ruetz, 2019; Ruetz & McKenna, 2021). Despite this growing evidence, in 2020, NB remained the only Canadian province without a provincially funded school food program (The Coalition for Healthy School Food, 2018). In response to this lack, the Heart and Stroke Foundation of New Brunswick, a non-profit provincial organization, conceptualized, developed, and later implemented the New Brunswick School Food Pilot Project (NBSFPP). The NBSFPP was subsequently funded by the government of New Brunswick and the New Brunswick Medical Society and piloted during the 2020-2021 school year. Specifically, this pilot project aimed to support schools and the health of their students by providing guidance, resources, and funding needed to implement customized school food programs that addressed each school's unique needs. The NBSFPP model was grounded in evidence-based best practices (Colley et al., 2019; Everitt et al., 2020; Haines & Ruetz, 2019; Hernandez et al., 2018) and consisted of five fundamental principles: ensuring universal access to healthy food, providing uniquely tailored programs, offering expert advice and ongoing support, promoting the development of food literacy, and encouraging partnership and community engagement.

Although school food programs are needed, it is also imperative that they be adequately evaluated. Outcome evaluation is most commonly used in program evaluation; however, focussing exclusively on effectiveness hinders one's ability to understand the broader context in which those outcomes were assessed

and the significance of the findings (Craig et al., 2008). Process evaluation helps stakeholders understand why a program outcome was or was not achieved by documenting how the program was implemented and providing insight into how it could be modified to achieve its desired outcomes (Glasgow et al., 2006). The RE-AIM framework is one of the most recognized and utilized frameworks for conducting process evaluations of school health-promoting programs (Dunton et al., 2009; Dunton et al., 2014; Larsen et al., 2017; Ruetz & McKenna, 2021; Thomas et al., 2016). This framework provides information on the Reach, Effectiveness, Adoption, Implementation, and Maintenance of programs relatively quickly and efficiently, increasing the speed at which research can be translated into practice (Glasgow et al., 1999). Therefore, the purpose of this study was to conduct a process evaluation of the NBSFPP using the RE-AIM framework, which included assessing its impact on teachers' perceptions of students' academic and diet-related outcomes.

Methodology

Description of the NBSFPP

Compared to traditional school food programs that have one specific objective (e.g. hot lunch programs that serve healthy meals to vulnerable students) (Bartfeld et al., 2020; Bauer et al., 2020; Frisvold, 2015; Robinson-O'Brien et al., 2010), the NBSFPP helped schools implement universal, tailored, individualized and comprehensive school food programs that address schools' and students' specific needs based on each school's priorities and available resources. This means that schools could implement a variety of programs, such as free breakfast, lunch, snack, or vegetable and fruit programs, school gardens, cooking carts or after-school food programs. Schools identified and developed relevant programs and implemented them with the help of a School Food Coordinator, a dietitian, who provided guidance and evidence-based nutrition recommendations to all schools. Further, the School Food Coordinator worked with schools to ensure that their proposed programs promote healthy eating, increase students' access to healthy foods, respect NB's school food policy and, when possible, promote food literacy. The School Food Coordinator also provided ongoing support to help schools overcome challenges they faced throughout the year.

In September 2020, schools that agreed to participate in the NBSFPP were asked to submit a School Background Form, which collected information on the number of students enrolled in the school, the estimated percentage of students who came to school hungry (based on personal observation), how schools planned to use the NBSFPP grant, the anticipated percentage of students who would be participating in their programs and information on any current school food programming. An in-person consultation with the School Food Coordinator and the school administrator was then held, and an action plan was developed to implement new or improve existing programs. Completing the action plan was followed by the release of the first portion (75 percent) of the NBSFPP grant. To receive the remaining 25 percent of their grant, schools were required to submit a mid-point report at the beginning of 2021 that described the food programs implemented or improved, along with the associated costs. Grants were allocated based on the school's size,

needs, and current infrastructure to ensure equity in resource distribution. Funding was re-evaluated throughout the year to ensure schools had the required financial support, and funds were redistributed when necessary.

Recruitment

A convenience sample of 19 schools was selected by the Heart and Stroke Foundation of New Brunswick to participate in the NBSFPP. Differences in school settings were prioritized throughout the sampling process. Factors that were considered included results of provincial school performance reports, which assess students' performance in math, reading, and science, and surveys of student perceptions of their school environment (Éducation et Développement de la petite enfance, n.d.; Department of Education and Early Childhood Development, n.d.), grades taught (elementary, middle, and high schools), location (urban and rural), quality of school infrastructure related to school food programming and degree of access to financial and community resources. Additionally, geographic and language considerations were taken into account, ensuring representation from each of the seven public school districts in NB (four Anglophone and three Francophone). This sampling approach enabled a deeper understanding of the potential outcomes of the NBSFPP across a range of contexts, an important factor in assessing scalability. Selected schools were contacted by the School Food Coordinator and invited to participate in the study. Of the 19 selected schools, 11 agreed to participate and provided informed, signed consent.

Teachers were recruited to assess the effectiveness of the NBSFPP. All Kindergarten to Grade 8 teachers in the recruited schools were eligible to participate in the study. High school teachers were excluded as students in grades 9-12 often have multiple teachers, and many leave school during breaks and lunch, thus making it difficult for teachers to observe and accurately report their students' behaviours (Chriqui et al., 2014). Solicitation letters and consent forms were emailed to all teachers by the school administrator. Teachers willing to participate in the study were asked to sign the consent form and send it directly to the School Food Coordinator to ensure their confidentiality from the school administrators. At the end of October 2021, a reminder was sent to teachers to encourage them to participate in the study. Ethics approval for this study was obtained from the Comité d'éthique de la recherche avec les êtres humains at the Université de Moncton (#2021-002).

Process and outcome evaluation

The RE-AIM framework (Glasgow et al., 1999) was used to guide the process evaluation. Elements of the framework, outcome indicators and data sources are presented in Table 1. As part of the *Effectiveness* element of the framework, a pre- and post-study design was used to assess the impact of the NBSFPP on student absenteeism and teachers' perceptions of students' in-class behaviours, attention, academic motivation and performance, vegetable and fruit consumption, and food insecurity.

Data sources and data collection

The *Reach* element of the framework was defined as the proportion and representativeness of schools, students, and partnerships involved in the NBSFPP (Table 1). Four data sources were used to assess the reach of the NBSFPP, including the School Background Form, publicly available geospatial data from the Community Information Database (Community Information

Database, 2016), the 2016 Census of Population data and the School Questionnaire.

The *Effectiveness* of the NBSFPP was assessed with a pre- and post online Teacher Assessment of Student Behaviours Questionnaire (Table 1). Since the evaluation was conducted during the pandemic, student-level data collection was not possible. Therefore, outcome variables were collected via teachers. The questionnaire was developed using previously validated questionnaires (Coladarci, 1986; Friedman, 1995; Hardré et al., 2008) and assessed teachers' perceptions of students' in-class disruptive behaviours, attention, academic motivation and ranking. Teachers' perception of classroom attention was measured using a subscale from Friedman's (1995) questionnaire, which showed good internal consistency ($\alpha = 0.85$). This question consisted of eight items scored from 0 (Never) to 5 (Always) for a maximum score of 40 points. These items assessed students' understanding of the course material, their ability to work independently, listen to one another, concentrate and work quietly, and their participation, interest, and enthusiasm in the classroom (Friedman, 1995). Teachers' perception of student disruptive behaviours was measured using a negative subscale of Friedman's (2015) questionnaire, which also showed good internal consistency ($\alpha = 0.87$). This question consisted of 11 items scored from 0 (Never) to 5 (Always) for a maximum score of 55 points. It assessed students' noncompliance with teachers' demands to be silent or to stop disrupting the class, students' disruptive interactions with each other, and students' disrespect towards the teacher, including talking back (Friedman, 1995). Teachers' perception of students' academic motivation was measured using a questionnaire by Hardré et al. (2008), which showed good concurrent validity ($r=0.49$, $p<0.01$) with overall student motivation from the Student Engagement and Effort Scale (Hardré et al., 2008). Specifically, teachers were asked to report how true five statements were for the students in their class on a scale from 0 (Not at all true) to 6 (Very much true) for a maximum score of 30 points. This question assessed students' effort and willingness to learn the course content and their attention, focus, and interest in class-related tasks (Hardré et al., 2008). Reliable data from student report cards were not available for baseline assessments. Therefore, one question was used to assess the academic ranking of students in teachers' classrooms (Coladarci, 1986). Specifically, teachers were asked to report the number of students they considered performing at grade level, one year below and one year above grade level (Coladarci, 1986). Compared to actual student test scores, Coladarci (1986) found that this question had a 62 percent agreement for students performing one year below grade level and 85 percent for students performing one year above grade level (Coladarci, 1986).

Since no current questionnaire exists to assess students' vegetable and fruit consumption, access to food at school or hunger when coming to school using teachers as proxies, four questions were developed to measure these outcomes. Specifically, teachers were asked to report the average number of students in their class that ate a vegetable or fruit at 1) snack and 2) at lunch on most days of the week. Teachers were also asked to estimate the number of students who came to school hungry or had no lunch on most days of the week. Results from a small validation study showed moderate correlations between teacher and student responses for vegetable and fruit consumption at snack ($r=0.50$) and lunch ($r=-0.36$), and moderate to good correlations for questions related to students coming to school hungry ($r=0.48$) and not having anything to eat ($r=0.69$) (data not published). These findings are similar to those of self-reported nutrition questionnaires

(Andersen et al., 2004; Bel-Serrat et al., 2014; Haraldsdóttir et al., 2005).

Administrative data on student absenteeism rates were collected over three weeks, before (September 21 to October 9, 2020) and after (May 17 to June 4, 2021) the NBSFPP. These periods were chosen because absenteeism rates were deemed less likely to be impacted by the back-to-school and end-of-school-year rush, flu season, weather and COVID-19-related school closures.

Adoption, Implementation, and *Maintenance* elements of the framework were primarily assessed using an online School Questionnaire, which school administrators completed in June 2021 (Table 1). The questionnaire was developed based on previous questions used in process evaluation studies that used the RE-AIM framework (Dunton et al., 2014; Larsen et al., 2017; Ward et al., 2018). Questions were written in English and back-translated into French (Brislin, 1970). Both copies of the questionnaires were piloted with elementary teachers from non-participating schools in August 2020. The questionnaire contained 36 items (multiple-choice, short, and long-answer questions). It was used to collect information about the school food programs, such as their type and frequency, cost and funding sources, facilitating factors and barriers, and schools' intention to offer their programs in the future. Notes from the School Food Coordinator and supporting documents were also collected throughout the year and used for data triangulation (Carter et al., 2014). Data from these notes and supporting documents were used to validate, supplement, or complete information obtained by school administrators and teachers and provide a more comprehensive understanding of the adoption and implementation of their school food programs.

Table 1. Elements of the RE-AIM framework, outcome indicators and data sources

Element	Outcome indicators	Data source
Reach	Number and % of schools located in Anglophone and Francophone school districts, in rural or urban areas, in low-, middle- or high-income areas and grades taught at each school.	Publicly available data (i.e., Community Information Database, 2016 Census of Population Profiles)
	Number and percentage of students in each grade.	School Background Form
	Number and percentage of students who had access to the programs.	
	Number and types of school partnerships.	School Questionnaire
Effectiveness	Teachers' perception of: Students' attention in class	Teacher Assessment of Student Behaviours Questionnaire
	Students' disruptive behaviours in class	School administrative data
	Students' academic motivation	
	Students' academic ranking	
	Average number of students who eat one vegetable or one fruit at snack time	
	Average number of students who eat one vegetable or one fruit at lunch	
	Average number of students who have no food at school most days of the week	
	Average number of students who arrive at school hungry most days of the week	
	Additional comments provided by teachers through an open-ended question.	
	Average absenteeism rate over three weeks.	
Adoption	Number and percentage of students who accessed the program.	School Questionnaire
	Number of students, staff and/or volunteers involved in the program's delivery.	School Food Coordinator's Notes and Supporting Documents
	Number of other individuals or organizations that accessed the programs.	

Implementation	Type and description of programs offered, program implementation versus what was planned, program cost and funding, additional funding received to run the program, barriers and facilitators to program implementation, frequency of contact with the School Food Project Coordinator, perceived impact of the School Food Project Coordinator and additional resources required to run the programs.	School Questionnaire School Food Coordinator's Notes and Supporting Documents
Maintenance	Number of schools that planned on offering the program the following school year. Aspects of the program that will be maintained or changed. Resources needed to maintain the programs.	School Questionnaire

Data analysis

Quantitative data analysis was conducted using the IBM SPSS Statistics 27 software. Frequencies and proportions were used to describe the participating schools, their students, and the community partners involved in the program. Paired t-tests and Wilcoxon signed-rank tests were used to analyze the program's effectiveness on teachers' perceptions of students' in-class behaviours, attention, academic motivation and performance, vegetable and fruit consumption and food insecurity, and student absenteeism.

All qualitative data obtained from open-ended questions in the school and teacher questionnaires and the School Food Coordinator's notes and supporting documents were thematically analyzed by two independent research assistants, who had an intercoder agreement of >90 percent. Short memos and codes were added beneath each open-ended question/item for each questionnaire/data source and then grouped to form broader themes (Creswell & Clark, 2017). Themes were then regrouped into larger categories to describe the NBSFPP according to each element of the RE-AIM conceptual framework.

Results

Reach

Of the 11 schools that participated in the evaluation of the NBSFPP, seven were anglophone (64 percent), and five were in an urban area (45 percent). Four schools (36 percent) taught grades from Kindergarten to Grade 5, five schools (46 percent) taught grades from Kindergarten to Grade 8, one school (9 percent) taught Grades 5 to 8, and one (9 percent) taught Grades 9 to 12. Eight of the 11 schools (73 percent) were situated in a medium-income area (median after-tax household income of $25,000 to $30,000). In contrast, two (18 percent) were located in higher-income areas (median after-tax household income of >$30,000) and one (9 percent) was situated in a low-income area (median after-tax household income of <$25,000). A total of 2,650 students attended the participating schools, with most (92 percent) of them being elementary (n=1,640 or 62 percent) or middle school students (n=807 or 30 percent). All students (100 percent) had access to one or more of their school's food programs.

Partnership and community engagement were fundamental principles of the NBSFPP. Overall, 64 percent of schools collaborated with at least one community partner to carry out their program, with 36 percent reporting that they had created at least one new partnership over the 2020-2021 school year. Further, 18 percent of schools reported collaborating with more than two community partners. Community partnerships included food banks (n=4 schools), community kitchens (n=2 schools), local shops or grocery stores (n=2 schools) and local or regional non-profit organizations (n=2 schools). Three of the 11 schools reported losing pre-existing community partnerships or could not create new ones due to the pandemic.

Table 2. Pre and post-scores for outcome variables assessed

Measured indicator	Baseline Mean (SD)	Endpoint Mean (SD)	P-value
Teachers' perception of students' behaviours and academic performance (n=12 teachers):			
Students' disruptive behaviours in class score (0 to 55 points, negative subscale)	37.58 (8.23)	37.25 (8.00)	0.86
Students' attention in class score (0 to 40 points)	28.75 (3.55)	30.25 (2.01)	0.09
Students' academic motivation score (0 to 42 points)	23.88 (3.86)	24.00 (2.89)	0.91
Students' academic ranking			
Students performing at school level	8.33 (3.75)	9.71 (3.56)	0.11
Students performing one year below	5.17 (3.43)	4.08 (3.26)	0.17
Students performing one year above	0.67 (1.16)	0.875 (1.60)	0.29
Teachers' perception of students' fruit and vegetable consumption and food insecurity (n=12 teachers):			
Average number of students who eat one vegetable or one fruit as a snack on most days	5.21 (3.09)	5.54 (2.39)	0.59
Average number of students who eat one vegetable or one fruit for lunch on most days	5.96 (3.78)	7.13 (2.36)	0.26
Average number of students who have nothing to eat for lunch on most days	0.25 (0.62)	0.67 (0.89)	0.19
Average number of students arriving hungry to school on most days	4.92 (5.35)	3.08 (1.68)	0.30
Student absenteeism rate (percentage) (n=9 schools)	7.01 (3.05)	7.19 (3.47)	0.69

Effectiveness

Of the 138 eligible teachers, only 20 (14 percent) agreed to participate and completed the pre-questionnaire. Despite reminder emails in May 2021, only 12 teachers completed the post-questionnaire. No statistically significant changes were observed for student absenteeism or between the pre- and post-scores for teachers' perceptions of students' in-class behaviours, attention, academic motivation and performance, vegetable and fruit consumption and food insecurity (Table 2).

Although no statistically significant effect was found, qualitative data from 12 teachers and nine school administrators suggest that the NBSFPP positively impacted the organization and overall

satisfaction of their school food programs and students' leadership skills, food literacy, and eating behaviours. For example, one school stated that the NBSFPP allowed them to "*improve the quality of the service offered*" (School administrator C, p.46). Some schools also reported that involving students in delivering their school food programs helped students develop their leadership skills.

The leadership development of our students has been one of the most significant gains of this program. Our students, under the guide of our coordinator, have ran the breakfast program, the mobile food cart, the backpack program, and all the snacks (School administrator J, p.57).

Despite not finding any significant impact on students' vegetable and fruit consumption, teachers and school administrators reported improvements in students' food literacy skills, including their enthusiasm and their ability to identify healthy foods, as well as their eating behaviours after implementing their programs.

If you offer our students yogurt and melon or a chocolate bar, we feel like they would pick the fruit now. It's amazing! [...] It was shocking to us to have seen so many children identify having cherries, pomegranates, etc., for the first time at school. (School administrator J, p.47)

One teacher (Teacher A) also reported that their lunch program was essential to ensuring that their students ate vegetables and fruit at school. This person also noted that while most (62 percent) of his students ate vegetables or fruit at lunch, less than a quarter (23 percent) brought those foods from home.

Adoption

Most administrators from elementary and middle schools (82 percent) reported that they perceived student participation in their school food programs to be high. Although only one high school was recruited for this study, the administrator noted low participation of Grade 9 to 12 students. In addition to students, school administrators reported that other individuals used their food programs. For example, staff accessed the reduced-priced lunch program offered in one school. In two schools, students' families received recipe kits and food through after-school food programs, and one school provided emergency food for students and families in need.

Most schools (64 percent) involved students in delivering their programs. They were involved in preparing food for meals and snacks (n=4 schools), distributing meals and snacks (n=2 schools), providing recipe ideas (n=1 school), managing food delivery and inventory (n=1 school), and implementing a student-led food program (n=1 school). Four schools reported that students could not be involved due to COVID-19 restrictions; however, three acknowledged that student involvement would have helped facilitate their programs.

Ten of the 11 schools reported receiving help from staff (i.e. teachers, administrators, cafeteria staff) and volunteers to deliver their school food programs. On average, four staff members were needed to provide the program daily. However, more than half of the schools (n=6) reported that they could not involve volunteers in delivering their programs due to COVID-19 restrictions. Of the schools that could, an average of eight volunteers were recruited, and three were needed daily.

Table 3. Description of school food programs implemented

Types of programs	Availability/Accessibility	Types of foods offered
Lunch Programs (81 percent of schools) Emergency lunch (n=5) Brown-bag lunch program, provided by external partners (n=3) Brown-lunch bag supplementation (n=2) Free lunch (n=1) Reduced-cost lunch (n=1)	Emergency lunch available at all times for any student without a lunch (n=4). Brown-bag lunch program offered to students in need approximately three times per week (n=3). Free hot lunch offered to all students twice per month (n=1). Reduced-cost lunch (-$1.00) available daily for all students (n=1).	Added sources of protein in brown-bag lunch, such as poultry and hummus (n=1). Larger servings of vegetables (n=1). Variety of healthy foods (n=7).
Breakfast Programs (73 percent of schools) "Grab and go" (n=1) Breakfast in the classroom (n=1) Before class (n=6)	All breakfast programs were offered daily for all students (n=8). Some special foods, such as pancakes or muffins, were offered approximately once per week (n=1).	Eggs, whole-grain products, homemade muffins, pancakes / waffles, smoothies, and fruits.

Snack/Fruit and Vegetable Programs (73 percent of schools) Free snack (n=7) Fruit platters (n=1) Special activities, such as "Fresh Fruit Friday" (n=1)	Snacks offered daily to all students (n=7). Various fruits offered on special occasions (once a week to once a month) to all students (n=2).	Variety of fruits, vegetables, protein-rich foods, and other healthy snacks (n=7).
Cooking Cart Programs (36 percent of schools) Cooking cart, including recipe demonstrations and taste-testing (n=3) Smoothie cart (n=1)	Carts are usually shared between classes so that each class can access them approximately once per month. All students had access to it over the year. (n=3).	Nutritious, easy, and culturally diverse foods (n=3).
School Garden Programs (18 percent of schools) Hydroponic garden (n=2) Small tabletop hydroponic garden for classrooms (n=1) Outdoor garden (n=1)	Indoor hydroponic garden available year-round (n=2).	Vegetables were used for lunch and snack programs (n=1).
After-School Food Programs (18 percent of schools) Backpack program/Take-home recipes (n=2)	Backpack program offered to students in need and their families every Friday (n=1). All students could bring a recipe with the ingredients home, at least once during the year (n=1).	All the ingredients needed to make the included recipes (n=2).

Table 4. Type of support provided to schools by the School Food Coordinator

Type of support	Percentage of schools	Examples
Evidence-based nutritional recommendations	100 percent	• Suggestions for increasing the variety of nutritious foods available and healthy recipe ideas for balanced meals and snacks. • Using healthier cooking methods (e.g., air fryer). • Ensuring compliance with Policy 711 (Department of Education and Early Childhood Development, 2018). • Adding a protein source to breakfast and lunches (brown-bag lunch program), if lacking. • Offering balanced snacks (source of carbohydrates + protein).
Purchasing or repairing equipment and kitchen renovations	91 percent	• Purchasing or repairing equipment (ranging from kitchen tools and small appliances to large industrial kitchen equipment). • Kitchen renovation for more cooking space.
Reorganizing programs for optimum efficiency	73 percent	• Increasing the availability of the program. • Planning and reorganizing the program's logistics. • Reviewing menus for lower costs (e.g., including plant-based protein). • Planning menus based on student satisfaction.
Implementing new programs/activities	64 percent	• Implementing various programs/initiatives based on the schools' resources and capabilities.
Ensuring food safety	55 percent	• Kitchen licensing (if not already in place). • Food safety training for staff and volunteers. • Additional recommendations for sanitary precautions related to COVID-19.
Recruitment and appreciation of volunteers	45 percent	• Encouraging schools to take steps to recruit volunteers through social media. • Encouraging schools to continue or initiate volunteer appreciation activities.

Implementation

Various school food programs were implemented during the 2020-2021 school year, with some schools offering multiple programs. These included breakfast, lunch and snack programs, school gardens, cooking cart programs and after-school food programs (Table 3). All schools reported offering at least one type of program daily to all their students. On average, schools delivered three different programs simultaneously and offered them for 33 weeks. All schools (100 percent) reported offering the food programs described in their action plan, and 82 percent said they were implemented as planned. Eighteen percent of schools mentioned that they modified the delivery of their program due to COVID-19-related restrictions (e.g. sanitary measures) and delays (i.e. delivery of equipment). Two schools reported implementing additional programs (one cooking cart program and one school garden) than initially planned.

The NBSFPP grant was the most significant funding source for schools (63 percent), totalling $80,000. Based on the schools' needs and resources, NBSFPP grants ranged from $4,500 to $11,500, averaging $7,300. Two schools required additional funds at the beginning of 2021 as they faced greater student participation than anticipated. On the other hand, three schools did not require the second part of their funding (the remaining 25 percent) due to donations, partnerships, and cancelling certain activities because of school closures. In addition to the NBSFPP grants, most schools (n=9) secured funds from other sources to deliver their program, including district funds ($15,758), fundraisers ($4,520) or sponsorships ($9,681) and other grant programs ($17,142). On average, each school spent $15,557 to implement and deliver its programs, with the median cost totalling $10,000. One school spent approximately $50,000 on their programs. However, they offered five different programs simultaneously (breakfast, lunch, snacks, cooking cart, and after-school programs) and secured additional funding (two other grant programs and district funding).

Providing ongoing support to schools was considered a fundamental element of the NBSFPP. Most schools (n=10) reported that the School Food Coordinator was very important to the overall success of their program by providing resources (n=9 schools), identifying best nutrition practices (n=7 schools), and optimizing their program's efficiency (n=7 schools). The School Food Coordinator provided various types of support to schools (Table 4). On average, each school received 15 hours of one-on-one support, and all schools reported that this amount of contact was adequate.

COVID-19 restrictions were reported as a major barrier to the delivery of many school food programs. These restrictions affected 64 percent of schools and included closures, restricted activities, limited sharing of equipment, limited volunteer and student involvement, late equipment delivery, and additional precautions and costs to ensure student safety. One school administrator mentioned its environmental concerns regarding their increased use of single-use plastics: *"COVID-19 made our single-use plastics go up. We are struggling with the single-use plastics and containers in which to get the food out there, but weighing the workload with reusable dishes"* (School K administrator, p.61)

Another major barrier to implementation was time constraints. One school (School administrator J) reported that some teachers did not have time to complete all planned activities due to their busy schedules. Another school (School administrator A) even noted that finding additional time to undergo food safety training was a struggle. Lack of space, higher food costs, and lack of human resources were also

reported by school administrators. Based on the School Food Coordinator's notes, student preferences were a barrier to the lunch program, as many students from one school disliked the canned tuna added to the brown-bag lunch.

More than half of schools (55 percent) stated that the funding and support received by the NBSFPP contributed significantly to the success of their school food program. Other facilitating factors that schools reported included having volunteers and community partnerships, promoting student implication, getting support from a school district employee, and ensuring proper program planning.

Due to our operational plan and students arriving to school and immediately coming into their classrooms (instead of playing on the playground), we were able to have more facetime with the students before class started. It was a great way to ensure that everyone ate breakfast and was ready for learning. (School K administrator, p.62)

Maintenance

Most schools (91 percent) reported that they intended to deliver their school food program during the 2021-2022 school year. Some schools noted that they hoped to enhance their existing programs by increasing students', parents', and community members' involvement, creating new initiatives, and adding some flexibility to their programming with the easing of COVID-19 restrictions.

When asked what resources schools would require in order to offer their program in the future, 82 percent of schools mentioned that funding was the most critical resource needed. One school reported that without funding, they would need to significantly reduce the scope of their programs and limit certain activities.

Funding is the biggest resource we would need... having the significant financial support from Heart and Stroke allowed us to offer a program that wasn't an event but a regular program in the school, which helped to increase healthy choice exposure and interest." (School J administrator, p.65)

One school even noted that they would not be able to offer their program at all if they didn't access sustainable funding to finance their program: "*It's really conditional on if we receive a grant or not. We hope to receive a similar amount from [NBSFPP] to allow us to offer the same program.*" (School C administrator, p.63).

Other than funding, two schools shared that access to more volunteers, better kitchen equipment, and additional educational resources for food-related activities would help with program maintenance.

Discussion

Findings from this study suggest that the NBSFPP provided crucial support to schools in developing, implementing, and delivering individualized school food programs that addressed each school's specific needs. With the help of the NBSFPP, schools were able to implement various food programs based on their context, available resources, and capabilities. Although the quantitative data did not show statistically significant improvements in academic and diet-related outcomes, qualitative data from teachers and school administrators suggest that the NBSFPP positively impacted program optimization and satisfaction, student leadership skills, food literacy and eating behaviours. This study also highlighted the key

facilitators and common challenges to school food program implementation, both of which revolve around acquiring adequate and sustainable funding.

Reach

Results showed that, regardless of socioeconomic status, all students had daily access to at least one of their school's food programs during the 2020-2021 school year. Programs that were universally accessible to students included emergency, reduced-cost and free hot lunch programs, breakfast programs, snack, fruit and vegetable programs, cooking carts, school gardens, and after-school take-home recipes. In contrast, only two programs were solely accessible to students in need: brown-bag lunch and after-school backpack programs. School food programs have traditionally targeted students affected by food insecurity. However, research has shown that these programs are often linked to increased stigmatization among students from lower-income families, which can discourage their participation (Leos-Urbel et al., 2013). Considering these potentially negative impacts and that most students, irrespective of socioeconomic status, have unhealthy diets and eating behaviours, there has been a push towards a universal approach to providing school food. Recent studies have suggested that universal school food programs can benefit all students by increasing student participation and acceptance, reducing the stigma associated with poverty, and addressing other reasons for skipping meals (Askelson et al., 2017; Haines & Ruetz, 2019; Leos-Urbel et al., 2013). Nevertheless, targeted school food programs can still be justified, particularly from an equity perspective. Therefore, a more nuanced approach may be to offer universal school food programs in conjunction with targeted ones and ensure that the latter are implemented in a stigma-free manner.

The NBSFPP strongly encouraged schools to create new or reinforce existing partnerships with their community. Although some schools reported having lost pre-existing community partnerships or stated they could not create new ones due to the pandemic, most had at least one community partner to help them carry out their programs. Collaboration with and involvement from community partners are often essential for the sustainability of school food programs (Colley et al., 2019; Everitt et al., 2020; Haines & Ruetz, 2019; Hernandez et al., 2018). Specifically, partnerships with local businesses and producers can help make certain foods more affordable while reducing the environmental impact of food production and transportation (Everitt et al., 2020). Yet, some schools may require assistance to identify and approach potential partners. In the context of the NBSFPP, this support was provided by the School Food Coordinator, who created an asset map for each school and encouraged them to partner with local businesses. Dietitians could also assist schools with identifying, reaching, and engaging community partners, as they are involved in helping communities create supportive and sustainable food environments (Dietitians of Canada, 2017).

Effectiveness

Our study found no statistically significant impact of the NBSFPP on student absenteeism or teachers' perceptions of students' classroom behaviours, attention, motivation, academic performance, vegetable and fruit consumption, or food insecurity. These findings could be due to several factors, including the small sample size (Creswell & Clark, 2017). Despite efforts to remind and encourage teachers to participate in the study, school administrators informed the School Food Coordinator that many teachers were reluctant to

engage in research due to high stress levels associated with the pandemic. This resulted in a sample size that was likely too small to detect any meaningful change. In addition, the duration of the study may have been too short to measure significant changes in behaviours. Similar results have been found in previous studies, which failed to observe significant impacts of school food programs on academic performance (Anzman-Frasca et al., 2015; Corcoran et al., 2016; Hearst et al., 2019), attendance (Bartfeld et al., 2020; McLaughlin et al., 2004), and dietary outcomes, including vegetable consumption (Coyle et al., 2009; Huys et al., 2019; Lohr et al., 2020; Morgan et al., 2010), over the course of a school year. In Bartfeld et al.'s (2020) study, improvement in attendance was only observed two years after implementing a universal school food program. Further, findings from short school food intervention studies may fail to represent the complexity behind food choice and maintenance of behaviour change (Everitt et al., 2020). Dietary and academic outcomes are influenced by multiple factors, including physical activity and screen time (Carson et al., 2016; Tremblay et al., 2011), weight stigma (Pont et al., 2017), racism and discrimination (Trent et al., 2019) and sleep quality and duration (Chaput et al., 2016). Furthermore, many social and environmental factors can influence children and adolescents' eating behaviours (Scaglioni et al., 2018), such as parental food habits (Zarychta et al., 2016), food exposures early in life (Hetherington et al., 2015), food advertising and media exposure (Norman et al., 2018) and household socioeconomic status (Non et al., 2016). Therefore, it is possible that any positive impact that the school food program may have had on students' dietary and academic outcomes was not enough to outweigh these external influences. Finally, it is worth noting that not all programs focussed on promoting vegetables and fruit, which could also explain why no significant changes in vegetable and fruit consumption were found.

Despite not finding significant quantitative changes, qualitative data obtained from teachers and school administrators suggest that the NBSFPP may have positively impacted the program's optimization and satisfaction, and some students' leadership skills, food literacy and eating behaviours. For example, some schools reported being surprised at the positive changes in students' food choices and enthusiasm for various healthy foods. These findings are similar to previous studies that reported increases in students' preferences for healthy foods (Colley et al., 2019; Coyle et al., 2009; Davis et al., 2015; Hernandez et al., 2018; Lohr et al., 2020; Morgan et al., 2010; Ohri-Vachaspati et al., 2018; Parmer et al., 2009), and improvements in their nutritional knowledge and dietary behaviours (Colley et al., 2019; Haines & Ruetz, 2019) following the implementation of school food initiatives. School food programs have also been found to improve students' food literacy skills, particularly when they combine experiential learning (e.g. cooking classes), nutrition education and healthy food provision (Gates et al., 2013; Morris & Zidenberg-Cherr, 2002; Saksvig et al., 2005). This is noteworthy since students with better cooking and food skills have better eating behaviours and consume more vegetables and fruit (LeBlanc et al., 2022).

Adoption

In this study, participation of elementary and middle school students was high, while participation was low among students in the only high school recruited for this study. This finding is not surprising, as the independence of older students has been identified as a barrier to school food program participation (Lopez-Neyman & Warren, 2016). High school students are

generally free to leave school grounds during lunch hours and are often engaged in school committees, sports teams, and other activities. Students might not be available or present to participate in food programs and activities. Therefore, school food programs in high schools may need to actively engage students in their implementation and delivery to increase participation. In fact, several elementary and middle schools reported including their students in their programs' management, preparation, and delivery. According to teachers and administrators, this involvement helped some students develop food literacy skills, such as cooking skills. Providing students with opportunities to develop their food literacy allows them to develop the skills and knowledge needed to make healthy food choices in complex food environments (Truman et al., 2017). In addition to developing their food literacy skills, engaging students in school food programming may also increase its acceptance. For example, a Canadian study found that students wanted to be involved in the selection and preparation of food at school and believed that their involvement was a factor that could contribute to the success of these programs (Colley et al., 2021). Therefore, age-appropriate student involvement in school food programs should be encouraged to benefit the program and the students.

This study also found that school staff (i.e. teachers, cafeteria workers) were essential to the adoption of most school food programs. Staff members' implication may have been particularly needed during the 2020-2021 school year since many schools could not involve volunteers due to COVID-19 restrictions. Since many Canadian school food programs rely highly on volunteers for program delivery, insufficient volunteers can lead to less frequent programming and, therefore, negatively impact the success and sustainability of those programs (Everitt et al., 2020; Ruetz & McKenna, 2021). Everitt et al. (2020) suggest that school food programs that are economically sustainable could allow schools and staff to focus on delivering high-quality programs instead of spending time and energy recruiting and training volunteers. Thus, universal programs that are sustainably funded by different levels of government, such as Canada's National School Food Program and NB's anticipated universal breakfast and pay-what-you-can lunch program, could solve this problem (Everitt et al., 2020; Ruetz & McKenna, 2021).

Implementation

Various school food programs were implemented during the 2020-2021 school year, with most schools offering multiple programs such as breakfast, lunch and snack programs, school gardens, cooking carts and after-school food programs. On average, schools delivered three different programs simultaneously and were accessible most of the school year. By providing more than one program, schools could offer a wider variety and quantity of food and food-related activities to address students' various needs. For example, most programs provided healthy foods to all students, some focussed on increasing students' food literacy, and others aimed to help students and families from food-insecure households.

Most schools' total costs for school food programs ranged between $6,000 and $15,500. Although funding was essential for program implementation and delivery, it was particularly needed for purchasing healthy foods. The NBSFPP grant was the most important funding source for schools. Without it, schools reported that their program would need to be considerably scaled down or discontinued. Funding is frequently recognized as a critical element for program implementation (Haines & Ruetz, 2019; Hernandez et al., 2018; Ruetz & McKenna, 2021). With the

NBSFPP, continuous evaluation of schools' needs helped determine appropriate and equitable funding for each school, highlighting the importance of evaluating their needs on an ongoing basis for better funding efficiency. Given the federal government's pledge to permanently fund a National School Food Program starting in 2029 (Prime Minister of Canada, 2025), implementing a process to continuously assess school needs should be considered to ensure equitable distribution of those funds.

Beyond funding, more than half of the schools reported that the support from the School Food Coordinator contributed significantly to the success of their food programs. The School Food Coordinator was seen as an asset, providing schools with the knowledge and resources needed to implement evidence-based, healthy and safe school food programs. It is suggested that nutrition experts, such as dietitians, should play a role in determining best practices and guidelines for school food programs to achieve better program delivery and outcomes (Godin et al., 2017; Haines & Ruetz, 2019). In NB, these dietitians could be employed by the Department of Education and Early Childhood Development to help support the implementation and sustainability of school food programs.

Unsurprisingly, COVID-19 restrictions were reported as a major barrier to the delivery of many school food programs. These restrictions affected 64 percent of schools and included closures, restricted activities, limited equipment sharing, delayed equipment delivery, and additional precautions and costs to ensure student safety. Another barrier to program implementation was time constraints. As commonly seen with other school-based initiatives (Dunton et al., 2014; Huys et al., 2019; Thomas et al., 2016), one administrator mentioned that some teachers did not have time to complete all planned activities due to their busy schedules. Similarly, Huys et al. (2019) noted that teachers were so busy with their current curriculum that they implemented, on average, 44 percent of all planned activities/lessons in the program's curriculum. Thomas et al. (2016) also noted that staff felt they lacked the energy to implement some of the activities that were part of their school food program in the long run. These findings emphasize the importance of considering teachers' and other school staff's busy schedules when planning the implementation and delivery of school food programs. Other barriers to implementation were reported by some schools, including higher food costs and a lack of human resources, both of which are well documented in previous studies (Colley et al., 2019; Hernandez et al., 2018). Addressing these issues by engaging families and increasing accessibility and affordability of healthy foods could improve program implementation and outcomes (Day et al., 2009; Triador et al., 2015).

Maintenance

Of all the barriers schools faced, access to funding was reported as the main challenge to the sustainability of school food programs. For some schools, the continuity of their program was conditional on the funding they received from the NBSFPP. The problem of sustainable funding is quite common, as several studies have identified financial constraints as an important issue for the implementation and maintenance of school food programs (Colley et al., 2019; Everitt et al., 2020; Haines & Ruetz, 2019; Ismail et al., 2021; Ruetz & McKenna, 2021). Banfield et al.'s (2015) process evaluation of a school health promotion program also found that access to annual grants was critical to offering the program from one year to the next (Banfield et al., 2015). School food programs vary significantly across Canada due to inconsistent and

inequitable funding from community groups, charities, and donations (Everitt et al., 2020; Haines & Ruetz, 2019; Ruetz & McKenna, 2021). Program sustainability is even more difficult for those relying heavily on the community and organizations for funding (Everitt et al., 2020; Ruetz & McKenna, 2021). To support schools and ensure that students have ongoing access to its programs, guaranteed provincial and federal funds are essential. Studies consistently show that universal, comprehensive, sufficiently funded, and regularly monitored/evaluated programs are recommended for effective and sustainable school food programming (Everitt et al., 2020; Haines & Ruetz, 2019; Hernandez et al., 2018; Oostindjer et al., 2017; Ruetz & McKenna, 2021). Luckily, the federal government has pledged to permanently fund the National School Food Program (Prime Minister of Canada, 2025), and the NB government has promised to provide free or low-cost foods to all schools across the province by 2026 (Lombard & Haggett, 2025). As the logistics of both programs continue to be refined, equitable distribution and plans for monitoring of these funds are strongly recommended.

Strengths and limitations

This study had several strengths, including the tailored and individualized approach to school food programming, the use of the RE-AIM framework to conduct the process evaluation, and the real-world context in which the study was conducted. However, limitations must be acknowledged. Recruiting teachers for the pre-post study was particularly difficult during the pandemic year. School administrators reported that extreme stress, anxiety, and uncertainty related to COVID-19 discouraged most teachers from participating in this study. This low participation rate resulted in a much smaller sample than planned, thus reducing the statistical power needed to detect meaningful changes in outcomes. Additionally, given that student-level data collection was not feasible due to pandemic-related constraints, teachers' perceptions served as a proxy, potentially leading to over- or underestimation of certain variables of interest. For example, teachers may not always be able to observe children eating at snack or lunch or notice what is included in their lunchbox. This may be especially true for older students who are more independent and need less supervision. Therefore, teachers' perceptions may not accurately reflect students' eating behaviours or whether they are truly affected by food insecurity. Although the tailored and individualized approach of the NBSFPP is a strength of the overall program, the heterogeneity of the specific school food programs implemented in schools may have limited our ability to measure significant changes in outcomes. Finally, since only one high school participated in this study, the findings may not be generalizable to other high schools. Future evaluations should ensure that more high schools are recruited to identify how older students can benefit from school food programs.

Lessons learned

Since this study was conducted during the COVID-19 pandemic, many traditional data collection methods were not feasible. For example, student report cards from the previous school year were unreliable and access to schools and students was restricted. Thus, collecting objective student-level data was not feasible. While using teachers as proxies has limitations, it also has advantages. For example, data from teacher questionnaires are easier and quicker to collect, reducing the need to adapt student questionnaires to different age groups and comprehension levels. While using student report cards is advisable in a post-

pandemic setting, developing validated data collection tools that use teachers as proxies is warranted, as these may help facilitate large-scale data collection in schools and reduce evaluation costs. There is also a need to develop tools that can help teachers adequately assess how many children in their classrooms come from food-insecure households. While some cases may be evident, other children in need of food assistance may go unnoticed. Collecting food insecurity data from student self-reports or parent surveys can be particularly difficult and subject to response biases (Tadesse et al., 2020), making it difficult to measure the effect of school food programs on food insecurity. Therefore, simple, age-appropriate, and non-stigmatizing screening tools are warranted.

Conclusion

When provided with adequate funding, human resources and expert support, schools were able to implement various food programs that met their students' needs, utilized existing resources and built new strategic partnerships. Providing schools with sustainable funding is critical to ensure that they can offer food programs to their students from one year to the next. Ideally, this funding should come from various levels of government (provincial and federal) and be distributed to schools equitably to acknowledge the inequalities in infrastructure and community resources. Finally, while targeted school food programs can help support vulnerable students, schools should be encouraged to implement universal food programs so that all children can access healthy foods at school and are ready to learn.

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