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Evaluating the Implementation of the Centrally Procured School Food Program (CPSFP) in Southwestern Ontario Elementary Schools

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Abstract

School food programs can improve children's health and well-being, while also creating economic opportunities for local food systems. Program evaluations of such interventions have always been done, but from the perspectives of their effectiveness. Yet, few have thoroughly examined the process or implementation practices of these interventions. The aim of this dissertation was to evaluate the implementation of the Centrally Procured School Food Program (CPSFP), a procurement and delivery-based school food program in Southwestern Ontario, that aims to improve elementary school-aged children's intake of fruit and vegetables (FVs). Canada remains one of the few industrialized nations without a national school food program, and therefore evaluating the implementation processes of this pilot program will identify the conditions and resources needed to lay the foundation for a universal school food program. Experiences of food providers, and Ontario Student Nutrition Program (OSNP) personnel who were involved in planning, coordination, and oversight of the program, as well as those involved in the production, procurement, and distribution of foods to schools were gathered using semi-structured interviews. An inductive content analysis of the interview transcripts indicates that the majority of the participants expressed positive perceptions of the CPSFP. Successes and challenges to program implementation included children's excitement and the alleviation of concerns with volunteer-led purchasing and delivery, while concurrently revealing challenges with volume and type of food, as well as infrastructure and funding limitations. Suggestions for improvement included focused opportunities to enhance the implementation of the CPSFP, while also identifying a need for continued and enhanced investment of resources. Next, using a mixed-methods study design, perspectives of personnel and volunteers involved in the implementation of the program at the school-level were examined. Findings show that participants were highly satisfied with the program and viewed the program as part of a successful effort to increase children's intake of healthy foods, especially FVs. Successes included appreciation for the CPSFP and the participation of the school community. Challenges included concerns with the volume and types of foods provided, issues with classroom food delivery and distribution, and communication issues. Suggestions for improvement included building capacities and enhancing children's engagement in the program. Evidence indicates that CPSFP is likely to be effective and sustainable but only with proper implementation. This research has implications for the CPSFP and other school-based efforts aimed at promoting FVs intake among children while also creating economic opportunities for local, sustainable agriculture.

Keywords

Process evaluation, Implementation, School, Children, Snack program, Food procurement

Summary for Lay Audience

School food programs have the potential to promote children's health and well-being, while also having a positive impact on the local food system. Numerous factors govern the implementation of food programs, which will ultimately have an impact on the foods that children consume at school. This research evaluates the implementation of the Centrally Procured School Food Program (CPSFP) in Southwestern Ontario, from the perspectives of personnel and/or volunteers, and food providers who were involved in the implementation and coordination of the program both in and outside of school-based settings. The majority of participants perceived the program to be a fruitful emerging economic opportunity in Canada, in addition to improving school-aged children's health and well being. Also, findings identified a set of well-conceived and practical recommendations for future improvements including, but not limited to: (1) enhancing the engagement of all stakeholders, including children; (2) maintaining program administration; (3) ensuring sustained and flexible funding; (4) stimulating adequate communication; and (5) devising ongoing support to motivate schools who want to implement the program but feel they have a lack of capacity. Overall, school food programs have the potential to support the health and learning of our children, transform our food systems, and foster the use of locally-produced food for strong economies. The lessons learned and suggestions presented provide guidance to future implementation of similar school food programming.

Co-Authorship Statement

This thesis is presented in an integrated article format, with three independent but complementary studies. Each integrated article within this thesis will be submitted for publication in peer-reviewed journals.

I would like to acknowledge the important contributions of four co-authors: Dr. Jason Gilliland, Dr. Danielle Battram, Dr. June Matthews, and Dr. Jamie Seabrook who had a significant role in the conceptualization, insight, as well as analytical support and guidance that contributed to each of the following manuscripts. Below are details of co-authorship for the integrated articles.

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Chapter 1 : Introduction

1. Introduction to School Fruit and Vegetable Programs

A healthful diet during childhood promotes optimal health, growth and cognitive development (Gerritsen et al., 2019; Valaitis, Hanning, & Herrmann, 2014). Fruit and vegetables (FVs) are important components of a healthy diet and sufficient daily consumption can help prevent the majority of non-communicable chronic diseases (World Health Organization [WHO], 2003). On the basis of these benefits, it is a wonder that unhealthy dietary habits are becoming an increasingly important element to poor health status among Canadian school-aged children. For example, the subsequent growth of non-communicable chronic diseases (e.g., diabetes and cardiovascular diseases) in younger ages that were previously seen exclusively among adults (Rao, Kropac, Do, Roberts, & Jayaraman, 2016) have sounded an alarming bell.

Thus, changing the dietary habits has become a public health goal, and one of the proposed actions include improving children's consumption of FVs. Health Canada recommends that children aged 9-13 years consume 6-12 servings of FVs for nutritional adequacy and health (Health Canada, 2007; Rolls, Ello-Martin, & Carlton Tohill, 2004; Taylor, Evers, & McKenna, 2005). However, the 2004 Canadian Community Health Survey 2.2 reported that approximately 70% of children were not meeting the (then) recommendations of 4-6 servings per day for FVs (Garriguet, 2007; Polsky & Garriguet, 2020). A more recent, nationally representative sample of children in grades 6-12 suggested only 10% met the current recommendations for FVs intake (6-8 servings, depending on age) (Colapinto, Graham, & St-Pierre, 2018; Minaker & Hammond, 2016). This is a concerning issue, given that dietary habits established in early life tend to be maintained into adulthood (Dennison, Rockwell, & Baker, 1998; Kelder, Perry, Klepp, & Lytle, 1994; Krebs-Smith et al., 1995), thus making childhood an opportune time for health promotion

initiatives to instill healthy dietary habits (Baxter et al., 1997).

School food programs (SFPs) offer a promising method to not only improve children's consumption of FVs, but also enhance their psychosocial behaviors (e.g., knowledge, awareness, self-efficacy, attitudes, preference) (Hector et al., 2017; Krolner et al., 2011). Children spend a great deal of their time in school. Upwards of 6-7 hours of their day is spent in the educational system, which includes a significant portion of their food consumption (Baxter et al., 1997). It is reasonable to suggest then, that with this significant time allotment, the school system has a responsibility to enhance the future health and well-being of children. Additionally, these programs have the potential to reach all children including their parents, siblings and extended families, regardless of ethnicity, socioeconomic background, and/or nutritional status, thus reducing social inequalities (Knai, Pomerleau, Lock, & McKee, 2006; Russell, Evers, Dwyer, Uetrecht, & Macaskill, 2008). For example, literature has shown that food items most influenced by income are FVs (Ricciuto, Tarasuk, & Yatchew, 2006), and therefore the foods children receive at school have provided the opportunity for all children, particularly economically-disadvantaged children, to increase their intake of FVs, independent of family income (Riediger, Shooshtari, & Moghadasian, 2007). This is important as food insecurity represents an urgent public health challenge in Canada, affecting 1.15 million- or one in six Canadian children under age 18 (The Coalition for Healthy School Food , 2018).

Despite the innumerable benefits of a school food program, the Government of Canada has not yet committed any support for a national, universal program. Canada remains one of the few industrialized countries without a national universal school food program (Food Secure Canada, 2018). Therefore, coordinated efforts are required from all stakeholders including parents and families, educators, community leaders, and government to work in concert to fulfill

the national dietary recommendations of FVs, and ultimately improve children's health and well-being.

To address the low levels of FVs intake among school-aged children, a number of intervention strategies have been developed to increase school-aged children of healthy foods, particularly FVs (DeCosta, Moller, Frost, & Olsen, 2017; Triador, Farmer, Maximova, Willows, & Kootenay, 2015). Increasing the availability and accessibility of FVs through distribution-based interventions within the school environment have been identified as consistent and positive predictors of children's FVs consumption (Blanchette & Brug, 2005; Knai et al., 2006; Rasmussen et al., 2006). Availability is defined as the presence of FVs at home or in school, while accessibility is defined as FVs that are prepared, presented, and/or maintained in a form that enables or encourages children to consume them (e.g. cutting up FVs or designating time to eat FVs) (Blanchette & Brug, 2005). Several intervention studies have also shown the positive effects of distributing FVs within the school environment on children intake, but with varying degrees of effectiveness (Ashfield-Watt, Stewart, & Scheffer, 2008; Coyle et al., 2009; Gates et al., 2011; Gates, Hanning, Gates, McCarthy, & Tsuji, 2012; Gates, Hanning, Gates, Stephen, & Tsuji, 2016; Skinner, Hanning, Metatawabin, Martin, & Tsuji, 2012). The success of these interventions may vary based on the level of implementation. To date, few formal process evaluations have been conducted to examine the implementation processes and practices of these programs (Aarestrup et al., 2014; Bai, Feldman, Wunderlich, & Aletras, 2011; Bouck et al., 2011; Wind et al., 2008).

2. The Centrally Procured School Food Program (CPSFP)

During 2017-2018, the Ontario Student Nutrition Program South West Region, operated by the Victoria Order of Nurses (OSNP_VON), and in partnership with the Ministry of Children

and Youth Services (MCYS), and 30 local schools in three Southwestern Ontario communities implemented a novel universal snack pilot program, the Centrally Procured School Food Program (CPSFP) ([OSNP], 2018). Briefly, the one-year intervention consisted of providing children, aged 9-13 years old, with free healthy foods, with an emphasis on FV snacks, 5 times a week for 10 weeks. The program aimed to increase children's intake of FVs by improving the nutritional quality of food being offered through the existing program; and establishing local food procurement strategies in order to source a greater proportion of program foods from local farmers.

It was hypothesized that this procurement and delivery-based model would enhance the quality of program delivered at the school-level via reducing the bulk of responsibilities (e.g., planning menus, purchasing foods that meets the Canada Food Guide (CFG) guidelines and food safety standards, delivering food to schools and reporting food purchases) associated with the implementation of the existing program ([OSNP], 2018). In addition to reducing the bulk of responsibilities on school personnel/volunteers involved in the implementation of the program at the school-level, the program was thought to influence the local food system via creating economic opportunities for local and sustainable agriculture. The ultimate beneficiary of the program is children, who will have access to a variety of healthy, high-quality, and cost-prohibitive FVs that they might not otherwise have access to at home.

3. Statement of Purpose

The primary purpose of this dissertation is to evaluate the practicalities of the implementation of the Centrally Procured School Food Program (CPSFP) in Southwestern Ontario elementary schools from the perspectives of stakeholders involved in the implementation of the program at the school-level and also with those responsible for food provision. Specifically, the focus of the

process evaluation was: to determine how the program was implemented, to identify factors informing the successes and challenges to program implementation, to provide practical feedback to program planners on the delivery of the program, and finally, to give guidance to others carrying out similar interventions.

4. Program Evaluation and Process Evaluations

Program evaluation is a systematic approach to evaluate public health interventions (Saunders, Evans, & Joshi, 2005). There are three different types of evaluation: "*outcome evaluation"*, which focuses on the results of an intervention; "*impact evaluation"*, which emphasizes changes in mediators that are considered vital to achieving the outcome; and "*process evaluation"*, which focuses on the extent to which the intervention was implemented as it was intended (Saunders et al., 2005).

Process evaluation studies serve an important role in health promotion research by providing information about how interventions are implemented, the predictors of conditions under which interventions are likely to be most effective (i.e. mechanism of impact), and how the contextual environment affects the outcome (Oakley et al., 2006). Process evaluations can be conducted both as formative and/or summative. Formative process evaluation is conducted as part of the development of an intervention (at the beginning), whereas summative evaluation is conducted near or at the end of the intervention, and is intended to show whether the intervention has achieved its intended outcomes (Saunders et al., 2005).

Data that are collected about the implementation process of an intervention study are usually referred to as process evaluation data. These data are usually used for several purposes including, but not limited to: revising and disseminating the program (i.e. fine-tuning intervention delivery); aiding in the interpretation of findings (i.e. analyzing factors that may

explain intervention success/failure, avoiding what has been termed as Type III error); and accounting for validity of the summative evaluation (Baranowski & Stables, 2000; Linnan & Steckler, 2002; Resnicow et al., 1998). For example, Story et al. emphasize a need to document and analyze the process of program's implementation to accurately interpret outcomes, to understand any inconsistencies between expected and observed outcomes, and to guide the transferability and future implementation of the program (Story et al., 2000). In otherwords, if the implementation process of an intervention is not evaluated, it is difficult to correctly determine the outcome, as a program may not have an impact if it was not implemented as planned (fidelity) or not feasible in its current form (feasibility) (Baranowski & Stables, 2000; Saunders et al., 2005; Story et al., 2000). In sum, evidence from process evaluation can inform whether an intervention is ineffective due to "*a poorly designed"* or inadequate due to "*poorly implemented"* intervention, or whether findings from an intervention study need to be scaled up, modified/tailored and adapted for implementation success to occur (Durlak & DuPre, 2008).

Additionally, there is an increasing emphasis within process evaluation on evaluating the implementation process of multi-components and/or multi sites intervention studies to disentangle which component best contributes to an intervention's success (Linnan & Steckler, 2002; McGraw et al., 1996; Viadro, Earp, & Altpeter, 1997), and to ensure that interventions are carried out equally at all intervention's locations (Oakley et al., 2006). For example, Wind et al. noted the importance of evaluating the implementation of the Pro Children intervention, which consists of FV provision, nutrition education, and parental involvement that was implemented in Norway, Spain and the Netherlands, to determine which component best contributed to intervention's effects. Also, the authors illustrated the importance of evaluating the operation of the intervention at different sites, that is Norway, Spain and the Netherlands, to determine if the

implementation and appreciation of the program may have somewhat dependent on the local circumstances (i.e. geographic and cultural setting) in which the program was implemented (Wind et al. 2008). The authors found a lack of curricular activities implementation in both the Netherlands and Spain, which resulted in a null intervention effect on children's consumption of FVs (Wind et al., 2008). The observed highest mean number of implemented lessons in Norway, on the other hand, might be explained by the fact that Home Economic teachers were responsible for the intervention, compared with Spain and the Netherlands where the regular classroom teachers were responsible for implementing the curricular component (Wind et al., 2008). The authors also found low parental involvement in Norway because of language barriers which might have caused low involvement in homework assignments. As for food provision, the free, high frequency (5x a week) of FVs per week in Norway, compared to the subsidized version in Spain and the free and low frequency (2x a week) in the Netherlands contributed to high intake of FVs in Norwegian children (Wind et al., 2008; Te Velde et al., 2008). Therefore, it is important to examine the effect of intervention component separately and at each site to determine what caused most of the change in intake and which of the multi-components really did not work (Wind et al., 2008). By examining the implementation processes and practices related to each intervention component and at each site, the researcher can obtain a comprehensive picture of the factors most influential in terms of any observed effect.

Despite increasing emphasis on the importance of evaluating the implementation process of public health intervention studies, research has primarily focused on outcome evaluation with little attention being paid to process evaluation (Baranowski & Stables, 2000; Saunders et al., 2005; Story et al., 2000). Therefore, there is an urgent priority to evaluate both the implementations and outcomes of respective programs (Ciliska et al., 2000; Stokols, 1995).

5. Theoretical Frameworks of Implementation Research

To date, there has been an increase in published research on theoretical frameworks driving process evaluations of public health interventions. However, there is no single defined, agreed upon comprehensive theoretical framework (Grant, Treweek, D'reischulte, Foy, & Guthrie, 2013). This is reflected by the lack of uniformity or "one size fits all" framework in implementation literature. Yet, despite heterogeneity, they are all intended to determine aspects that are not working in the program and that need to be further improved (Baranowski & Stables, 2000; Carroll et al., 2007; Dane & Schneider, 1998; Durlak & DuPre, 2008; Fleuren, Wiefferink, & Paulussen, 2004; Glasgow, Vogt, & Boles, 1999; Grant et al., 2013; Linnan & Steckler, 2002; Proctor et al., 2011; Rogers, 2003; Saunders et al., 2005).

For the purpose of this dissertation, we did not aim to present a comprehensive review of theoretical frameworks, but rather sought to gain a general understanding of the theoretical bases underpins the research field of process evaluation. For example, one commonly used framework, developed by Baranowski & Stables, 2000, and refined by Linnan & Steckler, 2002, and Saunders et al., 2005 outlined important aspects to assess including recruitment, context, and reach. Further, Fleuren et al. asserts that dimensions such as context and characteristics of setting, participants (skills, knowledge and perceived support) and the intervention itself (complexity, relative advantage) are also important for implementation (Fleuren et al., 2004). Similarly, Rogers emphasizes that characteristics such as relative advantage, compatibility, complexity, observability and trialability as perceived by intermediaries are important to determine the rate of adoption (Rogers, 2003). Likewise, there is consistency with the taxonomy of implementation outcomes proposed by Proctor et al. (Proctor et al., 2011) and Rogers (Rogers, 2003). However, Rogers not only focused on the innovation itself, but also took into

consideration the implementers (people who implement the intervention) (Rogers, 2003). Other frameworks have conceptualized the impact of an intervention as a function of factors including: fidelity, dosage, quality, participant responsiveness, program differentiation, monitoring of control conditions, program reach, and adaptation (Durlak & DuPre, 2008); adherence, moderators and identification of essential components (Carroll et al., 2007); and recruitment, delivery, response, reach, maintenance (sustainability), unintended consequences, and context (Grant et al., 2013).

It is worth noting that there is some overlap in process evaluation aspects across the reviewed theoretical frameworks; however, there are also distinct aspects within each framework. Additionally, not every aspect is usually measured, as each intervention has its own specific characteristics; however, the most common theoretical aspect that are repeatedly being highlighted is the measurements of fidelity- the possibility of whether the intervention was implemented as intended. For example, fidelity was discussed by Linnan & Steckler, 2002, is stated within Proctor et al., 2011 taxonomy of implementation outcomes and resembles the "implementation" dimension within Glasgow et al., 1999. However, Dane et al. identified fidelity as an independent concept to be monitored during the intervention. They used the term "implementation fidelity" and defined five dimensions in its assessment: adherence, exposure, quality, participant responsiveness and program differentiation (Dane & Schneider, 1998).

Overall, while some researchers have recommended that specific aspects (e.g., fidelity, dose delivered, dose received, reach and context) should be considered when evaluating the implementation of an intervention (Durlak & DuPre, 2008; Saunders et al., 2005), others have emphasized that outcomes and the characteristics of the interventions should be considered when designing a process evaluation (Grant et al., 2013). For this evaluation, the choice of process

evaluation components was influenced by fidelity and the need to achieve a rich understanding of what was happening, and to obtain information that could be used to improve the CPSFP.

6. Outline of Thesis

In order to achieve these objectives, three studies were undertaken. While each project was succinct and individual in its nature, they were all closely connected thematically. The structure of this dissertation will be as follows: **Chapter 1** presented an overall introduction to the research question and purpose of the studies, as well as a general summary of implementation research. **Chapter 2 (*study 1*)** includes a concise systematic review of the current knowledge on this topic and gives an overview related to this dissertation research. **Chapter 3 (*study 2*)** contains the first study: how was the Centrally Procured School Food Program (CPSFP) implemented from the perspectives of the OSNP personnel and food providers. **Chapter 4 (*study 3)*** presents the second study: how was the Centrally Procured School Food Program (CPSFP) implemented from the perspectives of school personnel and/or volunteers. Finally, **Chapter 5** highlights the summary, implications, unanticipated observation, impacts of COVID-19, general limitations and strengths of the studies as well as future directions for research and policy.

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Chapter 2 : "Process evaluation of fruit and vegetable distribution interventions in school-based settings: A systematic literature review"

1. Introduction

Fruit and vegetables (FVs) are important components of a healthy diet and sufficient daily consumption can help prevent the majority of non-communicable chronic diseases (World Health Organization [WHO], 2003), however, children consume less FVs than recommended (Colapinto, Graham, & St-Pierre, 2018; Dennison, Rockwell, & Baker, 1998; Garriguet, 2007; Minaker & Hammond, 2016). To combat this problem, numerous intervention strategies to have been developed to increase school-aged children's intake of healthy foods, particularly FVs (DeCosta, Moller, Frost, & Olsen, 2017; Triador, Farmer, Maximova, Willows, & Kootenay, 2015; Libman, 2007). Increasing the availability and accessibility of FVs through distribution-based interventions within the school environment have been identified as consistent and positive predictors of children's FV consumption (Blanchette & Brug, 2005; de Sa & Lock, 2008; Rasmussen et al., 2006). While a recent systematic review and meta-analysis examined the effectiveness of distributing FVs as a snack during break-time to school-aged children (*Ismail, Seabrook, & Gilliland, unpublished work*), these studies rarely inform us of how interventions were executed and the importance of implementation for program effectiveness.

Process evaluation studies serve an important role in health promotion research by providing information about how interventions are implemented, the predictors of conditions under which interventions are likely to be most effective (i.e. mechanism of impact), and how the contextual environment affects the outcome (Oakley et al., 2006). Evidence from process evaluation is important to determine whether the lack of an effect is due to inadequate (i.e. poorly *implemented)* or ineffective (i.e. poorly *designed)* interventions, thereby qualifying the

understanding of any effect of an intervention (Durlak & DuPre, 2008). Various theoretical frameworks (Baranowski & Stables, 2000; Fleuren, Wiefferink, & Paulussen, 2004; Glasgow, Vogt, & Boles, 1999; Linnan & Steckler, 2002; Rogers, 2003; Saunders, Evans, & Joshi, 2005) have been used to address process evaluation. To our knowledge, this constitutes the first systematic review of the literature to examine: 1) process evaluation studies of snack-based FV distribution interventions; and 2) the successes and challenges to the implementation of snack-based FV distribution interventions within the school environment. Knowledge gained from this review will not only guide future planning of process evaluation studies in this field, but also identify conditions and/or resources needed under which FV distribution-based interventions are likely to be most effective.

2. Materials and Methods

The authors followed the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidelines during all stages of design, implementation, and reporting (Moher, Liberati, Tetzlaff, Altman, & Group, 2009).

2.1. Search Strategy

Embase, ProQuest, PubMed, Scopus, and Web of Science Core Collection were searched in June 2019. No date limit, language or geographic location restrictions were applied. In consultation with an experienced librarian and informed by previously published literature, searches were carried out combining five different search arms: *(school* OR "school-based") AND (intervention* OR program* OR scheme* OR campaign* OR initiative* OR project*) AND ("program evaluation" OR "process evaluation" OR implementation OR evaluation) AND (fruit* OR vegetable*) AND (provision OR subsidized OR distribution OR free OR availability*

OR exposure OR accessibility). This method was adapted when Medical Subject Headings (MeSH) terms were not available. One reviewer screened the titles of the studies and imported all relevant titles into a citation manger (Mendeley v1.17.10). Duplicates were then removed and from the remaining studies, an abstract screening was completed independently by two reviewers. For potentially relevant articles, full texts were assessed for eligibility independently by two reviewers. Once eligible studies were identified, a manual search of the reference lists of the included studies was conducted to identify any missed relevant studies. Discrepancies were discussed, elucidated and resolved through discussions with a third reviewer.

2.2. Study Selection

Studies needed to meet the following criteria: ***Population***: stakeholders (e.g., school staff, volunteers, children); ***Intervention***: distributed FVs as snacks in school-based setting solely or combined with another intervention approach; ***Comparator***: not applicable; and ***Outcome***: provided information on the functioning of the intervention (i.e. implementation, mechanisms of impact, and/or contextual factors). Studies were excluded if they were not reported in English, reviews, conference proceedings/abstracts, design protocols, process evaluation of other approaches used to increase children's FV consumption, or studies that only reported on outcome evaluation with no information on process evaluation.

2.3. Data Extraction and Abstraction

Information from each study was extracted based on the following: 1) basic information about the study; 2) process evaluation participants; 3) measurement methods; 4) and findings. The Critical Appraisal Skills Programme (CASP) was used to provide descriptive information on the quality of the included studies rather than as a basis for inclusion/exclusion. Each study was rated independently by two reviewers. The tool consists of 10 questions all of which can be

answered with either “Yes”, “No”, or “Unclear” and are designed around three broad sections: A) Are the results of the study valid?; B) What are the results?; and C) Will the results help locally? (Critical Appraisal Skills Programme [CASP], 2018).

2.4. Data Synthesis

A narrative synthesis was presented detailing: 1) features of process evaluation currently being conducted, and 2) process evaluation findings of stated implementation of the planned intervention. Data analysis was conducted following an inductive content analysis approach (Auerbach & Silverstein, 2003; Braun & Clarke, 2006). For quality assurance, analysis was conducted by one author and validated/verified by a second author. The coding and interpretation of results were continuously discussed between co-authors and discrepancies were amended following discussion to clarify coding and emergent themes (i.e., investigator triangulation) (Merriam, 2009). Several strategies were employed to enhance trustworthiness of the data. The primary author revisited the studies after the development of the final common theme template to verify that findings were rooted in the data. Data coding was checked using the specification in the NVivo software program (Version 12, QSR International Pty Ltd, Melbourne, Australia). A reflective diary of data collection and analysis provided data immersion and validity, minimizing researcher bias (Green et al., 2007). A second reviewer (non-author) coded a random sample of the studies (*n=10*) in order to establish inter-coder reliability. Any coding disagreements were discussed, elucidated, and resolved with the first author. After extensive debate over interpretations of the studies, co-coders achieved 87.5%. This measure of agreement in coding interpretation was determined by comparing the codes each analyst affixed and calculating the percentage of agreement.

3. Results

3.1. Literature Search

Of the 1669 titles retrieved, 166 studies remained after title screening and removal of duplicates. Abstract screening left 93 studies, as 73 did not meet the pre-specified eligibility criteria. Full-text screening left 18 studies, as 75 did not meet the eligibility criteria. An additional six studies were added from a manual search of reference lists. In total, this search strategy identified 24 separate studies, reporting on 11 interventions and 1 policy, published between 2006 and 2019 (Figure 1).

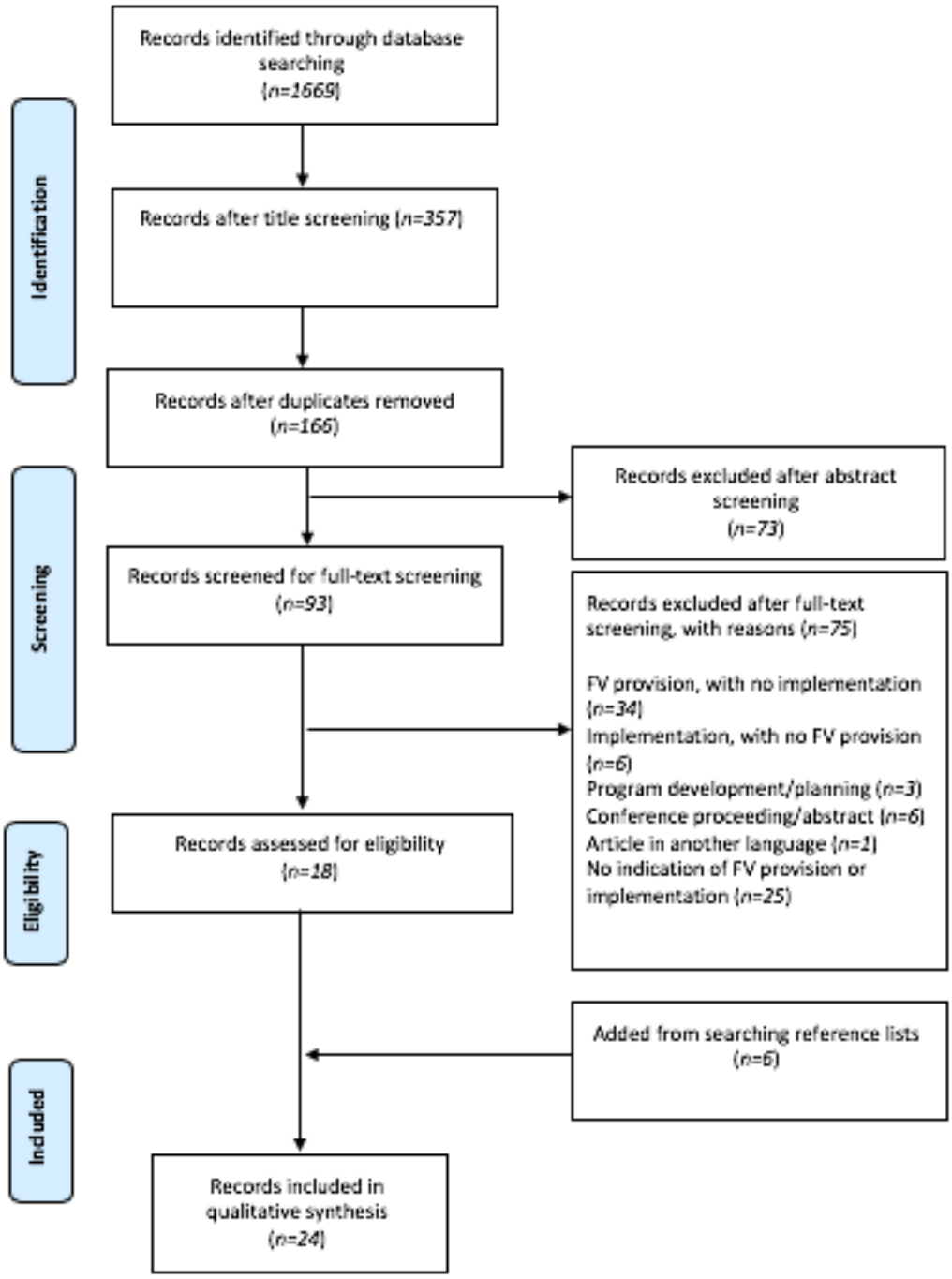

Figure 1: Flow diagram of search strategy and review process based on PRISMA statement.

PRISMA, Preferred Reporting Items for Systematic Reviews and Meta-Analyses

3.2. General Characteristics of the Studies

A descriptive summary of the studies characteristics (*n=24*) is presented in (Table 1). Included studies were published between 2006 and 2019 and were based in Canada (*n=6*), USA (*n=5*), and Denmark (*n=4*), and included a variety of participants (e.g., children, teachers).

Table 1: Summary of the reviewed studies on the effects of snack-based FV distribution interventions process summary (*n=24*)

Author(s), year, program name, country	Aims	Participants	Measurement	Findings
Aarestrup et al. (2014), BOOST, Denmark	To explore the implementation of FVs provision and eating environment	Children Teachers Suppliers	Interviews; focus group and observation	**Facilitators:** Children appreciation; supplier prospects of publicity and branding **Barriers:** Lack of timely FVs delivery; lack of teacher time
Jorgensen et al. (2014), BOOST, Denmark	To examine the barriers and facilitators to FVs provision and curricular component	Teachers	Interviews and focus group	**Facilitators:** Detailed teacher manual; teacher training; teacher motivation and ownership; customization and adaptation of the program; communication about the overall objective of the intervention **Barriers:** Intervention duration; extra workload on teacher; lack of teacher time
Aarestrup et al. (2015), BOOST, Denmark	To examine the implementation of FVs provision and eating environment	Children Teachers	Questionnaire	**Facilitators:** School characteristics [small; high SES; etc.]; children appreciation **Barriers:** School characteristics [large; low SES; etc.]
Jorgensen et al. (2016), BOOST, Denmark	To examine the implementation of FVs provision and	Parents Children	Questionnaire	**Facilitators:** Parent appreciation; parent involvement; parent characteristics (e.g.,

	level of parental involvement			SES, educational background) **Barriers:** Lack of parent time; technical problems with newsletters upload; parent forgetfulness
Coyle et al. (2009), The Mississippi Fresh Fruit and Vegetable Program (MFFVP), USA	To determine the extent to which children attitudes and consumption changed of FVs provision	Children School staff	Focus groups	**Facilitators:** Serving V with dips; food type **Barriers:** Food type (F or V); preparation method of V (cooked vs. raw)
Potters et al. (2011), The Mississippi Fresh Fruit and Vegetable Program (MFFVP), USA	To describe the implementation of FVs provision	Program staff Children School staff	Questionnaire; interviews; focus groups and logs	**Facilitators:** Program staff and children appreciation; teacher support; promotional activities; serving V with dips; food aesthetics; free snacks **Barriers:** Increased workload; lack of timely FVs delivery; shortage of fresh FVs (spoiled); lack of staff time; inconsistent communication among staff; lack of parental involvement/awareness; insufficient food storage; limited variety of FVs served
Bai et al. (2011), Fresh Fruit and Vegetable Program (FFVP), USA	To examine factors facilitating or challenging to FVs provision	School staff Program staff Parents	Interviews; observation and questionnaire	**Facilitators:** Snack time (morning); teacher role modelling; variety of FVs served **Barriers**: Insufficient volunteers; inadequate funding; ineffective communication; inconsistent food delivery to classes; type of snack served (F or V); no promotional activities
Jamelska et al. (2014), Fresh Fruit	To provide information about	Teachers School nutrition director	Interviews and logbook	**Facilitators:** Detailed implementation manual; adequate physical

and Vegetable Program (FFVP), USA	implementation, including benefits, challenges, and opportunities of FVs provision			infrastructure; adequate human resource; promotional activities; background knowledge/ previous experience; small school size **Barriers:** Limited/insufficient funding
Lin et al. (2016), Fresh Fruit and Vegetable Program (FFVP), USA	To understand children perceptions of FVs provision	Children	Questionnaire	**Facilitators:** Children appreciation; FVs quality; food type (F or V) **Barriers:** Poor quality of some FVs; food type (F or V)
Bouck et al. (2011), Northern Fruit and Vegetable Program (NFVP), Canada	To determine how FVs provision and nutrition education was implemented	Teachers Principals Food Preparers/Snack personnel On-site project coordinator Supplier	Interviews; tracking form and questionnaire	**Facilitators:** Teacher role modelling; teacher appreciation; adequate funding for supplies and personnel **Barriers:** Lack of timely FVs delivery; wastage; poor FVs quality (e.g., appearance, freshness and variety); lack of printed nutrition education resources
Gates et al. (2011), School Snack Program, Canada	To evaluate the implementation of FVs provision, nutrition education and parental involvement	Children Teachers Parents	Focus groups and questionnaire	**Facilitators:** Children, parents and teacher appreciation **Barriers:** Lack of teacher time; food insecurity (e.g., cost, variety, availability, quality and remoteness)
He et al. (2012), Northern Fruit and Vegetable Program (NFVP), Canada	To understand children perceptions of FVs provision	Children	Focus group	**Facilitators:** Children appreciation; free of costs; high quality foods **Barriers:** Inadequate quantity of some FVs; poor quality of some FVs; large amount of leftovers
Skinner et al. (2012), School	To examine the impact of FVs provision	Children	Questionnaire	**Facilitators:** Children appreciation; food type (F or V); dedication of

Snack Program, Canada				"program champion"; adequate food preparation and storage facilities; continuous financial resources; community support **Barriers:** FVs costs; difficult to transport, prepare and store FVs
Gates et al. (2012), School Snack Program, Canada	To examine the sustainability of FVs provision	Children School staff	Focus group and questionnaire	**Facilitators:** Children and teacher appreciation **Barriers:** Inadequate funding; insufficient facilities to store and prep the foods; limited volunteer capacity; inconsistent quality and availability of healthy foods
Gates et al. (2016), School Snack Program, Canada	To describe the facilitators and challenges to the operations of FVs provision	Children School principals and snack program coordinating committee	WEB-Q and focus group discussions	**Facilitators:** Bulk food orders supplemented with local procurement; chartered food orders; reliable supplier; adequate funding and donations; informal school policy; training staff; regular inspections; dedicated servery/kitchen space; physical resources to prep, store and serve foods; dedicated personnel **Barriers:** Limited variety; servery/kitchen space; geographical location; inadequate funding; inconsistent FVs quality; limited personnel
Yeo et al. (2006), School Fruit Scheme (SFS), UK	To explore the feasibility and cost of FVs provision	Teachers Parents	Questionnaire	**Facilitators:** Teacher and parent appreciation; teacher support and goodwill; pre-existing program or school policy **Barriers:** Waste

White et al. (2006), School Fruit Scheme (SFVS), UK	To investigate the impact of FVs provision	Children Teachers	Interviews	**Facilitators:** Children and teacher appreciation; flexibility of implementation; reinforcing the dietary messages at schools **Barriers:** Teacher busy schedule
Bere et al. (2006a), Fruits and Vegetables Make the Marks (FVMM), Norway	To report on the process evaluation of FVs provision and nutrition education	Teachers	Questionnaire	**Facilitators:** Teacher, parent, and children appreciation **Barriers:** Inadequate parental involvement
Reinaerts et al. (2007), Free School Fruit and Vegetable Program, Netherlands	To describe the implementation, evaluation and adoption of FVs provision	Teachers	Questionnaire	**Facilitators:** Teacher appreciation; simplicity of the intervention **Barriers:** High risk; lack of teacher time; inadequate funding; limited teacher support; inappropriate intervention timing (end of school year)
Wind et al (2008), Pro Children, Netherlands, Spain and Norway	To examine the implementation and appreciation of FVs provision, nutrition education and parental involvement	Children Parents Teachers	Questionnaire	**Facilitators:** Children appreciation; high curricular implementation in Norway; high parental involvement in Norway **Barriers:** Low parental involvement in the Netherlands and Spain; low curricular implementation in the Netherlands and Spain; low children appreciation
Clarke et al. (2009), Fresh Fruit and Vegetable Initiative (FFVI), Ireland	To describe the impact of FVs provision, peer modelling and rewards	Teachers Parents	Questionnaire	**Facilitators:** Rewards; children; parent and some teacher appreciation **Barriers:** Inadequate funding; lack of teacher time; lack of some teacher support; inappropriate intervention timing

				(beginning of school year); time consuming at younger grades
Hector et al. (2017), Crunch and Sip, Australia	To examine the feasibility, acceptability and efficacy of FVs provision	Teachers	Questionnaire	**Facilitators:** Timely FVs delivery, teacher support; free of costs FVs; food type (F or V); stakeholders appreciation and partnership **Barriers:** School SES; lack of teacher time; low parental involvement; food cost (expensive healthy foods)
Muellmann et al. (2017), DEDIPAC Project [Free Fruit Scheme and Food Dude], Germany	To gain an understanding of the factors facilitating adoption, implementation and maintenance of multi-level policies and FVs provision, peer modelling and rewards (Ireland) and FVs provision (Norway)	Health Promotion professionals Policy Makers	Interviews	**Facilitators:** Background knowledge/prior experience of the school environment; involvement of relevant stakeholders; inter-sectoral collaboration and good communication; flexibility in adjusting/adapting the intervention to accommodate children with special needs; incentives to encourage children FVs consumption; simplicity of program implementation **Barriers:** Time consuming to integrate into existing curriculum, especially in younger grades; lack of political support in the respective country; buy-in and adoption of all schools and municipalities into the program; inadequate financial resources; difficult to establish collaboration/consensus among different level of stakeholder; difficulty in changing the existing

				socio-cultural norms of eating FVs; time taken to record activities and monitoring program implementation; school day disruption/interruption
Hayes et al. (2019), DEDIPAC Project [Free Fruit Scheme and Food Dude], Ireland	To explore the implementation of FVs provision, peer modelling and rewards	Teachers School coordinators Project coordinators/managers	Interviews	**Facilitators:** Adequate funding; adequate communication at national and local levels; collaboration and support, and engagement of all school partners; designated FD coordinators; adaptation/flexibility of FD to children with special needs/serious aversions to specific FVs; intervention timing to suit the school timetable; existing school nutrition policy; timely delivery of FVs by supplier; pre-existing healthy eating policies; whole school approach and parental support; incentives/rewards to encourage children consumption; teacher support **Barriers:** Insufficient communication; inadequate funding; difficulty in changing the existing socio-cultural norms of eating FVs; time taken to record activities and monitoring program implementation; lack of resources to organize, package and store FVs; lack of low SES children and their parent involvement; time consuming especially in younger grades; lack of time and/or staff to prepare the food

SES: Socio economic status; F: Fruit; V: Vegetables; FV: Fruit and Vegetables; FD: Food Dudes

3.3. Quality of Evidence

The results of the quality assessment of the included studies *(n=24*) are presented in (Figure 2). A broad approach was used to avoid excluding studies based on assessment of quality, and thereby leave room to conduct exploratory research on the literature published in this field. Rather, we used the quality assessments to help us better understand the evidence base in this field, and therefore, we aimed at inclusion rather than exclusion. CASP is arguably the most "user friendly" alternative tool for novice researchers, however it was found wanting in terms of sensitivity to descriptive, interpretive and theoretical validity (Hannes, Lockwood, & Pearson, 2010). The tool consists of questions that are designed as prompts to guide the reviewers in a critical and holistic reading of the included studies. As there is no consensus on the relative weight that should be ascribed to any individual study, the presentation of a simple summed score of the tool's items would risk being more misleading than informative.

For these intervention studies, we did note a valuable contribution, but a great heterogeneity to adequately describe the implementation practices and processes of FV distribution-based interventions which makes it difficult to disentangle the contributing factors on the outcome reported. All studies were judged to have provided an adequately clear statement of the aims (Item1) and findings (Item9). None of the studies raised any significant ethical concerns; however, two studies (Reinaerts, De Nooijer, & De Vries, 2007; White, 2006) did not report the appropriate ethical permission (Item7). This may be partly reflecting the age of the studies and changing reporting requirement regarding ethical approval overtime. Although all studies were assumed to offer some potential value through "novel findings or perspectives", a number of studies reported minimal details available concerning qualitative methods, reflecting

the fact that this was supplemental to a quantitative survey data. This was noted with respect to inadequacy and/or lack of participant identifier accompanying data, and lack of quotes accompanying data which hampered assessment of the extent to which the authors had taken into consideration all available data (Aarestrup et al., 2015; Bai, Feldman, Wunderlich, & Aletras, 2011; Bere, Veierod, Bjelland, & Klepp, 2006a; Coyle et al., 2009; Gates, Hanning, Gates, McCarthy, & Tsuji, 2012; Gates, Hanning, Gates, Stephen, & Tsuji, 2016; Jamelske & Bica, 2014; Jorgensen, Jorgensen, Aarestrup, Due, & Krolner, 2016; Lin & Fly, 2016; Reinaerts et al., 2007; Skinner, Hanning, Metatawabin, Martin, & Tsuji, 2012; Wind et al., 2008; Yeo & Edwards, 2006).

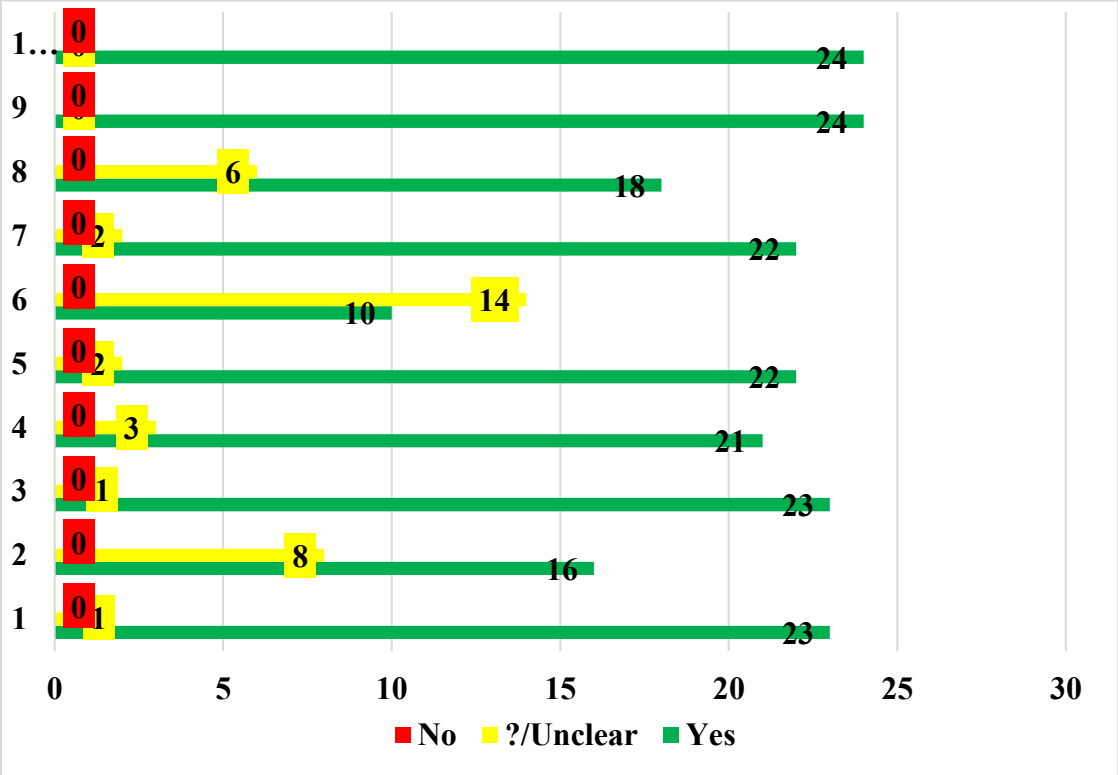

Figure 2: Summary of the reviewed studies on the risk of bias

The main 10 items were scored “yes”, “no”, or “can’t tell/unclear=?”. CASP Checklist. URL: https://casp-uk.net/wp-content/uploads/2018/01/CASP-Qualitative-Checklist-2018.pdf.
1 Was there a clear statement of the aims of the research?; 2 Is a qualitative methodology appropriate?; 3 Was the research design appropriate to address the aims of the research?; 4 Was the recruitment strategy appropriate to the aims of the research?; 5 Was the data collected in a way that addressed the research issue?; 6 Has the relationship between researcher and participants been adequately considered?; 7 Have ethical issues been taken into consideration?; 8 Was the data analysis sufficiently rigorous?; 9 Is there a clear statement of findings?; 10 How valuable is the research?
Section A: Pertains to questions 1- 6 ; Section B: Pertains to questions 7-9 ; and Section C: Pertains to question 10

3.4. Process Evaluation Features of Snack-Based FV Distribution Interventions

3.4.1 Terminology: 17 studies used the term “process evaluation”, “program evaluation” or “implementation” which can be determined from anywhere in the paper (e.g., title, abstract, introduction, methods) (Aarestrup et al., 2014; Aarestrup et al., 2015; Bai, Feldman, Wunderlich, & Aletras, 2011; Bere, Veierod, Bjelland, & Klepp, 2006a; Bouck et al., 2011; Gates et al., 2011; Gates, Hanning, Gates, McCarthy, & Tsuji, 2012; Gates, Hanning, Gates, Stephen, & Tsuji, 2016; Hayes, O'Shea, Foley-Nolan, McCarthy, & Harrington, 2019; Hector, Edwards, Gale, & Ryan, 2017; Jamelske & Bica, 2014; Jorgensen, Jorgensen, Aarestrup, Due, & Krolner, 2016; Jorgensen et al., 2014; Muellmann et al., 2017; Potter et al., 2011; Reinaerts, De Nooijer, & De Vries, 2007; Wind et al., 2008).

3.4.2 Aim, theoretical framework, research strategy and timing: 17 studies identified aims and research questions specific to process evaluation (Aarestrup et al., 2014; Aarestrup et al., 2015; Bai et al., 2011; Bouck et al., 2011; Gates et al., 2011; Gates et al., 2012; Gates et al., 2016; Hayes et al., 2019; Hector et al., 2017; Jamelske & Bica, 2014; Jorgensen et al., 2016; Jorgensen et al., 2014; Muellmann et al., 2017; Potter et al., 2011; Reinaerts, De Nooijer, & De Vries, 2007; Wind et al., 2008; Yeo & Edwards, 2006) while the remaining studies provided a very broad description of these objectives. Only nine studies reported the use of a theoretical framework to inform the design of the process evaluation (Aarestrup et al., 2014; Aarestrup et al., 2015; Gates et al., 2016; Hayes et al., 2019; Jorgensen et al., 2016; Jorgensen et al., 2014;

Muellmann et al., 2017; Reinaerts, De Nooijer, & De Vries, 2007; Wind et al., 2008). Most frequently cited were Baranowski et al. (2000), Glasgow et al. (1999), Linnan & Steckler (2002), and Saunders et al. (2005), Diffusion of Innovation Theory (Rogers, 2003) and the Utilization-focused participatory approach (Rossi, Lipsey, & Freeman, 2004). Several research strategies including qualitative, such as interviews and focus group discussions (Hayes et al., 2019; He et al., 2012; Jorgensen et al., 2014; Muellmann et al., 2017) quantitative, such as questionnaires and surveys (Aarestrup et al., 2015; Bere et al., 2006a; Clarke, Ruxton, Hetherington, O'Neil, & McMillan, 2009; Jorgensen et al., 2016; Reinaerts, De Nooijer, & De Vries, 2007; Wind et al., 2008; Yeo & Edwards, 2006) or both (Bai et al., 2011; Bouck et al., 2011; Gates et al., 2011; Gates et al., 2012; Gates et al., 2016; Jamelske & Bica, 2014; Potter et al., 2011) were used to measure the implementation process. Most studies collected their findings at the end of the intervention (Gates et al., 2011; Gates et al., 2012; Gates et al., 2016; Hayes et al., 2019; He et al., 2012; Jorgensen et al., 2016; Jorgensen et al., 2014; Lin & Fly, 2016; Muellmann et al., 2017; Reinaerts, De Nooijer, & De Vries, 2007; Skinner, Hanning, Metatawabin, Martin, & Tsuji, 2012; Yeo & Edwards, 2006) with some studies also collecting their findings during the intervention (Aarestrup et al., 2014; Aarestrup et al., 2015; Bai et al., 2011; Hector et al., 2017; Jamelske & Bica, 2014; Potter et al., 2011; Wind et al., 2008).

3.4.3 Addressing context: 18 studies explored how changes in contextual factors (e.g., policy, socioeconomic status, school size) mediated implementation and consequently outcome (Aarestrup et al., 2014; Aarestrup et al., 2015; Bai et al., 2011; Bouck et al., 2011; Clarke et al., 2009; Gates et al., 2011; Gates et al., 2012; Gates et al., 2016; Hayes et al., 2019; Hector et al., 2017; Jamelske & Bica, 2014; Jorgensen et al., 2016; Jorgensen et al., 2014; Muellmann et al., 2017; Potter et al., 2011; Skinner et al., 2012; Wind et al., 2008; Yeo & Edwards, 2006).

3.4.4 Describing those in charge of delivering the intervention: 15 studies investigated the challenges, successes and experiences of intervention providers (Aarestrup et al., 2014; Aarestrup et al., 2015; Bai et al., 2011; Bouck et al., 2011; Gates et al., 2011; Gates et al., 2012; Gates et al., 2016; Hayes et al., 2019; Jamelske & Bica, 2014; Jorgensen et al., 2014; Muellmann et al., 2017; Potter et al., 2011; Reinaerts, De Nooijer, & De Vries, 2007; Wind et al., 2008; Yeo & Edwards, 2006).

3.4.5 Investigating recipients of the intervention: Nine studies reported the experiences, motivations and opinions of those exposed to the intervention (Aarestrup et al., 2014; Aarestrup et al., 2015; Gates et al., 2011; Gates et al., 2012; Gates et al., 2016; He et al., 2012; Lin & Fly, 2016; Potter et al., 2011; Skinner et al., 2012).

3.4.6 Linking intervention outcomes to process evaluation findings: 16 studies used the findings from the process evaluation to build explanations about intervention outcomes (Bere et al., 2006a; Bouck et al., 2011; Clarke et al., 2009; Coyle et al., 2009; Gates et al., 2011; Gates et al., 2012; Gates et al., 2016; He et al., 2012; Hector et al., 2017; Jamelske & Bica, 2014; Jorgensen et al., 2016; Lin & Fly, 2016; Reinaerts, De Nooijer, & De Vries, 2007; Skinner et al., 2012; Wind et al., 2008; Yeo & Edwards, 2006).

3.5. Implementation of Snack-Based FV Distribution Interventions: Five overarching themes emerged, including: perceived value of the snack-based FV distribution intervention; successes of, and challenges to program implementation; perceived impact of the snack-based FV distribution interventions; and implications for future programming.

3.5.1 Perceived value of the snack-based FV distribution interventions: All studies valued FV distribution interventions because they provided children with free, equitable reach to a variety of healthy dietary choices (Aarestrup et al., 2014; Aarestrup et al., 2015; Gates et al.,

2011; Hector et al., 2017; Potter et al., 2011; Reinaerts, De Nooijer, & De Vries, 2007) especially those who had limited exposure to FVs because of economic challenges, and lack of nutrition knowledge (Bai et al., 2011; Bouck et al., 2011; Hector et al., 2017; Potter et al., 2011; White, 2006) or remoteness (Bouck et al., 2011; Gates et al., 2011; Gates et al., 2012; Gates et al., 2016; Skinner et al., 2012).

3.5.2 Successes: Many aspects contributed to the success of FV distribution interventions including: 1) participation of the school community, 2) publicity and branding, 3) school characteristics, 4) children's appreciation, 5) background knowledge, and 6) parental engagement.

1) Participation of the school community, particularly teachers' role modeling, was crucial to intervention success (Bai et al., 2011; Bere et al., 2006a; Bouck et al., 2011; Gates et al., 2011; Gates et al., 2012; Gates et al., 2016; Hayes et al., 2019; Hector et al., 2017; Potter et al., 2011; Reinaerts, De Nooijer, & De Vries, 2007; White, 2006; Yeo & Edwards, 2006). Identified strategies included nutrition discussions, tasting FVs with children, and encouragement (Bai et al., 2011; Reinaerts, De Nooijer, & De Vries, 2007).

2) Publicity and branding of FV suppliers to schools, children and parents facilitated timely supply, storage and delivery of the discounted FVs to schools (Aarestrup et al., 2014; Hayes et al., 2019; Hector et al., 2017; Muellmann et al., 2017).

3) School characteristics including size, pre-existing food policies or programs, and socio-demographic characteristics of the children affected implementation. Schools with small size (i.e., fewer than 300 participants) (Jamelske & Bica, 2014), pre-existing food policies (Muellmann et al., 2017; Yeo & Edwards, 2006), programs (Hayes et al., 2019; Yeo & Edwards, 2006), low percentage of economically disadvantaged children (Aarestrup et al., 2015) or

children with special needs (Hayes et al., 2019; Muellmann et al., 2017) showed minimal implementation challenges.

4) Children's appreciation of intervention activities (Gates et al., 2011; Wind et al., 2008), FV aesthetics (Aarestrup et al., 2014; Aarestrup et al., 2015), and quality, quantity, and variety of FVs (Bouck et al., 2011; Potter et al., 2011), was positively associated with their consumption. Children also valued FV distribution interventions for the physical and cognitive benefits, sustained focus on schoolwork, feeling full, and demonstrated that the school staff cared about them (Gates et al., 2011; Gates et al., 2012; Gates et al., 2016; He et al., 2012; Lin & Fly, 2016; Potter et al., 2011; Skinner et al., 2012).

5) Background knowledge was reported as a valuable resource in facilitating the coordination of the food service operation, especially for new coordinators who did not have prior experience in the area of FV handling and management (Jamelske & Bica, 2014). Also, providing guidelines on the implementation of the program (Jamelske & Bica, 2014; Jorgensen et al., 2014; Wind et al., 2008) and/or conducting a pre-intervention training workshop (Aarestrup et al., 2014; Aarestrup et al., 2015; Jorgensen et al., 2014; Wind et al., 2008) facilitated implementation.

6) Parental engagement facilitated children's consumption of FV at home, and therefore intervention's overall success (Aarestrup et al., 2015; Bai et al., 2011; Clarke et al., 2009; Gates et al., 2011; Hayes et al., 2019; Hector et al., 2017). Identified strategies included teaching children about nutrition and health, food preparation demonstrations, serving as a role model, setting rules, providing rewards (Bai et al., 2011) and participating in program guided child-parent activities (Jorgensen et al., 2016; Wind et al., 2008).

3.5.3 Challenges: Although all of the included studies were generally positive about FV distribution interventions, some key challenges were identified, including: 1) lack of timely FVs delivery, 2) limited funding, 3) inadequate promotional activities, 4) lack of teachers' time, and 5) food waste.

1) Lack of timely FVs delivery from suppliers was a key barrier to implementation. Factors such as lack of communication (Aarestrup et al., 2014; Bouck et al., 2011), low priority on the delivery company schedule (Bouck et al., 2011), remoteness (Aarestrup et al., 2014; Bouck et al., 2011; Gates et al., 2012), seasonality, and/or business size (Aarestrup et al., 2014) contributed to FV lateness. Further, unforeseen weather circumstances often meant that FVs would be unavailable or of unacceptable quality (Bouck et al., 2011; Gates et al., 2012). In addition, delivery size was not perceived as convenient because of suppliers' business size (Aarestrup et al., 2014). Identified strategies included serving dried, instead of fresh fruit (Potter et al., 2011), serving less desirable healthy choices (Bouck et al., 2011; Gates et al., 2012), adequate communication (Aarestrup et al., 2014; Aarestrup et al., 2015) or changing the distribution company (Bouck et al., 2011).

2) Limited funding was noted to have a negative impact on food type, program staff, and planning, and resources acquisition needed for implementation. For example, schools in remote locations are typically constrained by higher costs of daily FV distribution and the inability to stretch limited funds by purchasing fresh FVs in bulk or at bulk prices, which ultimately impacts the quantity and quality of FVs offered (Gates et al., 2011; Gates et al., 2012; Gates et al., 2016; Skinner et al., 2012). In such situations, dried fruit or fruit juice was most frequently served because of long shelf-life and ease of transportation (Bouck et al., 2011; Skinner et al., 2012). Limited funding was also linked to factors such as inadequate facilities for storage (e.g.,

refrigerator), limited space for preparation (e.g., sinks) (Gates et al., 2012; Gates et al., 2016), and/or lack of staff capacity (Bouck et al., 2011; Gates et al., 2012; Gates et al., 2016; Potter et al., 2011), which affected intervention implementation. The extra time needed for FVs preparation not only led to an increased workload, but also affected other school duties. The extra time in washing and cutting FVs (Bouck et al., 2011), and/or lack of school staff/volunteer capacity to coordinate the intervention (e.g., order, purchasing, preparing and delivering the snack) (Gates et al., 2012; Potter et al., 2011) led to serving whole fruit (e.g., bananas) rather than fruit requiring more preparation (e.g., pineapples), further limiting children's exposure to a variety of FVs (Bai et al., 2011; Hector et al., 2017; Jamelske & Bica, 2014). Identified strategies included transferring FVs to nearby schools with extra cooler space, assistance from additional staff and children, and/or ordering prepackaged FVs (Potter et al., 2011).

3) Inadequate promotional activities to publicize the program were recognized as a challenge (Bai et al., 2011; Jamelske & Bica, 2014) despite "school ethos and environment" (e.g., policies or activities that promote healthy nutrition values and attitudes within school). This is because promotional activities (e.g., posters, announcements, events) were encouraged, and not required.

4) Lack of teachers' time was a barrier to implementation. In some cases, the amount of time teachers spent on the daily distribution of FVs was large (Aarestrup et al., 2014; Aarestrup et al., 2015; Reinaerts, de Nooijer, Candel, & de Vries, 2007). This included cutting up FVs, allocating time to eat the FVs, and restoring order after children consume FVs. This led to disruption in teaching time, especially in classes of young children (Clarke et al., 2009). In addition to the daily distribution of FV workload, program curricular activities (Aarestrup et al.,

2014; Aarestrup et al., 2015; Jorgensen et al., 2014; Wind et al., 2008), and duration (e.g. 1-year) (Jorgensen et al., 2014) further limit the implementation of the intervention.

5) Food waste was dependent on the popularity of FVs served. The less popular the FVs served, the more was leftover. Therefore, fruit was purchased more frequently than vegetables (Bai et al., 2011; Hector et al., 2017; Jamelske & Bica, 2014) to avoid waste and maintain children's interest (Coyle et al., 2009; Jamelske & Bica, 2014; Potter et al., 2011; Yeo & Edwards, 2006). Other contributing factors to food waste were poor food quality because of remoteness, handling, and delivery issues (Bouck et al., 2011; Gates et al., 2011; Gates et al., 2012; Skinner et al., 2012) or receiving too much FVs (Bouck et al., 2011; He et al., 2012). For example, children sometimes felt that they did not receive enough quantity (Aarestrup et al., 2014; Aarestrup et al., 2015) yet others felt there was too much leftover and discussed efforts to reduce waste (He et al., 2012). Additionally, food aesthetics contributed to food waste. For instance, children were not allowed to eat the cut up FVs because teachers control the time of FV break. This caused enzymatic browning of the FVs as children perceived it as unappetizing to eat (Aarestrup et al., 2014). Identified strategies included coating FVs with lemon juice (Aarestrup et al., 2014) serving vegetables with dips (Bai et al., 2011; Bouck et al., 2011; Coyle et al., 2009; Lin & Fly, 2016; Potter et al., 2011), stop purchasing vegetables that were rejected by children (Coyle et al., 2009), sending extra FVs home with children/teachers (Bouck et al., 2011; Reinaerts, De Nooijer, & De Vries, 2007), serving FVs another day (Bouck et al., 2011), donating FVs to food banks (Bouck et al., 2011), serving more than one FVs snack a day (Potter et al., 2011), or cooking vegetables (Coyle et al., 2009; Lin & Fly, 2016).

3.5.4 Perceived impact of the snack-based FV distribution interventions: All studies reported the beneficial effects of FV distribution interventions on children, and parents' FV

consumption and/or related behaviors. These include improved child focus on schoolwork (Gates et al., 2011; Hector et al., 2017), bringing fresh FVs from home (Hector et al., 2017), increased knowledge, awareness, preference for and consumption of a variety of FVs (Clarke et al., 2009; Gates et al., 2011; Hector et al., 2017; Potter et al., 2011; White, 2006), and stimulating social interactions (Aarestrup et al., 2014; Aarestrup et al., 2015; He et al., 2012). Furthermore, improved children's FV related-eating behaviors, such as asking parents to buy FVs (Coyle et al., 2009; Gates et al., 2011; Gates et al., 2012; Gates et al., 2016; He et al., 2012) or coordinators to incorporate FVs snack items into schools' meals (Jamelske & Bica, 2014) were also cited. Moreover, some studies reported that FV distribution interventions extended its benefits to parents via potentially improving FVs consumption (Clarke et al., 2009), influencing dietary purchasing (Coyle et al., 2009; Jamelske & Bica, 2014), and reinforcing healthy dietary messages at home (Clarke et al., 2009), and schools (White, 2006).

3.5.5 Implications for future snack-based FV distribution interventions: Nearly all studies used process evaluation findings to generate suggestions and to develop suggestions to counter balance the limitations of their research study. These recommendations were regarding aspects of the intervention that could be adapted or modified/tailored in order to increase the chances of success of future implementation research in this field (Table 2).

Table 2: Implications for future programming

- Run a sponsored event to secure funds (Reinaerts, De Nooijer, & De Vries, 2007).
- Consider food aesthetics (e.g., appearance) when presenting food to children (Aarestrup et al., 2014; Bai et al., 2011; Coyle et al., 2009; Jamelske & Bica, 2014; Lin & Fly, 2016; Potter et al., 2011).
- Provide guidelines on program implmentation (Aarestrup et al., 2014; Hayes et al., 2019; Muellmann et al., 2017).
- Make FV break a compulsory part of the curriculum (Aarestrup et al., 2014), and integrate nutrition topics into the school curriculum (Bai et al., 2011; Jorgensen et al., 2014), and policy (Hector et al., 2017).

- Address school context (Aarestrup et al., 2015), geographical location (Gates et al., 2011; Gates et al., 2012), and pre-existing policies or programs (Hayes et al., 2019; Hector et al., 2017; Jamelske & Bica, 2014; Muellmann et al., 2017; White, 2006; Yeo & Edwards, 2006).
- Involve parents (Bai et al., 2011; Bere et al., 2006a; Gates et al., 2011; Gates et al., 2012; Jamelske & Bica, 2014; Jorgensen et al., 2016; Potter et al., 2011; Wind et al., 2008), and examine the impact of their involvement in the program (Bai et al., 2011; Bouck et al., 2011; Coyle et al., 2009; He et al., 2009; Hector et al., 2017; Jorgensen et al., 2016; Wind et al., 2008).
- Involve teachers in intervention planning, development and implementation of the program (Clarke et al., 2009; Gates et al., 2012; Jorgensen et al., 2014; Potter et al., 2011; Wind et al., 2008).
- Improve FVs delivery to minimize lateness (Bai et al., 2011; Bouck et al., 2011; Potter et al., 2011), and establish regular food quality monitoring (Bouck et al., 2011).
- Implement a community-based intervention (Bouck et al., 2011; Gates et al., 2011; Gates et al., 2012; Hector et al., 2017; Skinner et al., 2012).
- Involve children in intervention development (Bere et al., 2006a; Bouck et al., 2011; Lin & Fly, 2016; Wind et al., 2008), and snack preparation (Aarestrup et al., 2014; Bai et al., 2011; Gates et al., 2011; Skinner et al., 2012).
- Incorporate interactive activities (i.e. kinesthetic lessons, testimonials) (Bouck et al., 2011; Coyle et al., 2009; Gates et al., 2011; Potter et al., 2011).
- Communicate program's objectives (Jorgensen et al., 2014; Potter et al., 2011), logistics (Bouck et al., 2011), and support (Bai et al., 2011).
- Support the implementation and maintenance of policies (Muellmann et al., 2017).
- Explore ways to encourage V consumption (i.e., dips) (Bai et al., 2011; Bouck et al., 2011; Coyle et al., 2009; He et al., 2012; Hector et al., 2017; Jamelske & Bica, 2014; Lin & Fly, 2016; Potter et al., 2011).
- Ensure adequate exposure to FVs (Jamelske & Bica, 2014) and choose FVs that children like (Coyle et al., 2009; Jamelske & Bica, 2014; Lin & Fly, 2016; Skinner et al., 2012; Yeo & Edwards, 2006).
- Identify effective promotional activities (i.e., announcement, posters, events) to increase awareness about the program (Bai et al., 2011; Coyle et al., 2009; Jamelske & Bica, 2014; Potter et al., 2011).
- Implement a comprehensive FV distribution intervention, including parent and community involvement (Bai et al., 2011; Coyle et al., 2009; Gates et al., 2011; Gates et al., 2012; Gates et al., 2016).
- Utilize a "whole-of-school" approach (Clarke et al., 2009; Hayes et al., 2019; Hector et al., 2017; Jamelske & Bica, 2014; White, 2006; Yeo & Edwards, 2006).
- Tailor the intervention to suit school socio-cultural context (Bai et al., 2011; Hayes et al., 2019; Jorgensen et al., 2014).
- Consider background knowledge, previous experience, and/or training of the implementors (Jamelske & Bica, 2014; Jorgensen et al., 2014; Reinaerts, De Nooijer, & De Vries, 2007).
- Balance children's need for variety, and/or ethnic FVs (e.g., papayas) (Bai et al., 2011; Bouck et al., 2011; Gates et al., 2016; He et al., 2012; Hector et al., 2017; Lin & Fly, 2016; Potter et al., 2011; Skinner et al., 2012).
- Incorporate seasonality, sustainable agriculture, and cost messages into program's materials (He et al., 2012), and general nutritional information (Gates et al., 2011).
- Consider cost when supplying FVs to schools and staff labour for food preparation (Bouck et al., 2011; Hector et al., 2017; Potter et al., 2011; Yeo & Edwards, 2006).
- Establish a system for ordering and distributing FVs to schools (Hector et al., 2017).

- Evaluate intervention's long-term impact on children's overall dietary consumption, obesity and home environment (Bai et al., 2011; Hector et al., 2017; White, 2006).

4. Discussion

This systematic review acknowledged the successes and challenges to the implementation of FV distribution interventions and provide opportunities to not only address some of the challenges, but potential insights into how to improve and enhance future FV distribution programming.

All studies highlighted the value FV distribution interventions in providing children with free, universal access to a variety of high-quality, healthy FVs. Universal access was seen to lower the risk of stigmatization and increase children's reach, which has been demonstrated previously with similar interventions (Hector et al., 2017; Russell, Evers, Dwyer, Uetrecht, & Macaskill, 2008). Furthermore, the increased availability and accessibility to a variety of foods are known facilitators in changing children's FVs consumption (Blanchette & Brug, 2005; de Sa & Lock, 2008; Rasmussen et al., 2006) and have been reported as a valuable aspect to school FV distribution interventions (Bere, Veierod, Skare, & Klepp, 2007; Bere, Veierod, Bjelland, & Klepp, 2006b; Reinaerts, Crutzen, Candel, De Vries, & De Nooijer, 2008; Reinaerts, de Nooijer, Candel, et al., 2007; Wells & Nelson, 2005). For example, subsidized FV distribution interventions were not associated with children's consumption because FVs were provided at a cost to parents, which increased the accessibility but not the availability of FVs to all children (Bere et al., 2006a). However, when the intervention was implemented free of cost, all children, including economically disadvantaged children participated, indicating the role of availability and accessibility of free FVs in promoting children's intake (Bere et al., 2007).

All studies reported the beneficial effects of FV distribution interventions on children and/or parent's consumption of FVs and/or related behaviors (Gates et al., 2011; Hector et al.,

2017; Coyle et al., 2009; Gates et al., 2012; Gates et al., 2016; He et al., 2012 Clarke et al., 2009). Health promoting activities in school settings have the potential not only to enhance the health and well-being of children (Baxter et al., 1997; Veugelers & Fitzgerald, 2005) but also to reach a large number of parents, siblings and extended families, regardless of their ethnicity, socioeconomic background, and/or nutritional status (Knai et al., 2006). These beneficial effects also directly address many mediators of behavioral change (Bandura, 2004) including changing children's preferences, awareness and attitudes (Bere & Klepp, 2005; Krolner et al., 2011; Tak, Te Velde, & Brug, 2008), increasing social norms, and role modelling (Addessi, Galloway, Visalberghi, & Birch, 2005) which all have shown to positively influence children's dietary behavior.

The greater the school support, the better the implementation and outcomes achieved. Teachers were receptive to the intervention because there was a need; otherwise they would regard it as an addition to their workload (Hector et al., 2017; Jorgensen et al., 2014). Perceiving the relative advantage of the intervention likely allowed for better adoption, supported buy-in, and facilitated implementation (Durlak & DuPre, 2008; Rogers, 2003). However, lack of teachers' time was identified as a key barrier to the delivery of the program in classrooms (Aarestrup et al., 2015; Clarke et al., 2009; Gates et al., 2011; Jorgensen et al., 2014; Reinaerts, De Nooijer, & De Vries, 2007). For instance, lack of curricular activity implementation in both the Netherlands and Spain is the result of lack of adoption, cooperation in addition to the extra workload placed on the teachers implementing the program (Wind et al., 2008). This, in turn, resulted in a null intervention effect on children's consumption of FVs at follow-up (Te Velde et al., 2008).

When teachers' level of implementation depends on being involved in a research project, sustainability can be a challenge. Therefore, the only effective alternative is either using trained research staff, which is considered an unrealistic option because of limited resources (Gates et al., 2011; Reinaerts, De Nooijer, & De Vries, 2007) or incorporating the program into the formal curriculum. Embedding the program into the school day will not only ensure children can learn about and consume FVs, but also ensure a high implementation rate by teachers.

Moreover, teachers perceive distribution of FVs as complex (Reinaerts, De Nooijer, & De Vries, 2007). This is because teachers are used to teaching activities rather than distributing FVs, thereby suggesting that skills, coordination and/or sufficient time are required to facilitate implementation (Carroll et al., 2007). This is consistent with Diffusion of Innovation Theory (DOI), where initiatives that are perceived as simple (i.e., easy to use and understand) and can be conducted on a limited time basis are often more accepted (Rogers, 2003). Therefore, conducting a pre-intervention training workshop (Aarestrup et al., 2015; Jorgensen et al., 2014; Roccaldo, Censi, D'Addezio, Berni Canani, & Gennaro, 2017) or providing detailed guidelines on the implementation of the program (Aarestrup et al., 2014; Jorgensen et al., 2014) motivated teachers to implement the intervention with high fidelity by providing the latter with adequate tools, training and knowledge to promote children's consumption of FVs.

Furthermore, allowing teachers' discretion to tailor the intervention to suit school context (e.g., timetables (Hayes et al., 2019; Jorgensen et al., 2014; Muellmann et al., 2017) or children with special needs (Hayes et al., 2019; Muellmann et al., 2017)) were perceived as strongly supportive. This is consistent with the Implementation Theory that an on-going customization to the program may contribute to implementation success and that some adaptation always occurs (Chambers, Glasgow, & Stange, 2013; Corbett & Lennan, 2003; Durlak & DuPre, 2008). In

addition to FVs distribution and curricular activity workloads, teachers' implementation was challenged by intervention duration (Jorgensen et al., 2014). Deterioration in implementation over time was a noted challenge (Aarestrup et al., 2014; Aarestrup et al., 2015; Jorgensen et al., 2014; Wind et al., 2008) despite evidence that longer interventions are more effective at promoting health than those with only one or a few sessions (Wang & Stewart, 2013). Previous extensive reviews of previous school-based FV programming recommend programs to be of adequate time and duration for dietary behaviour change to occur (Ciliska et al., 2000; Hoelscher, Evans, Parcel, & Kelder, 2002). However, health promotion planners often encounter the problem of motivating schools to participate in such programs because of the time constraints. Therefore, school-based interventions that require minimal classroom or teacher time, such as FV distribution, are considered a viable avenue (Reinaerts, de Nooijer, Candel, & de Vries, 2007; Yeo & Edwards, 2006).

Overall, these findings demonstrate the difficulty in designing an intervention that is applicable to all schools; however, incorporating the intervention into the existing school curriculum and policy, and utilizing a "whole school" approach by involving school personnel, particularly teachers in the planning, development and implementation of the program will not only avoid leading them exclusively based on interest and goodwill of school personnel, but ensure optimal implementation. Furthermore, to maximize fidelity, these findings also illustrates the importance of flexibility to tailor the program to deal with circumstances as they best fit-in with the school context (i.e. school schedule, children's needs) aligns with both Diffusion of Innovation Theory (DOI) (Rogers, 2003) and Implementation Theory (Corbett & Lennan, 2003) and are important to maximize the fidelity of the intervention.

Publicity and branding of suppliers acted as a facilitator to delivering FVs to schools (Aarestrup et al., 2014; Aarestrup et al., 2015) which has been demonstrated previously with similar interventions (Marshall, Feenstra, & Zajfen, 2012; Webb, Gosliner, Woodward-Lopez, & Crawford, 2013). Schools benefit from associated savings, and farmers gain from an increased market demand and increased awareness of local agriculture among consumers (Webb et al., 2013) and enhanced public relations (Marshall et al., 2012). The ultimate beneficiary is the child, whose increased consumption of FVs will contribute to long-term health. However, lack of timely FVs delivery was identified as a barrier to the implementation of FV distribution interventions (Aarestrup et al., 2014; Aarestrup et al., 2015). This is because of concerns related to limited capacity for supplying, predictability of FV crops, communication and ordering, and dealing with major suppliers were therefore seen as a necessary intermediary between the schools and farmers (Marshall et al., 2012; Webb et al., 2013).

Additionally, publicity of the program raised awareness at schools and homes, and ultimately increased children's interest to participate in the program (Jamelske & Bica, 2014; Potter et al., 2011). However, these promotional activities were inadequate because of the amount of staff time and/or resources needed to sufficiently influence children's consumption of FVs (Bai et al., 2011). Therefore, communication campaigns are needed to affirm healthy eating messages and to create a positive environment in which FVs consumption is a norm in both school and home environments.

Free, universal FV distribution interventions have proven to be effective at increasing children's consumption of FVs (Bouck et al., 2011; Coyle et al., 2009; Gates et al., 2011; Gates et al., 2012; Reinaerts et al., 2008; Reinaerts, de Nooijer, Candel, et al., 2007; Skinner et al., 2012; Wells & Nelson, 2005) but most have identified sustained funding as a necessity to

maintain them at the level required to be effective (Bai et al., 2011; Hayes et al., 2019; Potter et al., 2011; Reinaerts, De Nooijer, & De Vries, 2007). Specifically, researchers reported limited funding to address food costs, inadequate facilities (Gates et al., 2011; Gates et al., 2012; Gates et al., 2016), laboring (Gates et al., 2011; Gates et al., 2012; Gates et al., 2016; Potter et al., 2011), costs associated with serving FVs (Potter et al., 2011), and type of FVs served (Gates et al., 2012; Skinner et al., 2012). For instance, apples, bananas and oranges were most frequently served because they are affordable. Also, "whole" instead of "chopped" fruit was served to reduce waste, increase shelf-life and reduce costs associated with chopping FVs. Thus, if steps are taken to improve the variety and presentation of FVs, additional financial resources are therefore required to make school facilities adequate to store, prepare and serve FVs in a safe and appealing manner.

Children's dietary practices are a function of varied environments (i.e. cultural and familial influences, and school and community involvement). This is consistent with both the socio-ecological model (Davison & Birch, 2001) and Social Cognitive Theory (SCT) (Bandura, 2004) in which even if individuals (e.g., children) are committed to behavior change, they still encounter factors (e.g., barriers, facilitators) posed by the physical environment that could ultimately influence their behaviour change. For example, children's consumption at home was positively associated with their parents' consumption (Ovrum & Bere, 2014; Rasmussen et al., 2006) because parents' food preference and knowledge affect the availability and accessibility of FVs at home (Patrick & Nicklas, 2005). Although several studies attempted to engage parents (Bere et al., 2006a; Jorgensen et al., 2016; Te Velde et al., 2008), there was likely to be a proportion of children in disadvantaged areas whose parents would not provide FVs because of lack of awareness, high cost, limited access or resources (Gates et al., 2011; Gates et al., 2012;

Hector et al., 2017; Jorgensen et al., 2016; Skinner et al., 2012), social-cultural beliefs (Hayes et al., 2019; Muellmann et al., 2017), language barriers (Wind et al., 2008), socio-economic status (Jorgensen et al., 2016; Wind et al., 2008), and lack of time (Jorgensen et al., 2016). As parental influence is regarded an essential for children dietary behaviour change, future interventions should explore the potential of incorporating parental components into the existing school structure and system by identifying effective mechanisms to reach parents (e.g., family tasting events, nutrition-related homework activities, cooking workshops, newsletters) to overcome barriers for parental involvement and ultimately intervention's overall success.

Additionally, children's consumption of FVs was also associated with the availability and accessibility of FVs at the community-level. For example, children reported being motivated to eat healthier, however, the nutrition environment in remote, isolated, northern communities was not conductive to behavior change (Gates et al., 2011; Gates et al., 2012; Gates et al., 2016; Skinner et al., 2012). Therefore, coordinated efforts are required from all stakeholders including parents and families, educators, community leaders and government to work in concert to provide all children, particularly nutritionally-vulnerable children with an opportunity to consume healthy foods at schools, independent of independent of family income (Riediger, Shooshtari, & Moghadasian, 2007). Furthermore, support for policies to overcome food inequities should be the focus of future initiatives as a positive association between policies aimed at improving the food environment in schools and outcomes such as decreased consumption of unhealthful snacks (Asada, Chriqui, Chavez, Odoms-Young, & Handler, 2016). For example, literature showed that when the political party supporting the School Fruit Scheme (SFS) in Norway was in power, the program was passed as a policy/law and was therefore implemented in all Norwegian schools. However, when the political power shifted in parliament,

funding was ended and the law was abolished (Muellmann et al., 2017). In addition, the majority of stakeholders had the authority to make decisions with regards to policy adoptions which made it difficult to reach consensus (Muellmann et al., 2017). This indicates the necessity of all stakeholders who are involved in the funding and organization of the program to work together and in concert, as programs are more likely to be effective and sustainable when designed and implemented in partnerships and with the provision for on-going funds.

This systematic review has several strengths. First, a rigorous and comprehensive search strategy of a wide range of bibliographic databases was utilized. Second, the use of a broadly defined process evaluation served the exploratory goal of this review, in which we aimed at inclusion rather than exclusion. This review also has some limitations. First, there is a possibility that some studies were missed because the term "process evaluation" was not considered a MeSH term. Second, gray literature was not included; a rigorous search of gray literature might have provided additional evidence. In addition, only studies written or translated in English were included in this review and there is a chance that, by doing this, a number of relevant studies, written in other languages, were left out.

5. Conclusion

Evidence from process evaluations can help us understand whether changes in FVs consumption are due to the interventions, or the ways in which the interventions are implemented. Future research should not only examine intervention effectiveness, but should consider factors such as sustainability, cost-effectiveness, and the implementation process. Also, accounting for the social, physical, economic, and political settings in which the intervention is embedded can shed light on potential contextual factors affecting implementation, and consequently the sustainability of the program. This review offers researchers, child educators,

and policymakers' valuable recommendations on how to implement snack-based FV distribution interventions in schools for improving children's overall health and well-being**.**

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Chapter 3 : "Process evaluation of the Centrally Procured School Food Program in Ontario, Canada: Perspectives of OSNP personnel and food providers"

1. Introduction

Health Canada recommends that children aged 9-13 years consume 6-12 servings of fruits and vegetables (FVs) for nutritional adequacy and health (Health Canada, 2007; Rolls, Ello-Martin, & Carlton Tohill, 2004; Taylor, Evers, & McKenna, 2005). Despite this, recent reports indicate that 94% of children aged 12 and older are not meeting these recommendations and that consumption levels have remained unchanged or have slightly declined over the past several years (Colapinto, Graham, & St-Pierre, 2018; Minaker & Hammond, 2016). Given that dietary habits established in early life tend to be maintained into adulthood, this low FVs intake in children is concerning (Dennison, Rockwell, & Baker, 1998; Krebs-Smith et al., 1995). Although many settings have been used to implement programs to increase FVs consumption in children, schools represent an ideal setting for successful interventions. Not only do children spend a significant amount of time in school, but schools are also committed to supporting children's development and success through education and learning (Baxter et al., 1997; de Sa & Lock, 2008; Knai, Pomerleau, Lock, & McKee, 2006; Wechsler, Devereaux, Davis, & Collins, 2000).

Universal provision of free FVs in schools has resulted in increased FVs consumption in children. School snack programs, such as the Fresh Fruit and Vegetable Program in the USA (Coyle et al., 2009; Olsho et al., 2015), and the European School Fruit Scheme in Norway (Bere, Veierod, Bjelland, & Klepp, 2006b), Italy (Roccaldo, Censi, D'Addezio, Berni Canani, & Gennaro, 2017), and Britain (Horne et al., 2004; White, 2006; Yeo & Edwards, 2006), have demonstrated positive results, with most reporting improvements in FVs intake. Common amongst these programs, however, is the fact that they are often part of a national, government-

funded program, and have existing infrastructures such as food service operations and paid staff in schools to support them.

Despite the benefits of these programs, Canada currently does not have a national school food program. At the provincial level, school food programs use a variety of approaches based on individual school capacities, often relying on staff and caregivers to volunteer their time to plan, procure, purchase, prepare, and serve food items (Ontario Student Nutrition Program [OSNP], 2018). This poses many challenges and potential risks, including concerns with food safety (e.g., maintenance of cold chains from purchase to school) and reduced reach as limited funds reduce purchasing power and can often result in foods that do not adhere to nutritional guidelines (Valaitis, Hanning, & Herrmann, 2014).

In 2017, the Centrally Procured School Food Program (CPSFP) was implemented in partnership with the Ministry of Children and Youth Services (MCYS), the Ontario Student Nutrition Program Southwestern Region (OSNP), and 30 local schools in three Southwestern Ontario communities. The purpose of the CPSFP was twofold: 1) to increase the intake of healthy foods (with an emphasis on FVs) in elementary school-aged children; and 2) to address the challenges experienced by existing programs around food procurement and delivery.

While many studies have examined the implementation of snack programs at the school level (Aarestrup et al., 2014; Bai, Feldman, Wunderlich, & Aletras, 2011; Bouck et al., 2011; Coyle et al., 2009; Hector, Edwards, Gale, & Ryan, 2017; Potter et al., 2011; Reinaerts, De Nooijer, & De Vries, 2007), few have examined the logistics and feasibility of procurement-based interventions (Aarestrup et al., 2014; Bouck et al., 2011). Therefore, a process evaluation of the CPSFP was undertaken to explore the perspectives of program implementation from non-school-level stakeholders who were involved in the planning, coordination, and oversight of the

program, as well as those involved in the production, procurement, and distribution of foods to schools.

2. Methods

2.1 Overview of the CPSFP intervention

The CPSFP is part of a larger study that involved 60 elementary schools: 30 received the CPSFP (the intervention) and 30 served as controls (traditional program). Schools that had previous experience running a school food program and had the capacity to serve a snack 3-5 days a week were eligible for the intervention. Schools were included from different geographic locations, including rural and urban areas, and ranged in size from approximately 200 to 700 students in full-day kindergarten (FDK) through Grade 8. The CPSFP was implemented in three, 10-week phases: Phase I-Winter 2017 (*PhI*), Phase II-Fall 2018 (*PhII*), and Phase III- Winter 2018 (*PhIII*).

The CPSFP consisted of two components: 1) *Free, universal provision and delivery of food to schools:* With a particular emphasis on FVs, food was provided and delivered to each school based on a pre-set menu designed by the OSNP to meet their goals of providing a variety of foods that were also in line with serving sizes in Canada's Food Guide to Healthy Eating (Health Canada, 2007); and 2) *Nutrition promotion materials:* Two guides, provided to schools during the second and third phases of the CPSFP, aimed to improve aspects of food literacy in both snack personnel (*Farm to School Recipe Guide*) and Grade 4-8 children (*Tasty Ontario Tuesday Guide*), and showcase local farmers.

2.2 Overview of CPSFP process evaluation

2.2.1 Recruitment

Near the end of Phase I of CPSFP implementation, researchers contacted the Food and Logistic Coordinator of the CPSFP via email to obtain a list of potential participants. These participants were non-school personnel and included OSNP personnel (OSNPs; e.g., Regional Directors [RDs], Food and Logistic Coordinators [FLCs], and Community Development Coordinators [CDCs]), as well as Food Providers [FPs; e.g., farmers, suppliers, distributors]). RDs provide leadership and support to FLCs and CDCs, liaise with funders, build partnerships between school boards and public health units, and collaborate with program leads across lead agencies to share information about effectives practices. FLCs facilitate efficient sourcing, purchasing, storage, and distribution of foods; support CDCs; track equipment needs; and work collaboratively with FLCs across Ontario to share information and leverage partnership opportunities. CDCs assess program adherence, build capacity in schools, share knowledge and effective practices with program volunteers, support fundraising activities, and build partnerships with other local, regional, and provincial CDCs across the province (Ontario Student Nutrition Program [OSNP], 2018). Of these participants, those with an email address were sent the study's Letter of Information (LOI) and asked to contact research personnel if they were interested in participating. An interview time was then arranged. Following Phase II and III, previous participants were contacted again via email to determine their interest in completing a follow-up interview to discuss any changes in the CPSFP throughout each phase of implementation. Additional potential participants were identified throughout this process by snowball sampling and contacted as described above. Given the participatory nature of this project, any participant

who expressed interest in the study was interviewed. Participant verbal consent was acquired at the beginning of each interview.

2.2.2 Data Collection Methods

The overall goal of this evaluation was to explore participants' experiences with and perceptions about the program, to gain an in-depth understanding of the successes and challenges to implementation and obtain information to improve and sustain the CPSFP for the future. To achieve this, the evaluation was designed with process evaluation components in mind (e.g., reach, fidelity) (Linnan & Steckler, 2002).

Interviews were conducted over the phone in May/June (Phase I and III) and November/December (Phase II), ranging between 30-45 minutes. To maximize reliability and consistency, the same researcher facilitated all interviews. Two semi-structured interview guides were developed with different participants roles in mind (i.e., OSNPs or FPs). Following Phase I, revisions to the interview guides were made to more specifically target individual participants according to their role and to capture longitudinal changes over the course of program implementation. The interview guide for food providers is presented in Table 3. All interviews were audio recorded, transcribed verbatim by undergraduate student research assistants, and verified by the researcher who conducted the interviews to ensure accuracy.

Table 3: Interview guide for food providers

1. When thinking about school food nutrition programs (in general and specific to CPSFP), what are your overall goals?
2. What are your thoughts about how the implementation of the Centrally Procured School Program (CPSFP) has been going?
3. What have you liked (if anything) and why? What did you not like (if anything) and why?
4. What were your expectations for this phase? Have your expectations been met? Why/why not?
5. What are the challenges and successes you have experienced with this phase of the program? How were these different (or not) from previous phases?

6. What have been some of the positive impacts to you or to your organization (business) since partnering with OSNP to run the program during this phase?
7. What have been some of the negative impacts to you or to your organization (business) since partnering with the OSNP to run the program during this phase?
8. What lessons did you learn from this phase that were helpful with implementing future phases? Will you carry any of these lessons into your future implementation of such programs?
9. Is there anything else you would like to say about the program or the partnership with the OSNP or to the research team?

2.2.3 Data Analysis

Data were then analyzed using an inductive content analysis described by Braun and Clarke (2006). To increase reliability, transcripts were independently coded by three researchers, two of whom have experience with qualitative research methods and analysis. The research team then met to discuss their findings. Any issues that arose during this initial analysis were resolved through discussion and consensus until a common template was developed. To enhance the trustworthiness of the data, a few strategies were used. Member checking was conducted during all interviews to confirm participants' perspectives. After the first few interviews, debriefing discussions among the researchers helped to confirm the validity of the data being collected. An audit trail was also kept as documentation of decisions made during the analytical processes. Finally, credibility was enhanced through the triangulation of data sources (e.g., a breadth of perspectives from a variety of non-school stakeholders), and the use of a team approach to data analysis (Merriam, 2009; Patton, 1990).

3. Results

Of the 12 participants invited for interviews, all agreed to participate in the study (100% response rate). In total, 20 interviews, ranging between 30 and 45 minutes in length, were conducted over the three phases of intervention: Phase 1 (5 interviews: 4 OSNP, 1 FP), Phase II (7 interviews: 6 OSNP, 1 FP), and Phase III (8 interviews: 4 OSNP, 4 FP). Two participants

were interviewed over all phases (2 OSNP), 4 were interviewed over 2 phases (3 OSNP, 1 FP), and 6 were interviewed once (2 OSNP, 4 FP). While the intent of this evaluation was to get a longitudinal understanding over all phases of the CPSFP, not all participants could be interviewed in all phases due to unforeseen circumstances (e.g., scheduling issues, time constraints, no interest, or a change in position).

Data analysis revealed three main themes: 1) vision for the CPSFP; 2) successes and challenges to program implementation; and 3) requirements and opportunities for future program implementation. Representative quotes are identified by participant and phase (e.g., OSNP2_Ph I; FP3_Ph III).

3.1 Vision for the CPSFP

When asked their thoughts about the new CPFSP, or school food programs in general, all participants expressed that they provide children with universal access to safe and healthy foods. Most participants also believed that these programs supported children in making healthy dietary choices (that may carry forward into adulthood) and promoted healthy child development and student success.

> *The overall goal would be to ensure that students have access to healthy food at school in a non-judgmental, universal non-stigmatizing way (OSNP4_ Ph I)*

> *The goals are to support healthy child development and also academic success, students' success (OSNP7_ Ph II)*

> *We're dealing with the younger generation and encouraging them to make better eating choices. Those younger folks grow up into adults and will continue those choices hopefully for them and their family (FP3_Ph III)*

Most participants also commented that universal programs leveraged a variety of higher quality food items at a better price and allowed increased purchases of local foods. In addition, most FPs highlighted opportunities for the program to support the building of valuable

partnerships and connections with the community. This was especially important for food producers who wanted to grow and diversify their business in an increasingly competitive global market.

> *For our local food to be sustainable, we need to build valuable connections in our community. I think the program is an important step in that direction. A lot of produce is globally traded so it's hard for us to compete on a global scale but I think there is value in local food and I think this program is great start for us to kind of work on that (FP4_Ph III)*

3.2 Successes and Challenges to Program Implementation

All participants viewed the program as successful in some way. From an impact perspective, most participants commented on the excitement that the program generated within schools, with children often excitedly asking delivery personnel what foods were being provided each week. OSNP personnel stated that the introduction of food literacy components in Phase II enhanced the CPSFP by promoting the program, reinforcing healthy eating messages, increasing local farmers' profiles, and/or encouraging school personnel to enhance children's' learning by accessing interactive activities during instructional time.

> *Successes are just the happiness of the children. A lot of the program coordinators tell me that the kids are like, "Oh what are we going to get next?" The kids are getting through the day and they're excited about the foods and trying new things (OSNP5_ Ph II)*

From a logistical perspective, all participants stated that the CPSFP was successful at addressing some of the planning, procurement, and delivery concerns of traditional programming; however, additional challenges were identified. For example, one OSNP personnel noted:

> *…Schools have limited manpower as far as having a designated shopper each week. Several of our schools have over 600 students. For those schools to ensure that they*

> *could go to their local grocer and get the volumes they needed each week was very hard. So the central procurement model was very beneficial in that sense (OSNP1_PhI)*

Another participant added:

> *Under central procurement, we are hoping to leverage better pricing with economies to scale, to add better quality standards around the nutritional value of food served, and [we] wanted to focus on looking at opportunities to purchase more local food. Finally, we wanted to purchase a greater variety of produce to expose children to see preference shift in their likability and their overall consumption (OSNP7_ Ph II)*

While most OSNP participants deemed the design and use of the pre-set menu as successful on many levels, including alleviating the burden on volunteers to plan menus that met nutritional guidelines, for those who had direct school contact, there was some initial confusion over the flexibility and creativity of the menu. Some commented that the lack of variety and school input into students' preferences in the early versions of the menu led to pairings of food items that were undesirable (e.g., celery and melba toast) and may have contributed to increased waste. This improved throughout implementation.

> *I think there was some confusion as far as flexibility with the menu because it took some time before schools realized they could transfer food items around during the course of a week based on their manpower. After being in contact with them and discussing that, they did show a little more flexibility and creativity (OSNP1_ Ph I)*

Another success of the pre-set menu mentioned by all participants was that it helped with food procurement, specifically to predict food volumes and increase opportunities to incorporate more local foods. Not only did this improve the reach of the program (i.e. greater number of student participation), but all participants also observed an improvement in the purchasing power of the CPSFP. FPs involved in-group purchasing noted the synergies between their existing customer base (e.g., health care) and the CPSFP with respect to food volume, noting that the inclusion of the CPSFP benefitted all customers mutually, as more items could be purchased at

better prices because of higher and committed volumes. Furthermore, it was mentioned that the diversity of available food items for all customers increased due to the CPSFP's pre-set menu and requested food items.

> *We can forecast those numbers, because it is a preset menu. So it's easier to source from those Ontario producers (OSNP6_PhII)*

> *It has added volume to our pile [healthcare customers], which helps with pricing for everyone and this student nutrition volume boosts that pile. There's a lot of similarities between health care food items and students' nutrition food items, so there's been some real benefit to everyone (FP2_Ph II)*

Despite its success, food volume and type did pose some challenges at the school level. All OSNP personnel commented that food volumes and types might have unintentionally placed additional burdens on school staff and volunteers with respect to food handling and preparation. Most OSNP personnel mentioned that the amount of food initially received by schools was overwhelming, as it tended to be in excess of their typical purchasing volume. A few participants commented that this excess volume led to food waste, primarily due to limited volunteer/staff time to prepare items, but also due to infrastructure limitations. OSNP personnel mentioned that some schools lacked the appropriate storage facilities (e.g., refrigerators, freezers), preparation space, and utensils to prepare and serve certain food items, and/or that the funding was inadequate to acquire these resources to fully implement the program.

> *I think that some of the schools were a little bit overwhelmed with how much food comes because when they shop, they're not used to getting that much (OSNP5_ Ph III)*

> *I know some of the schools have an issue just with sheer storage of where to put it all (FP1_ Ph III)*

All participants stated that the CPSFP's procurement and delivery practices alleviated concerns over food safety and supported the maintenance of cold chains. The following quote aptly captured this theme:

> *It preserves the food chain…I'd hate to have someone get sick because they had the yogurt in the trunk. It makes me feel good that the food that gets to students have maintained their cold chains from produced to consumed and I know that these kids are getting safe, good food at a good price (FP2_PhII)*

With respect to delivery, most participants noted the alleviation of burden on school staff and volunteers to purchase and transport foods from supermarket to school. A few participants mentioned minor challenges. This included inconsistent delivery times to schools (which challenged volunteer capacity to receive and store items) and insufficient lead time or past information to secure and forecast food volumes. Some participants mentioned a few instances of inconsistencies in food quality (e.g., under-ripe produce, spoilage), food volumes (e.g., less than one serving per student), and/or last-minute food item substitutions.

3.3 Requirements and Opportunities for Future Program Implementation

All participants stated that there was a continuous improvement in the CPSFP across all phases of implementation, particularly with respect to communication and procurement practices. Many lessons were learned and, from these, participants made several suggestions to enhance and improve the program in the future. One aspect of implementation deemed invaluable by all participants was the presence of dedicated, paid OSNP staff. From a procurement perspective, food distributors valued the role of the FLCs to provide timely communication about volume forecasting and food item needs, including problem-solving when menu items were unavailable. FPs also appreciated this role, as it alleviated the strain placed on them to coordinate and deliver produce from their individual farms to schools. All participants commented that this position provided an opportunity for program growth that would benefit

everyone. With dedicated staff, they believed that more schools could be recruited to participate in the program, which in turn would expand reach and further increase economies of scale for all their customers. While FPs shared this perspective (i.e. that it would increase their business), they also stated that this would improve their profile in the community:

> *…What I liked most about the program is [FLCs] takes care of all the logistics. We work with some schools, just more one-on-one, and sometimes it's very difficult to coordinate all the logistics. It was nice to have that taken care of. It was really simple and especially when farmers are really busy, it can't be too much work for them, otherwise they're not going to be able to participate (FP4_Ph III)*

> *Working with [Food and Logistic Coordinator] felt pretty well organized. We were given volume well in advance so we could prepare for pickup and it worked out really good (FP4_Ph III)*

In addition to expanding the number the schools involved in the CPSFP, all participants recognized the importance of continued and enhanced engagement of existing stakeholders, with opportunities to explore new partnerships. Most participants noted the importance of conducting a situational assessment in schools prior to program implementation to aid in the planning of the menu. This would allow individual schools to provide some input into the menu to ensure that their students' food preferences and their school's resource capacities were taken into consideration. This included ensuring that weekly menus included both high and low preparation food items (e.g., whole pineapples vs. apples) as well as dry goods and perishable items to accommodate each school's volunteer and storage capacities.

> *The quantity of food we're providing, just how better to efficiently meet the needs of what the school would use versus just delivering what we expect them to use (OSNP 4_Ph II)*

> *They would like to have more choice. There are certain products that they just feel that their students don't like and therefore they would like to not have those products (OSNP7_ Ph II)*

> *A lot of schools don't have those resources [e.g., blenders for smoothies] so I think it's just trying to find a way that we can get those resources to them or help them to get them so that they can offer the program to the full scale (OSNP5_ Ph II)*

A few OSNP personnel also mentioned the potential for exploring new partnerships with local post-secondary institutions to expand their volunteer base and alleviate pressures for school personnel to locate program volunteers. Finally, a few OSNP personnel mentioned expanding their distributor pool to avoid any unforeseen changes in contracts (e.g., changes in fee structure) and to maximize customer service contracts.

> *I think there's an opportunity to strengthen our relationship with [local university and college] food service programs because the lack of capacity has a huge impact on the quality of the program; sustaining these partnerships would be really helpful (OSNP7__ Ph III)*

> *Working with multiple vendors so that we don't get in that situation where we're really dependent on one vendor (OSNP7_ Ph III)*

All participants mentioned the potential for greater engagement and learning by children and program volunteers as one enhancement to the program. These participants commented that not only could children's food literacy be further enhanced by including more opportunities for involvement in the program and more resources for classroom activities, but program volunteers' food literacy could also be improved by providing best practice guidelines and more support during initial program implementation. A few OSNP personnel who had direct contact with school-level program volunteers commented that, while communication and practices improved over the course of implementation, volunteers still requested additional resources to effectively implement the program. This included strategies to use leftovers, suggestions on different delivery models to classrooms (e.g., bins/ad hoc distribution and/or pre-prepped snack distribution at specified times), instructions for appropriate serving sizes for different grade

levels, guidance on how to prepare certain food items, and creative recipe ideas to keep snacks interesting for students.

> *We were surprised at the level of positive feedback to the food literacy guide…the reality is that some of our school partners view the program as simply a feeding program and so the more that we hear about the guide the more that they started to be really aware of the value of using this program as a health promotion tool (OSNP7_ Ph II)*

> *It's kind of enriching their learning. I know a lot of the schools have kind of gone off into other directions incorporating some of that stuff into some of their science lessons days (FP1_Ph I)*

> *Our role is around delivering the food to the school and once it gets to the school there's a lot that can be done under that best practice framework that would really enhance the quality of outcomes (OSNP7_ Ph III)*

Finally, all participants recognized the importance of committed, continuous, and flexible funding for the sustainability of the CPSFP. Participants highlighted that costing of food is often variable and associated with seasonality, which can lead to changes in forecasting and availability of items. Because the CPSFP did not address the current funding restrictions imposed by the Ministry of Children and Youth Services (MYCS) (e.g., cannot support infrastructure or be used to purchase serving utensils), some participants mentioned the importance of having flexibility to support infrastructure needs to ensure that safe food handling practices are maintained.

> *Funding obviously. Funding with the freedom to look for the best value is required. With donations, there's a requirement to spend it within the store that donates it and that does not allow for aggregated volumes and contracting product when you're dealing with gift cards (FP2_ Ph III)*

> *We struggle to understand how we articulate the price, because what the school wants to see is what's the price per unit per student and that gets a little bit confusing with the production and the serving sizes. Moving forward as we go to scale, schools want to know, and our community partners want to know, well what is the cost of it… present the cost in a way that's clear and easy to understand (OSNP7_ Ph III)*

> *I know that every school is different so some schools have storage and some don't. Some have a lot more fridge and freezer space… a school has to apply for infrastructure and there's minimal funding that goes towards that… so I would hope that with this project there would be some extra funding for that (OSNP2_Ph I)*

4. Discussion

This study highlighted a diversity of perspectives from participants involved in the planning, procurement, and distribution of foods in the CPSFP. Although some challenges were identified, these tended to be either rectified or improved over program implementation. Thus, most participants focused their comments on the numerous benefits and strengths of the program, with opportunities to expand and improve it in the future.

One key aspect mentioned by all participants was the collective benefits experienced by being involved in the CPSFP. Participants entered the partnership with the CPSFP as a community engagement opportunity with the goal to support and build healthy eating habits in school-aged children, while simultaneously enhancing their businesses. From food producers' perspectives, more product was sold, with a diversified consumer base to help support them in an increasingly competitive global market. From a food procurer/distributor perspective, the CPSFP was an opportunity to not only grow their business, but also to improve economies of scale, a perspective shared by OSNP personnel. Although the primary intention of the program from an OSNP perspective was to address current challenges in traditional, ad-hoc school snack programming, including food safety and nutritional guidelines, OSNP personnel also saw the program as a way to extend their existing public funding to increase the reach of the program and to ensure that greater quality, quantity, and variety of foods were offered to children. This, in turn, benefitted the consumer base of FPs, in that synergies between different customers (e.g., health care) allowed everyone access to previously unavailable food options. Taken together, the

addition of the CPSFP not only improved economies of scale for a publicly-funded school snack program, but for health care as well, which ultimately increased the affordability of highly-perishable FVs or specialty food items (and stretched limited tax dollars).

Previous farm-to-school programs have found that the primary motivations for farmers to participate in these programs included enhancing economic incentives (e.g., diversifying their marketing strategies) (Izumi, Wynne Wright, & Hamm, 2010; Joshi, Azuma, & Feenstra, 2008), fostering healthy eating habits among children (Izumi, Wynne Wright, & Hamm, 2010; Joshi, Azuma, & Feenstra, 2008), supporting the local economy (Izumi, Wynne Wright, & Hamm, 2010; Joshi, Azuma, & Feenstra, 2008), and solidifying good public relations (Gregoire & Strohbehn, 2002; Izumi, Rostant, Moss, & Hamm, 2006). While this was true for the current study's participants, they were also motivated by their desire to increase awareness about their produce and farms, and to make connections with their community. Although Canadians place high trust in farmers, 91% know little about farming or the challenges farmers face (The Canadian Center for Food Integrity, 2019). Therefore, school snack programs present another avenue to raise public awareness of the value of farming and agricultural practices.

Improving the public and children's food literacy was a common theme mentioned by participants. For children, although some materials were introduced during the latter phases of program implementation, most participants felt that CPSFP could offer more opportunities for learning. For example, many wanted a greater link to classroom curriculum and/or classroom enhancement activities, and more opportunities for greater children involvement in snack preparation. The increasing focus on food literacy development in children stems not only from its influence on eating habits (Libman, 2007; Triador, Farmer, Maximova, Willows, & Kootenay, 2015), but also in its ability to build resilience (Azevedo Perry et al., 2017). Food literacy goes

beyond an understanding of nutrition and cooking into a greater understanding of the complexities of food and its interaction with health and the environment (Vidgen & Gallegos, 2014). By incorporating the CSPFP into school curriculum, concerns regarding time away from other lessons could be avoided, as was identified by school personnel and/or volunteers (*Ismail, Gilliland, Matthews, & Battram, unpublished work*).

Although the CPSFP alleviated burdens on snack volunteers to plan and procure food items for their schools, unintended consequences emerged from the volume and type of food provided. OSNP personnel stated that snack volunteers were overwhelmed and, at times, struggled with preparing and storing certain menu items. All participants agreed that, moving forward, a situational assessment and development of best practice guidelines could help to alleviate some of these issues. A situational assessment is an invaluable tool for any program implementation as it not only allows potential challenges to be circumvented, but it also promotes a sense of agency among stakeholders (Ontario Agency of Public Health and Protoction, 2015). For example, previous process evaluations conducted on similar initiatives have indicated that support for their programs would have been enhanced if school personnel had been more involved in the planning stages (Bouck et al., 2011; Clarke, Ruxton, Hetherington, O'Neil, & McMillan, 2009; Jorgensen et al., 2014).

To ensure the CPSFP's feasibility, fidelity, and sustainability, participants identified committed and flexible funding as a necessary aspect. Maintenance of the current funding model would continue to support the personnel deemed invaluable to program implementation and would ensure that current food procurement and delivery practices were maintained (e.g., maintenance of food safety standards, alleviation of volunteer burden). Furthermore, the current funding model would make a variety of high-quality food items – including local, seasonal, fresh

produce – to be more readily available. Enhanced and flexible funding to support infrastructure, and possibly human resource needs, were also deemed necessary to ensure that food safety standards and program fidelity are maximized. Adequate and committed funding to support food costs, infrastructure, and human resource needs have been identified in previous process evaluations of school food programs as a necessary component to the success and sustainability of such programs (Bouck et al., 2011; Gates, Hanning, Gates, Stephen, & Tsuji, 2016).

There are a few strengths and limitations of this study. Including participants with diverse roles in the program was a major strength as it enabled a broad perspective of program implementation from procurement to distribution. Further, credibility of the data was enhanced through the use of three researchers during data analysis. One potential limitation was that, this study was designed to evaluate the CPSFP and thereby may not be transferable to other school snack program models.

5. Conclusion

Diverse participants offered a variety of in-depth insights into the planning, procurement, and delivery aspects of the CPSFP. Inevitably, some challenges were experienced; however, participants collectively highlighted many broad successes of the program. Although partnerships were built to support healthy eating in children, the inclusion of the CPSFP in the local community's food system had a greater holistic return on investment. OSNP personnel increased the reach of their existing nutrition programming, while maintaining food safety and nutrition standards. Distributors identified synergies in food procurement between school food nutrition and their existing customers (e.g., health care), which not only increased purchasing power for all publicly-funded customers, but it also increased the variety of nutritious products available. The CPSFP provided food producers with an opportunity to diversify their businesses,

while educating the community (e.g., children, parents, and schools) about their products and practices, and promoting support for local foods. Taken together, the CPSFP presents a promising implementation model for school snack programs that is feasible and sustainable and that also can benefit the local food system.

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Chapter 4 : "Process evaluation of the Centrally Procured School Food Program in Ontario, Canada: School-level perspectives"

1. Introduction

Despite the well-documented health benefits of consuming fruits and vegetables (FVs), children's intakes are below recommended levels. Results from the 2004 Canadian Community Health Survey (CCHS) indicated that the majority of children and youth in Canada did not consume the recommended minimum number of FVs servings based on age and sex (Garriguet, 2007), with more recent studies showing no improvement or a slight decline in intake within this population (Colapinto et al., 2018; Minaker & Hammond, 2016). These findings are disconcerting as eating habits established early in life can affect consumption of FVs, and poorer diet-related health outcomes, in adulthood (Dennison et al., 1998; Kelder,Perry, Klepp, & Lytle, 1994; Krebs-Smith et al., 1995; Minaker & Hammond, 2016). FVs are important components of a healthy diet, and their inadequate consumption is associated with poorer diet quality and nutritional inadequacy (Rolls et al., 2004; Taylor et al., 2005), as well as the development of obesity, cardiovascular diseases, and cancer (World Health Organization [WHO], 2003).

The importance of availability and accessibility of FVs as significant predictors of children's FVs intake has been well demonstrated in the literature (Blanchette & Brug, 2005; Knai et al., 2006; Rasmussen et al., 2006). School snack programs that offer free FVs to children have shown promising results on children's intake both in Canada (Bouck et al., 2011; Gates et al., 2011; Gates et al., 2012; Skinner et al., 2012) and internationally (Bere, Veierod, & Klepp, 2005; Reinaerts, De Nooijer, & De Vries, 2007; Te Velde et al., 2008; Yeo & Edwards, 2006). Although school snack programs have been implemented in Canada, little is known about the successful implementation practices and processes of these diverse, largely volunteer-led

programs, and no national food program exists. Furthermore, while it is widely accepted that process evaluations serve an important role in understanding whether an intervention was performed as intended, and under which conditions and contexts interventions are successful (Linnan & Steckler, 2002; Oakley et al., 2006), few have been conducted for school-based snack programs (Bere, Veierod, Bjelland, & Klepp, 2006b; Wind et al., 2008).

In 2017, a new Centrally Procured School Food Program (CPSFP) was undertaken in partnership with the Ministry of Children and Youth Services (MCYS), the Ontario Student Nutrition Program (OSNP) of Southwestern Ontario, and 30 local schools in three Southwestern Ontario communities. The primary mandate of the CPSFP was to increase the intake of healthy foods in elementary school-aged children, with an emphasis on FVs, and to improve program feasibility and fidelity. The aim of this study was to conduct a process evaluation of the novel CPSFP to gain a better understanding of program implementation from the perspectives of school-level stakeholders.

2. Methods

2.1 Overview of the CPSFP intervention

The CPSFP is part of a larger study that involved 60 elementary schools from two local school boards. Of these 60 schools, 30 received the CPSFP, while the remaining 30 served as controls. To be eligible to receive the CPSFP, schools were required to serve a snack 3-5 days a week and to have had previous experience running a school food program. Schools ranged in size from approximately 200 to 700 students in full-day kindergarten (FDK) through Grade 8 (ages 4 to 14 years) and included schools in different geographical locations (urban and rural) to capture a range of economic status and ethnic diversity. The CPSFP was implemented in three,

10-week phases: Phase I-Winter 2017 (*PhI*), Phase II-Fall 2018 (*PhII*), and Phase III-Winter 2018 (*PhIII*).

The CPSFP consisted of two components: 1) *Free, universal food provision and delivery:* Based on a pre-set menu developed by the OSNP, the program provided and delivered food to each school on a weekly basis. The menu was designed to meet OSNP nutritional guidelines of providing each child a snack containing a serving of FVs and at least one additional food group item based on Canada's Food Guide to Healthy Eating (CFGHE) (Health Canada, 2007), and to promote locally-produced foods whenever possible. 2) *Nutrition promotion materials:* Two information guides were provided to schools during the second and third phases of the CPSFP. The *Farm to School Recipe Guide* was provided to snack preparation personnel with creative recipe ideas and information about food items. The *Tasty Ontario Tuesday Guide* was given to each student in Grades 4-8, to take home and provided information, activities, and recipes about different FVs, while also showcasing local farmers (not included in this evaluation).

2.2 Overview of the CPSFP process evaluation

From the 30 intervention schools in the larger study, seven were invited based on their willingness. Schools were selected to represent different geographic regions and school size rather than to be representative of all schools that received the program.

2.2.1 Recruitment

All school personnel (e.g., Teachers [T], Educational assistants [EA], Principals [P], Vice-Principals [VP], Volunteers [V], Early Childhood Educators [ECE], and other school staff [S]) were invited to participate in the study. Participant recruitment occurred primarily by placing a recruitment flyer and Letter of Information (LOI) in the staff lounge. Principals also made recruitment announcements in staff meetings and on the day scheduled for interviews.

Given the participatory nature of this project, any participant who expressed interest in the study were interviewed. Participant written consent was acquired at the beginning of each interview.

2.2.2 Data Collection Methods

Although process evaluation components (e.g., reach, fidelity) (Linnan & Steckler, 2002) were considered during the study design, the focus was to get a detailed description of those factors that contributed both to the successes and challenges associated with program implementation, while also obtaining information to improve and sustain the program (Bouck et al., 2011). Furthermore, to explore participants experiences and perceptions about the implementation of the CPSFP, a mixed-methods study design was employed.

Qualitative data were obtained through interviews, and field notes from on-site visits. Interviews and the focus group were conducted at the end of each intervention phase during school hours on dates determined in collaboration with the school principals. A semi-structured interview guide assessed the feasibility and acceptability of the program and was adapted to each participant's involvement with the CPSFP to allow role-specific concepts to be explored. The final interview guide is presented in Table 4. Field/site visits to every school were conducted by one researcher and involved observing and making notes on program implementation practices throughout each 10-week phase of the CPSFP.

Table 4: Interview guide for direct snack preparers

1.	What do you think about having a school food nutrition program in your school?
2.	Can you tell us your expectations for the program? Have your expectations been met? If so, how?
3.	Can you describe the challenges (if any) associated with the implementation of the program in your school?
4.	Can you describe what aspects of the program were successful and unsuccessful (if any) and why?
5.	Can you tell us what you liked most and least about the program and why?
6.	From your perspective, how is the program received by the students?
7.	From your perspective, how has the program impacted the students?
8.	Can you comment on the Farm-to-School Recipe guide?

9. Can you comment on whether or not parents are aware of your school snack program? And if so, how?
10. Have you received any feedback (e.g., from teachers, students, parents, or others) about the program? If so, what was it?
11. What changes or suggestions (if any) would you make moving forward?
12. Is there anything else you would like to say about the program?

Quantitative data were derived from a *general information form* and *weekly logbooks*. The *general information form* gathered data on general school and snack characteristics (e.g., number of students, program frequency) and was administered once at the beginning of the CPSFP. *Weekly logbooks* collected data on how the CPSFP was implemented and received; quality and freshness of foods provided; and usage of the Farm to School Recipe Guide. Logbook data were collected from participants directly involved in snack preparation.

2.2.3 Data Analysis

All interviews (except one) and the focus group were audio recorded, transcribed verbatim by student volunteers, and verified by one of the researchers. Detailed notes for the unrecorded interview were included with the transcripts for data analysis. Interviews and the focus group were analyzed using inductive content analysis (Auerbach & Silverstein, 2003; Braun & Clarke, 2006). To increase reliability, transcripts were independently coded by three researchers, two of whom had experience with qualitative research methods and analysis. Coding discrepancies were resolved through consensus until a common theme template was developed. Field note data were compiled and analyzed according to the theme template generated from the interviews.

Several strategies were employed to enhance the trustworthiness of the data. The semi-structured interview guide was employed to achieve reliability and consistency in data collection. Member checking was conducted during interviews to confirm participants' perspectives. An audit trail, including a reflexive journal, were kept as documentation of the decisions of the

analytical processes (Patton, 1990). Credibility was enhanced through triangulation of data sources (e.g., field notes, interviews, focus group, and logbooks), breadth of perspectives from a variety of school-level participants, and team data analysis (Merriam, 2009; Patton, 1990). For quantitative logbook data, response categories (e.g., yes/no, poor to excellent) were coded and descriptive statistics calculated for each dimension assessed using Microsoft Excel (Office 365, Microsoft Corp. CA. 2019).

3. Results

All seven invited schools agreed to participate in the process evaluation (see Table 5 for school characteristics). In total, 27 interviews (*26 in person; 1 via telephone*) and one group interview (*involving 6 participants*) were conducted. Interview participants (*n =33*) included representation from a variety of school roles: Teacher (*n=10*); Educational Assistant (*n=9*); Principal (*n=2*); Vice Principal (*n=4*); Early Childhood Educator (*n=2*); Volunteer (*n=3*); and Staff (*n=3*). In addition, 15 on-site visits were conducted. Schools were observed at least twice, 2-3 hours per visit, during the 10-week intervention phase. Also, seven general information sheets (one per school) and 57 out of a possible 70 weekly logbooks (81% response rate; range of 6-10 per school) were collected.

Table 5: School characteristics

School characteristics	**A**	**B**	**C**	**D**	**E**	**F**	**G**
Phase of implementation	I	II	II	III	III	III	III
Urbanicity	Urban	Rural	Rural	Urban	Urban	Rural	Rural
School enrollment	326	360	600	387	400	650	216
School schedule	TSD	BSD	BSD	TSD	BSD	BSD	BSD
Other food program	Milk program	Milk program		Breakfast program	Milk and Breakfast program		Milk program

I = Winter 2017; II = Fall 2018; and III = Winter 2018.
BSD = balanced school day (2, 40 minute lunch periods); TSD = traditional school day (2, 15 minute recesses and 1, 1 hour lunch period).

Supported by participant quotes and field notes, four themes (and multiple sub-themes) emerged from data analysis: 1) perceived value of the CPSFP, 2) successes of program implementation, 3) challenges of program implementation, and 4) suggestions for future programming. Results will conclude with a description of the perceived impact of the CPSFP. Representative quotes are presented in Table 6.

1) Perceived Value of CPSFP

School-level participants valued the CPSFP for a variety of reasons. Most participants noted the importance of the program to provide students with free, universal access to healthy foods in a non-stigmatizing way. Equally, participants stated that increasing the availability of and exposure to a variety of foods provided children with the opportunity to try foods that they might not otherwise have access to at home.

2) Successes of Program Implementation

i) *Appreciation for the CPSFP*: While there was an overall general appreciation for the program model, three aspects were identified as contributing most to its success.

Procurement and Delivery Model. All participants agreed that the program's efficiency was greatly enhanced because of the central procurement and delivery of foods directly to the schools. Most participants recognized that this alleviated issues related to food purchasing including securing a designated shopper, using personal time and vehicles to purchase food, planning menus that balanced meeting nutritional guidelines with school needs and resources, ensuring food safety (e.g., maintenance of cold chains), and price-matching food items to secure the needed volume.

Some participants also mentioned that the delivery of predetermined food items increased buying power. This not only improved the variety of foods offered, some of which were

previously cost-prohibitive but also increased the volume of food provided, thereby improving the reach of the program. This latter point was highlighted by one rural school during field visits that was limited to only one food outlet for food purchasing.

Pre-set Menu. Most participants appreciated the pre-set menu as it ensured that the food provided to children met nutritional guidelines. Most school personnel also mentioned that the menu improved the availability and quality of food choices offered to students and alleviated the burden and time commitment on program personnel to plan menus. Analysis of weekly logbooks revealed that 86% of respondents rated the quality of food delivered to their schools as good to excellent; however, 69% also reported at least some level of spoilage upon delivery (e.g., produce under- or over-ripened). Despite occasional spoilage, freshness and appearance of food was also rated favorably with 95% and 96% of respondents reporting a good to very good rating, respectively. Overall, the interviews revealed that many participants also liked the variety of foods provided to children, which was confirmed by weekly logbooks with 68% reporting that "lots" of variety was provided.

Reduction in Administrative Load. A few participants mentioned that they appreciated the reduction in the reporting requirements with the CPSFP, such as the submission of receipts and delays in reimbursement, reporting of food items purchased, and adherence to nutritional guidelines; all of which decreased burden on their already limited time.

ii) *Participation of the School Community*: Participants appreciated the involvement of all school personnel, volunteers, and OSNP staff. Participants emphasized the dedication of food preparers and school staff to the success of the program. Some participants also mentioned the importance of role modelling of school staff, particularly teachers, in promoting foods served.

Field observations in one Grade 7/8 classroom confirmed this: “if the teacher did not like the food, the whole class seemed less willing to try it” (field observation, *PhI*).

3) Challenges to Program Implementation

i) Volume and Type of Food: Several aspects regarding the volume and types of foods offered to schools highlighted, and in some cases imposed, challenges to the program’s success.

Limited Volunteer Capacity. The main challenge mentioned by most participants was that the amount of food preparation imposed additional time burdens on already-limited manpower. This necessitated using other staff to complete food preparation tasks. From general information forms, most schools had on average two volunteers, spending 30 minutes to 2 hours per day involved in the snack program, with all schools indicating that this was often inadequate (unpublished results).

This burden of food preparation was mainly attributed to too many high-preparation food items that required cutting into individual portions (e.g., pineapples, mangoes), and inconsistencies in items delivered. For example, items sometimes came as individual portions (e.g., cheese strings) and at other times required more preparation (e.g., large blocks of cheese).

Also mentioned by some participants, was that the additional food preparation stifled creativity in snack preparation as too much time was spent prepping foods to then invest in creating “interesting” snack ideas (e.g., deviled eggs or egg salad vs. hard boiled eggs).

***Limited Physical Resources*.** Another common challenge identified by participants was not only the lack of appropriate physical resources to prepare and store foods in an effective and safe manner (e.g., cutting knives/boards, adequate cold storage), but the lack of utensils for students to consume their snacks.

Wastage. Participants identified both food and non-food waste issues created by the volume and type of foods provided by the CPSFP. Several participants indicated that their schools received too much food. Participants noted that food orders were based on school enrollment and the provision of one serving per child [(based on Canada Food Guide Healthy Eating (CFGHE))]. Therefore, adjustment for younger children and student food preferences were not initially considered and sometimes led to increased spoilage and food waste. Also, since the menu was on a rotating cycle, food preparers felt that children sometimes became bored with some foods, which also contributed to increased leftovers (75% reported some leftover food at the end of the week), spoilage (50% reported at least some spoilage at the end of the week), and waste (93% reported 25% or less waste on a weekly basis). In response to increased food waste, participants identified creative strategies for dealing with excess produce, such as sending extra produce home, serving it on another day, donating it to food banks or a neighboring school, or allowing staff to take leftovers home.

Participants were also concerned about the additional non-food waste imposed by the program and the potential environmental impact this may have. Many participants commented on the number of utensils required to consume certain snacks (e.g., plastic spoons for yogurt). Some food preparers also raised concerns regarding some food items being delivered in styrofoam containers which can neither be recycled nor composted, challenging curricular messaging to students regarding recycling and the environment.

ii) Delivery and Distribution Issues: While inconsistent delivery times posed minor challenges to schools with respect to the handling of foods (e.g., timely storage), the most prominent issue was the inconsistent delivery to, and distribution of, food within the classroom. Teachers mentioned some disruptions to instructional time due to food being delivered at inappropriate

times, announcements to pick up/return snack bins from/to the servery, and/or the time required to serve and portion food for each child (e.g., yogurt from large tubs vs. individual containers). While teachers were encouraged to implement the program to best suit their classroom environment, some issues arose regarding how to distribute the snack (e.g., designated time vs. a "serve yourself" model). During field observation, an EA stated that "there is a definite correlation between teachers' mood and/or perception of the program from day to day that is not consistent from class to class. The children want the food, but unsure on routine and permission" (field observation, *PhI*).

For those classrooms that used a "serve yourself" model, issues regarding serving size and food safety were also mentioned. Some teachers found that some students would take too much food, thereby leaving none for their classmates, creating issues within the classroom. In terms of safe food handling practices, some food products (e.g., dairy) were left out at room temperature for long periods of time. This, in turn, affected perceived food quality and children's desire to consume certain foods, which led to increased waste.

iii) Communication Issues: Another challenge commented on by participants was the lack of timely and streamlined communication between different stakeholders. One of the most frequently mentioned was the lack of clear communication from the OSNP to schools regarding food volumes and types and the expected serving size per child. When in the field, one vice principal stated: "there was lots of confusion regarding what food was going to be delivered" (field observation, *PhII*).

Also of concern was the lack of understanding by school personnel regarding the expectations of the program. During field observation, one EA commented, "teachers think that this program is only for the needy kids and therefore perception should be changed" (field

observation, *PhI*). Although most participants noted that communication improved over the course of the program, most felt more was needed to effectively and efficiently improve program implementation.

4) Suggestions for Future Programming:

Participants commented on several important lessons that were learned throughout their experience with the CPSFP and identified two key suggestions on how to improve their snack programs in the future.

i) Capacity Development: Participants identified three ways to improve capacity in their schools to better support the implementation of the CPSFP.

Investment in School Resources. Most participants highlighted the need for more human, physical, financial, and educational resources. Support for more personnel was mentioned as a key need to ensure the continued feasibility and fidelity of the program. Funds to support needed physical infrastructure (e.g., refrigerator, adequate space) and associated supplies (e.g., utensils) was also a key priority mentioned by participants.

More educational resources (e.g., feasible and creative snack recipes, ideas for preparing or plating food, ideas for leftovers) were also wanted by some participants to improve their own food literacy to implement the program. This was confirmed by weekly logbooks, where all participants indicated they did not use the “Farm to School” Recipe guide provided, citing that the recipes were too complicated to implement and/or there was a lack of time to prepare them because of the existing burden of food preparation. Some participants also highlighted the importance of having best-practice implementation guidelines to improve the efficiency and effectiveness of the program (e.g., timing of food delivered, appropriate serving size per child).

Enhanced Input from Schools. Most participants highlighted the need to engage school staff in menu planning in order to personalize the menu to their school community's unique needs (e.g., food allergies) and culture. Participants felt that if they had some flexibility and input into choosing food menu items, they could order the appropriate volumes and types of food and consider the food preferences of their individual school communities. This, in turn, could further address issues discussed regarding waste, resources (including volunteer capacity), and class disruption.

Enhanced Communication. Many participants highlighted the need for streamlined communication between OSNP personnel and school staff. Participants mentioned the need for clear communication before program initiation to ensure that expectations are managed effectively. Participants also highlighted the need for more OSNP support (e.g., school visits), especially in the first few weeks of program initiation, to ensure timely correspondence when issues arose during program implementation.

ii) Enhancing Children's Engagement and Involvement: Participants indicated that engaging children in the program in a meaningful way (e.g., involvement in food preparation) would not only enhance the fidelity of the program but would also provide children with ownership and leadership opportunities. Some participants mentioned the need to incorporate the program into local school curricula to enhance program adoption and acceptance by all participants and to improve children's food literacy.

5) Perceived Impact of the CPSFP

All participants commented that they observed benefit of the program to the children. Some suggested there were even benefits to parents and school staff. All school-level participants agreed that the program created excitement and anticipation among children and

provided them with an opportunity to try a variety of healthy foods that they might not otherwise have access to at home. Weekly logbooks confirmed this finding, with 90% of participants indicating that feedback from children about the program was good to excellent. Furthermore, 67% of logbook entries indicated that children appeared to enjoy their snacks, with their dislikes normally centered on specific foods (e.g., zucchini and mushrooms).

Some participants mentioned that the program stimulated social interactions and enhanced positive social norms with respect to FVs consumption. This was confirmed during a field visit, where children were observed chatting happily doing their homework while eating the provided snacks (field observation, *PhI*).

Some participants commented that the program was helpful not only for increasing children's awareness of healthy foods, but also potentially having a positive impact on their diets (e.g., more FVs consumption, healthier options in lunches).

Although participants commented that the overall level of parents' awareness of the program was unclear, some had direct interactions with parents that suggested that there was some translation of the program to home (e.g., children discussing the foods they tried). Finally, some teachers also commented that their own awareness of healthy eating improved.

Table 6: Selected quotations from interviews with school-level participants

1) Perceived Value of CPSFP

… The good thing about the program is that we are servicing all children um doesn't matter whether they need it or not (EA2_Ph1)

For many of our students, I'm sure they've never had a mango. So it gives them an opportunity to try something…(VP1_Ph2)

2) Successes of Program Implementation

i) Appreciation for the CPSFP

Procurement and Delivery Model.

And the people that were going to the store were basically doing it at on their own time outside of work. It would typically last 2 or 3 days (EA2_Ph1)

I think probably getting bulk purchasing as opposed to each individual school-school just purchasing their own vegetables and … just means that we can serve more kids (V3_Ph3)

Pre-set Menu.

…Knowing that it's compliant with all of the requirements also took something off of our volunteers having to think about what to serve them and make sure it all complies with the regulations (V3_Ph3)

ii) Participation of the School Community

…The staff are very willing to pitch in and help getting it done and having the various staff helping, it works but there is a lot of steps involved as far as getting the food to the kids (T10_Ph3)

…I find a trend that if the teacher doesn't like eggs, the class doesn't like eggs (EA4_Ph1)

3) Challenges to program implementation

i) Volume and Type of Food

Limited Volunteer Capacity.

I can see a lot of EAs delivering, chopping, doing all those types of things…That it's a lot of time that they might have been wanting to do something else (T6_Ph2)

….Other people step up, like teachers step up and give away their prep periods and their breaks just to get it done… (VP3_Ph3)

Least favorite thing is the big brick cheese- they have managed to cut it but its time consuming and they want to keep their volunteers and not give them more work (V2_Ph2)

Limited Physical Resources.

I could not believe how much food was coming in, oh my God! And where do you put it? ….We didn't even have a cutting board; they had to use a cookie sheet to cut it on, so. We're not really prepared (VP1_Ph2)

…It's been some money out of our own pockets buying bags and that kind of stuff to prep the foods, serve to the kids…and sometimes it's playing Tetris try to get everything in the fridge just fitting everything in (EA9_Ph3)

Wastage.

And how much was coming for each student… so we had a lot leftovers (EA6_Ph1)

…With the apples that we have…. we could do with something a little bit smaller…the kids only eating only half of it because of our little ones (S1_Ph1)

Because our kids are embracing the whole recycling concept here, that [plastic utensils] sort of contradicts that whole concept, right? (S1_Ph1)

ii) Delivery and Distribution Issues

…It's relying on the teacher to do it [portion food], we don't have any time in our schedule for snack. It comes out of instructional time…you're talking about 25 minutes into a lesson, and you've got 10, 15 minutes left to teach (T2_Ph1)

…There are more interruptions, for sure, with fruit coming in, fruit going out, bins getting picked up, bins being delivered (T6_Ph2)

I'm thinking, probably things like the- the dairy products are a bit of a concern for me- they're sitting out a long time (T1_Ph1)

iii) Communication Issues

…I was quite surprised, on the first day when we had this gigantic pile of fruits and vegetables that were delivered and I phoned to say, "Are you sure?"(VP1_Ph2)

4) Suggestions for future programming

i) Capacity development

Investment in School Resources.

…That is the biggest challenge… not having a lot of hands. (EA8_Ph3)

We did not have the tools ready for the menu items or the dishes, the portioning containers… we were scramble[ing] each week with those kind of things (VP4_Ph3)

Some suggestions on how to plate it …or just ways that you guys have found have been successful on how to serve the food (ECE2_Ph3)

Enhanced Input from Schools.

...My only recommendation would be um if things were pre-portioned so they don't have to be scooped out during class time (T2_Ph1)

...I think we would like to sort of personalize it to our community a little bit more… we know our kids will enjoy (VP2_Ph2)

Enhanced Communication.

Communicate more with the people that are running it [the program]. ... Get together with the coordinators and determine the right amount of food (V2_Ph2)

...Maybe having someone come out early on to help out with that might make it a little bit of an easier transition (VP2_Ph2)

ii) Enhancing Students' Engagement and Involvement.

There are a lot of kids that would that really like to help. It's just they don't get the permission say from the teacher because there's time constraints to deal with the curriculum. But if we implement this into the curriculum…we get used to it and realize how important it is (EA4_Ph1)

It would be really awesome in some ways to have the kids get to be a part of seeing the food prepped and seeing a bit more of where the food kind of comes from (T10_Ph3)

5) Perceived Impact of the CPSFP

They were always anxious to see what's in the snack bin today… "Oh yay! I love that!" or "Ooh, I don't know. Well I'll try it" (T1_Ph1)

Everyone is eating ...it just provokes conversation and good times (T7_Ph2)

...Sometimes they might not try things at home, but when they are sitting in a classroom with a group of peers, they're more apt to try them, so its kind of neat to see kids, who maybe at first didn't wanna try anything but now they're excited. (ECE_Ph2)

…Get them started early enough where they form a love for whole fruits and vegetables,...So as they grow older, it becomes more and more (S1_Ph1)

Parents have been coming in, complimenting what the kids are having and …their children are talking about the program at home (EA8_Ph3)

It's affected me in that I've started eating a lot more fruits and vegetables (T1_Ph1)

4. Discussion

This study examined the implementation of a CPSFP in Southwestern Ontario. Using an exploratory approach, school level participants' perceptions and opinions about the program revealed many successes and challenges associated with implementation. In addition, results provided many insights for program improvement.

The successes of the CPSFP can be attributed not only to the engagement of all school-level participants, but also to their dedication to provide children with every opportunity to succeed. The fact that schools had implemented snack programs in the past and had realized the benefits for children likely led to participants willingness to adopt the new model and believe in its potential value. This confirms previous research, where community buy-in and engagement have been identified as essential aspects for the successful implementation of snack-based programming (Gates et al., 2011; Gates et al., 2012; Hayes et al., 2019; Hector et al., 2017; Skinner et al., 2012).

All participants felt that free, universal access to a variety of high-quality, healthy food choices would benefit children. Universal access was seen to lower the risk of stigmatization and increase program reach, which has been demonstrated previously (Hector et al., 2017; Russell et al., 2008). Furthermore, the increased availability and accessibility to a variety of foods are known facilitators in changing children's FVs intake (Blanchette & Brug, 2005; de Sa & Lock, 2008; Rasmussen et al., 2006) and have also been reported as key aspects of similar snack programming (Bere et al., 2007; Bere et al., 2006b; Reinaerts, De Nooijer, & De Vries, 2007; Wells & Nelson, 2005).

In addition to participants' anticipated benefits of the CPFSP, direct benefits were also observed including increased exposure to a variety of healthy foods, enhanced willingness of

children to try new foods, enhanced awareness and excitement about snacks, and a positive social atmosphere during snack times. While not measured in this study, these observed benefits directly address many mediators of behaviour change (Ajzen, 2011; Bandura, 2004). Changing children's preferences, awareness, and attitudes to foods by repeated exposure (Bere & Klepp, 2005; Krolner et al., 2011; Tak et al., 2008a), while also increasing social norms, social support, and role modeling have all been shown to positively influence children's eating habits (Addessi et al., 2005). While the assessment of dietary intake is beyond the scope of this process evaluation, it is reasonable to suggest that if the CPSFP has the potential to increase mediators of behaviour change, it may also have the potential to improve children's dietary behaviors.

From a practical perspective, the CPFSP model was greatly appreciated by participants as it alleviated many challenges participants experienced with their existing snack programs. Bulk purchasing increased buying power, and direct delivery to the schools addressed issues regarding food procurement, food safety (e.g., maintaining cold chains) and distribution, and increased the reach of the program. The pre-set menu alleviated issues with menu planning and administrative load (e.g., tracking of foods served and purchased), and increased the feasibility and fidelity regarding OSNP nutritional guidelines by providing each child with a full serving of FVs. Overall, these relative advantages likely allowed better adoption of the program by participants, supported buy-in, and facilitated the program's success (Rogers, 2003), while also ensuring that program fidelity was achieved.

All participants expressed interest in continuing with the CPSFP and saw not only opportunities to address some of the challenges experienced with the new model, but also potential strategies to improve and enhance the program for the future. Central to this was the volume and type of foods delivered that challenged the capacities of each school with respect to

physical and human resources. Unintended consequences of this included, at times, increased waste, concerns with food safety, and changes to food aesthetics. Food aesthetics and/or appeal have been shown to have an impact on children's food consumption (Aarestrup et al., 2014; Bai et al., 2011; Cooke, 2007). Food preparation and distribution will need to be addressed to ensure that snack personnel have the time and training to be creative in snack preparation and that snacks are delivered to and distributed within classrooms appropriately to maintain foods in safe and good quality condition to support health and encourage consumption.

To address limitations in resource capacity, participants suggested that the OSNP seek greater input from schools before program implementation. Of note was participants' desire to provide enhanced input on menu items and volumes to ensure individual school preferences and needs were met. It was believed that this input would help to address issues regarding waste, both food and non-food, and would allow schools enough flexibility to schedule food items to balance high- and low-preparation items and personnel time. A situational assessment is an invaluable tool for any program implementation as it not only allows potential challenges to be circumvented, but it also promotes a sense of agency among stakeholders (Ontario Agency of Public Protoction and Promotion, 2015). Previous process evaluations conducted on similar programs have noted that support for their programs would have been improved if school personnel were more involved in the planning stages (Bouck et al., 2011; Clarke et al., 2009; Jorgensen et al., 2014). Regardless, if the OSNP allows schools to have flexibility in choosing menu items to address capacity issues, this would have to be balanced against maintaining bulk purchasing power to sustain the program's reach. Furthermore, adherence to program values, such as exposing children to novelty items to increase preferences would also have to be

maintained, as repeated exposures to unfamiliar foods is a known strategy for promoting the liking of foods and addressing neophobia in children (Wardle, Herrera, Cooke, & Gibson, 2003).

In addition to a situational assessment, participants also noted that sustainable funding and access to additional funding sources would be needed to fully address capacity limitations. Free, universal snack programs have been shown to be effective at increasing children's dietary intake (Reinaerts et al., 2008; Reinaerts, de Nooijer, Candel, et al., 2007; Tak, Te Velde, & Brug, 2007; Tak, te Velde, & Brug, 2008b; Te Velde et al., 2008), but most have identified the need for sustained and committed funding to maintain them at the level required to be effective (Bai et al., 2011; Hayes et al., 2019;Reinaerts, De Nooijer, & De Vries, 2007). Furthermore, addressing the availability of physical resource (e.g., refrigeration, cupboards) and appropriate utensils (e.g., spoons, cups) for food preparation and serving would then tackle the limited feasibilities to program implementation, including the food safety concerns mentioned by participants. This aspect of food safety was a novel theme identified by participants and has not been identified previously in the literature. This may be because most Southwestern Ontario elementary schools do not have adequately equipped facilities; therefore, if the CPFSP were to continue, there is an acknowledged need for policy makers and decision makers in school boards and ministry bodies (i.e. education, agriculture and health) nationwide to work in concert to invest in school infrastructure (e.g., refrigerators, dishwashers, and prep areas with large tables).

Another suggestion to improve program implementation was to enhance communication between schools and OSNP personnel. Although personnel and resources were available and provided to schools, most participants perceived these as inadequate in some way. Some participants expressed confusion regarding the OSNP's expectation for the program with respect to food volume, the expected level of adherence to the implementation of the pre-set menu (e.g.,

how strictly it needed to be followed), and contact information for real-time issues. Insufficient communication between participants at all levels has been reported to hinder the adoption and implementation in similar snack programs (Blaine et al., 2017; Chan, Moy, Lim, & Dahlui, 2018; Greaney et al., 2014; van Nassau et al., 2016). Therefore, to maximize program feasibility and fidelity, a continued investment in adequate human resources will be needed to ensure good communication channels between all participants. It is worth noting that the CPSFP was rapidly rolled out as a pilot program in early 2017 and by the third phase a year later, many of the communication and logistical issues (e.g., distribution, amounts, wastage) had been resolved.

Finally, to enhance the CPSFP, all participants wanted more student engagement and believed this could be accomplished by integrating the program into current curricula. Development of food literacy (e.g., food skills, food knowledge) has been identified as a facilitator to developing healthy dietary habits in children (DeCosta, Moller, Frost, & Olsen, 2017; Triador et al., 2015) and is a part of life-skill development that helps to build resiliency in children and youth (Libman, 2007; Wind et al., 2008). Additionally, by integrating the CPSFP into school curricula, classroom and teacher burdens identified by participants would also be alleviated as it would become part of their duties and not compete with other curricular priorities. Embedding the CPSFP into school curricula would also build sustainability and has been identified as a key aspect to building acceptance and support by children, school personnel, and parents (Bai et al., 2011; Hayes et al., 2019; Wind et al., 2008).

The strengths of this evaluation included both the use of multiple data sources, which provided a rich understanding of program implementation at the school level and data triangulation during analysis that enhanced credibility of the findings. This study also was conducted in a naturalistic setting and, while this introduces variance in implementation

practices, it allows easier transferability of research to practice. Limitations to this evaluation include the fact that participants were already familiar with implementing snack programs; therefore, generalizability to novice snack programs may not apply. Finally, social desirability may have resulted in more positive perceptions about the CPSFP; however, participants discussed many challenges to program implementation, and therefore the data likely reflect an accurate reality of the implementation process.

5. Conclusion

This study assessed the implementation of the CPSFP, a free, universal, volunteer-led snack program using a central food procurement and delivery model. School participants provided an in-depth understanding of the many successes, challenges, and possible solutions for volunteer-led snack programming. While participants clearly identified that additional investments in resources and sustained funding must be considered to maintain the reach, fidelity, and feasibility of the program, they also identified many opportunities for efficiencies and enhancements. Collaboration between OSNP, key school decision makers (e.g., administrators, government), and school staff can enhance communication, aid in the development of best practice guidelines for program implementation and facilitate opportunities to integrate the CPSFP into school curricula. By doing so, the challenges discussed by school-level participants can be managed, while maximizing the program's potential to have a positive impact on children's food literacy and dietary habits.

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Chapter 5 : Summary, Implications and Conclusions

5.1 Summary

This chapter includes my reflections on and conclusions about my project study, limitations and strengths of the project, as well as implications and recommendations for future programming in Canada. While the first study (***chapter 2***) provided a concise summary of the current state of knowledge on this topic and gave an overview related to my own research, the aim of this dissertation has set out to answer the overarching research question: how was the Centrally Procured School Food Program (CPSFP) implemented in Southwestern Ontario? To answer this question, I conducted two interrelated studies (***chapter 3 and chapter 4***) that have addressed the implementation processes and practices of the program. Specifically, the perspectives of participants involved in the implementation of the program at the school-level and also those responsible for food provision were explored: to determine how the program was implemented, to identify factors (e.g. issues, supports, barriers) informing program implementation, to provide practical feedback to program planners on the delivery of the program, and to give guidance to others carrying out similar interventions.

The first study (***Chapter 2***) served to encourage transparency on the research field of process evaluations and to develop a deeper understanding of the perspectives, potential challenges and facilitators associated with the implementation. The findings of this systematic review suggest that the majority of the studies included limited references to implementation literature. Recurring limitations include the number of components assessed, the data collection methods used, and/or an absence of an evaluation theoretical framework. Several factors were identified as informing the success of a snack-based school food program, including school participation, publicity and branding, school characteristics, children's appreciation, background

knowledge, and parental engagement. Lack of timely FVs delivery, insufficient funding, inadequate promotional activities, lack of teachers' time, resources needed, and food waste were identified as challenges to successful programming. Evidence indicates that distributing FVs to children as snacks can increase their consumption, but only with proper implementation. Knowledge gained from this review has not only identified conditions or resources needed under which FV distribution interventions are likely to be most effective, but also revealed that further evaluative research is required to better inform future implementation of snack-based FV distribution interventions in school-based settings.

The second study (***Chapter 3***) was designed to qualitatively explore how CPSFP was implemented from the perspectives of the Ontario Student Nutrition Program [OSNP] personnel (e.g., Community Development Coordinators, Food and Logistic Coordinators, and Regional Directors), and food providers (e.g., farmers, suppliers, and distributors) involved in planning, coordination, and oversight of the program, as well as those involved in the production, procurement, and distribution of foods to schools. Qualitative interviews (*n=20*) were conducted to assess participants' perceptions of and experiences with the CPSFP. The results of this study showed that the majority of the participants expressed positive perceptions of the CPSFP in that it provided children with universal access to safe and healthy foods. Facilitators of successful program implementation included the excitement the program generated among school-aged children and the alleviation of concerns with volunteer-led purchasing and delivery. Meanwhile, challenges to program implementation included the volume and type of foods, as well as infrastructure and funding limitations. Requirements and suggestions for the future focused on opportunities to enhance implementation of the CPSFP, while also identifying a need for continued and enhanced investment of resources. Knowledge gained from this study provided an

in-depth insight into the implementation of the CPSFP and highlighted the impact of the program on the local food system. The lessons learned and suggestions offered in this study may provide guidance to enhance the CPSFP and promote its sustainability, inform best practice guidelines for similar programs, and support future policy development.

The third study (***Chapter 4***) was designed to address qualitatively and quantitively factors that manifest CPSFP implementation in seven elementary schools within Southwestern Ontario. This study isolated the various features of the CPSFP that contributed to successful program implementation from the perspectives of school personnel and/or volunteers involved in the implementation of the program at the school-level. Employing a mixed-methods study design, qualitative data were obtained through interviews (*n=27*) and one in-person group interview (*n=1; involving 6 participants*). On-site visits (*n=15*) were also conducted at each school to observe program's implementation practices and processes. Quantitative data were obtained through a general information form (*n=7*) that provided school characteristics, as well as logbooks (*n=57*) that described program logistics/delivery and food quality on a weekly-basis. The findings showed that the program was viewed as part of a successful effort to increase children's intake of healthy foods, specifically FVs. Facilitators to successful program implementation included an appreciation for the CPSFP and the participation of the school community. Challenges included concerns with the volume and type of food provided, issues with classroom food delivery, and communication issues. Overall, the program was perceived as successful, but participants indicated that there needs to be effort placed on maximizing capacities and enhancing children's engagement in the program. The lessons learned and recommendations offered in this study provide guidance to sustain and enhance the reach, feasibility, and fidelity of the program.

5.2 Implications

As a whole, the research presented in this dissertation has some significant practical implications or key lessons that are valuable for future school food policies, programs and research. Based on the overall findings, I argue that this pilot procurement and delivery-based program (i.e. CPSFP) sets the stage for a successful school food program in Canada. With the information gained from conducting this evaluation research, public health researchers will provide relevant insights into: how to best develop and implement these programs in and outside of school settings; how to inform decision-making about future interventions, methods and policy development; how to revise and disseminate the program; and how to provide marked implications to school districts and funding agencies. Addressing the elements that impede the implementation of the program or make it successful, and identifying what can be done to make the delivery of the school food programs the most beneficial and rewarding to all participants involved, including the end-recipients (i.e. children) is considered a forward step towards establishing a universal, national school food program in Canada.

5.2.1 Implication for Practice

The first and perhaps the most significant implication of this work is that the program ran during school hours, while children were in the classroom. This is a strength, as participating children will consider the program as part of their curriculum, and potentially learn more from the program (Hector, Edwards, Gale, & Ryan, 2017; Triador, Farmer, Maximova, Willows, & Kootenay, 2015). For example, an evaluation of a morning meal program in the Toronto District School Board found that children who use the program most days show at least 10% increase in skills such as independent academic work, conflict resolution, class participation and problem-solving at schools (Easwaramoorthy, 2012). Unfortunately, the CPSFP is not being run as it

intended to be, and it is often being treated as an optional component of the school day, and therefore is left up to the discretion of the teacher. For example, it was evident that there was a great deal of variation in program delivery from school to school, between different teachers and between grades, with such unstructured program. While this variation is important to enabling implementation across Ontario's elementary schools, it may also impact the effectiveness of the program as schools are already overwhelmed with a demanding academic curriculum and the added responsibility of delivering a school food program could prove to be challenging. Therefore, the only effective way is through embedding the time allotment of the program into the school official day schedule and/or incorporate the program into the mandated Health and Well-being share of educational time and school policies. This, in turn, would enhance the quality of the program delivered and eliminate the propensity for teachers to use the program time discretionally. Overall, a national, health-promoting school food program in Canada is essential and with adequate national standards and/or guidelines/mandates, it can be the powerful health-promotion program to benefit all Canadian school-aged children.

A second practical implication or lesson learned from this work is that providing schools with physical and human resources would greatly support the implementation of the program. This research shows that the schools are not uniformly equipped with adequate resources for running the program. For example, many schools lack the appropriate physical resources (e.g., refrigerators, cupboards, or appropriate prep areas) to prepare foods. In addition, the majority of schools lack sufficient volunteer capacity to deliver the program and stated that the largest barriers to the delivery of CPSFP included the workload and lack of time. In the absence of these capacities, significant effort needs to be placed on enabling schools to acquire the infrastructure and human resources needed. These include, but are not limited to: training staff, improvement

in storage capacity, and adequacy in tools and equipment used to prepare and serve the food items. Overall, provision for on-going funding, staffing, and training must be part of a school food program because an investment in a universal, national school food program is an investment in children and youth of today and the leaders of tomorrow.

A third implication revealed through this work is the importance of engaging children in the program. This research pointed out to the potential benefits of involving children in the development and implementation of such programs, and suggest further research should more fully investigate the potential benefits of directly involving children. Previous research suggests that hands-on approaches, such as cooking (DeCosta, Moller, Frost, & Olsen, 2017; Margolin, Goto, Wolff, & Bianco, 2018) or gardening (Libman, 2007; Triador et al., 2015) skills programs, would provide children with an increased educational opportunities to practice lifelong food literacy. If transferred successfully to children's home environment, these skills can help nourish themselves and their families by gaining greater control over their health and well-being via building essential life skills, self-confidence, and self-efficacy and thereby further contribute to overall program success (Hector et al., 2017; Krolner et al., 2011). Additionally, if schools are not comfortable or capable of delivering the program as intended during the school day, it may be more beneficial to simply involve children in the program to ensure the same benefits of the program without the stress on school staff/volunteers. This is in concert with the literature in which the researchers found a decrease in program burden when children were engaged in the program (e.g., cutting up food, serving it their classmates, and cleaning afterwords) (Aarestrup et al., 2014). This was also a teaching opportunity intended to help children build their leadership skills, by actively involving them in the implementation of the program (Aarestrup et al., 2014).

Finally, school food programs, in which foods are sourced from regional producers, provide an opportunity for improving children's nutrition knowledge while opening a market for local small and midsized growers. A national school food program in Canada is not just an expense, it is an opportunity to develop an economic growth strategy, akin to what other countries, such as Italy has pursued (Roccaldo, Censi, D'Addezio, Berni Canani, & Gennaro, 2017). Literature have shown when local food is served, a holistic return on investment including regional food production, household and business earnings, long-term gross domestic product, and the creation of new jobs in communities (World Food Program[WFP], 2016; Upstream Public Health, 2011). There is currently limited research examining the connection between these programs and the local food system. Thus, investigating the logistical aspects of getting FVs into the classroom, from the perspectives of those involved in the supply chain (e.g., distributors, suppliers and farmers) may be critical to expand the scale and scope of local food procurement in schools.

By providing an opening and infrastructure in a market that typically excludes small and midsized growers, school food programming have the ability to strengthen the local and regional food system via fostering/cultivating the use of locally-produced food for stronger economics and sustainable agriculture beyond just a food program conducted at the school-level. To ensure this, however, the federal government needs to establish food procurement criteria and regulations to protect against corporate food and beverage from getting entry into schools (Gidney, 2015). For example, the Government of Canada can play a very important role in the development of local food systems to become more geared towards the production, processing, and buying of local foods "local food systems" instead of large-scale "conventional and global food systems". "Local food systems" provide several advantages over "conventional and global

food systems" including socio-economic and environmental benefits, strengthens regional economies, support family farms, provide fresh foods to consumers, preserves the local landscape, and fosters a sense of community. Potential strategies to foster/cultivate the "local food systems" over the "conventional and global food systems": include programs focused on local consumers, institutional purchasing local programs that create direct links between growers and institutions, low interest loan programs, increased processing capacity, increased market access, improved links between farmers and distributors, and improved agriculture education (Irshad, 2010).

In sum, the school system provides an excellent point of intervention in which virtually every child can be reached in a relatively cost-effective manner. However, with all the known physical, social, and academic benefits of increased FVs consumption, it is surprising that more is not being done to expand school food programs in Canada. Distributing FVs at school settings will promote children's inclusion and participation more widely as children spend most of their time at school, and almost 2/3 of food groups are consumed in the school settings (Baxter et al., 1997). Through this research, it is evident that interventions to improve children's intake of FVs can be strengthened by accounting for the different constraining factors that impede the implementation, effectiveness, and ultimately the sustainability of a school food program.

5.2.2 Implication for Research

Process evaluation is increasingly recognized as an important component of implementation research, and yet there has been surprisingly little work to understand what constitutes best practices. At present, there is no consensus regarding which terminology (and definitions) to use or clear study aim/objectives among researchers conducting and reporting results from process evaluation. In addition, to date process evaluations of these interventions

had only provided information about the facilitators and barriers to program implementation. However, to generate a comprehensive understanding of the quality of the intervention delivered, there is a need to address: the context in which the intervention was developed, implemented and finally evaluated; a description of those in charge of intervention delivery (e.g., incentives and motivation, background knowledge, previous experience and/or training) and recipients of the interventions (appropriation and attitude/opinion). Accordingly, identifying the factors that impact the program across multiple socio-ecological levels, including the broader community and policy environment/context and the employment of mixed methods (quantitative and qualitative) study design to obtain a comprehensive picture of the lived experiences or factors affecting implementation. This together with a solid grounding in theoretical framework will provide a multi-dimensional view on the quality of the program delivered (Bauer, Damschroder, Hagedorn, Smith, & Kilbourne, 2015). In otherwords, process evaluation should be a piece of research in its own right and therefore should be described as a protocol. However, these recommendations can be sometimes challenging to implement for researchers working within tight budgets as they will always face trade-offs about what aspects of the intervention and its delivery to focus on when conducting process evaluations. As research environment work under increasingly dynamic, resource-constrained conditions and are driven by equally complex political and economic environment, evidence-based strategies are essential in order to ensure that research investment improve public health. As a result, the process of implementation studies need to be carefully designed to maximize their ability to gain in depth understanding of the “anticipated” factors that are likely to impact outcomes, and thereby determine the possibility of scale-up programs or initiatives that have demonstrated effectiveness.

5.3 Unanticipated Observations: Personal Reflections, Tensions and Contradictions

Throughout this doctoral journey, I have encountered many challenges. First, recruitment for the study was difficult; however, my personal and professional attitude, resilience, and perseverance have enabled me to secure a purposive sample for my study. Many participants told me that they would participate, and even help recruit other participants, because of my kind and modest nature.

Second, my professional view of scholarship has also been developed. For example, throughout this research, I noted several seeming tensions and contradictions in the way some participants spoke about the program. These incongruities suggest a disconnect between how some participants perceive, or are willing to identify, factors as influencing program implementation, and what I, as a researcher, conceptualize as affecting implementation. For example, each time I visited a school, a number of participants casually responded that this program had affected their daily routine, as well as school routines in general. On the other hand, when interviewed, the majority of these participants stated that the program was not affecting their school routine. Yet, when I asked/probed them for additional feedback about the program, many responded that the program is time consuming.

To conclude, these seeming contradictions are not contradictions at all, but are to be expected as part of the unstable positions we, as researchers, occupy in relation to the benefits of such initiatives. These types of tensions in individual responses may also make more sense when we contextualize them within socio-ecological processes (i.e. individual, interpersonal, organizational, community and public policy). From an individual vantage point, it may not be possible for one participant to view the constellation of factors affecting program implementation, but when fitted together with those of other levels of participants and in relation

to context/environment in which the program was implemented, the widely diverse picture starts to become clear and is better understood as part of the web of socio-ecological relations that underpin program implementation processes.

5.4 Impact of COVID 19 on School Food Programs

Healthy foods can contribute to strengthening people's immune system, thus increasing their capacity to cope with disease (Gerritsen et al., 2019). However, the closure of schools and associated suspension of school food programs around the world due to COVID-19 have posed a challenge to the food security and nutritional status of many children, especially those from economically-vulnerable households (Unicef, 2020). For these school-aged children, this could be their only nutritious meal of the day, and this turn of events is calamitous on both children and their families. We can shift to online learning, but not to online eating, and therefore an extensive inter-institutional collaboration/partnerships is needed to keep school food programs going, while taking all precautions to avoid transmission of the virus (World Food Program[WFP], 2020). Possible alternative solutions or measures to support children and their families include: provide take out rations at schools in lieu of the meals; home delivery of foods; provision of cash or vouchers; exemption from taxes on basic food items; distribution zone hubs/stationary locations (e.g., food banks, non-government organizations, and churches); and the use of digital tools (e.g., georeferenced smartphone apps) to improve communication regarding access points for food deliveries, distribution times, recommendations for the proper use of food, and measures to reduce the risk of COVID-19 (Food and Agriculture Organization [FAO], 2020; World Food Program [WFP], 2020). Some of these suggested solutions have been already introduced across Canada to help protect children during this crisis (C. News, 2020; G. NEWS, 2020) to support the health and learning of our children, while cultivating community and environmental health.

5.5 General Strengths

The findings of this dissertation are significant given the paucity of process evaluations conducted on school-based FV distribution interventions. First, the interviewed participants in this study had experience working both at the Traditional School Food Nutrition Program (TSFNP) versus the Centrally Procured School Food Program (CPSFP), so they provided rich insights into the advantages of implementing the new model. Second, corroborating findings from the weekly logbooks provided a platform that was important in documenting program aspects on a weekly basis, thereby minimizing recall bias, as well as giving an explicit opportunity to program staff to state their thoughts/opinions that were not touched upon during the interviews. As well, it minimizes social desirability bias, which is usually encountered when conducting individual (in-person) interviews. Third, field observations were also conducted to capture the implementation process at each school. This in turn helps to build a trusting rapport and a sense for participants to open up discussions concerning program delivery and possible recommendations. Also, the use of both qualitative and quantitative approaches have yielded a more detailed and nuanced picture of how the intervention was delivered. Specifically, the use qualitative methods provided an in-depth understanding of the different aspects of the implementation process (e.g., peoples' experience, practices and social interactions). This mix of methods also allowed for triangulation of the findings. Finally, the same researcher facilitated all aspects of data collection, thereby ensuring consistency and accuracy when data were collected.

5.6 General Limitations

Despite the many strengths of this research, a few limitations should also be noted. First, the research was conduced in seven schools in Southwestern Ontario, and it is likely that the specificities of program implementation may differ in other school locations, particularly with

different cultures, economies, or political structures. The restricted geographic focus of this work limits the generalizability of the findings to other regions. Second, while this study may allow easier transferability of research to practice, it often resulted in less-rigorous study design because it was conducted in a naturalistic setting; therefore definite conclusions regarding intervention implementation remain uncommon. Third, our process evaluation protocol was not guided by a theoretical framework from the beginning, as the researchers were not engaged in the program planning and development, and the evaluation plan was rolled out very quickly. Fourth, recruitment of participants for the interviews and completion of logbooks proved a challenge as it placed an additional task on school staff, which they saw as burdensome on top of their regular responsibilities. In addition, recruitment for the food providers relied heavily on a list made available by the OSNP food and logistic coordinator. This is a limitation of the study, because these interviews were not selected at random and therefore may not be representative of all food providers involved in food provision. In addition, for the field observations, the initial plan was for researchers to visit schools unannounced. This proved impractical, however, as there were often changes to school schedules and some schools were located more than an hour drive away from campus. Field observation were therefore pre-arranged with schools, which meant schools had prior knowledge that the program would be observed, potentially influencing its delivery. However, in practice, this did not appear to happen as it became clear that school staff/volunteers are accustomed to do what they used to do. Finally, we did not interview health promotion professionals and policy makers involved in the funding and organization of the program at a higher level. Their insights would provide wider perspectives on the factors facilitating or impeding a policy implementation and/or provision for funds.

5.7 Future Directions

Based on the findings of this dissertation, four future directions for program evaluation are recommended. First, more research is needed into process evaluation of health promotion interventions that seek to identify factors influencing the implementation of school food programs. Second, it may be beneficial to compare the findings from schools that implemented the traditional model versus schools that implemented the new model to address the issues of fidelity of implementation. This would also help make informed evidence-based decisions that are directly aligned with program goals and objectives. Third, future research should assess the impact of this program on mediating psychosocial factors (e.g., attitudes, self-efficacy), the context of the family (e.g., translating positive impacts to home), or children's health status (e.g., obesity) to examine the overall impact of the program. Finally, future research should conduct an economic evaluation as public health decision makers are particularly interested in program costs and potential cost savings resulting from avoided health care costs.

5.8 Conclusion

When taken together, these studies provide valuable contextual information about the value, worth, and realities of implementing the Centrally Procured School Food Program (CPSFP). Our findings indicate that the introduction of a new school food program usually requires a period of adjustment or "breaking-in" period before it can run efficiently and effectively, which is the case with every newly introduced intervention program. Whilst the components within the intervention program were predefined, it was acknowledged that each school would have different contextual influences on intervention delivery and response. This flexibility to accommodate individual school circumstances added complexity to delivery of the intervention and emphasizes the importance of evaluating the processes of intervention delivery

at each school. This research also adds to what is otherwise rarely conducted evaluation research, particularly studies addressing the procurement logistics, and fidelity and feasibility of implementation processes outside of school settings. Their evaluation address the broader impact that school food program can have on the food system.

Furthermore, there is an acknowledged need to provide guidance to policymakers and decision-makers in school boards and ministries (i.e. education, agriculture, and health) nationwide to work in concert toward a common goal of improving the lives of elementary school-aged children. As is needed in any effective health promotion program (World Health Organization[WHO], Health and Welfare Canada, & Canadian Public Health Association, 1986), when a variety of partnerships are invested in reaching a common goal, there is a greater possibility that the goal will be achieved and the program will be sustainable. In sum, a comprehensive, universal school food program is a foundation step towards better social, educational, and health outcomes for Canadian children. If designed and implemented right, it would help families and local economies too.

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Appendices

Appendix A: Recruitment flyer

Process Evaluation of the Ontario Student Nutrition Program (OSNP)- Sign-up Sheet- School Staff

Hello: My name is _____. I am a graduate student at Western University. As a partner of the Ontario Student Nutrition Program (OSNP) program evaluation, I wish to conduct an interview with you to gain a better understanding of your thoughts about the program. Our conversation will take no more than 30 minutes (or maybe less) and will be audio recorded to make sure any important information shared will not be missed. The interview will be one-on-one in a private place during the workday at your school. You will be asked questions about your expectations and thoughts about the program, aspects of the program that were challenging and successful, how the program was received by the school staff and the students and if there are any suggestions for the program in the future. Your participation in the discussion is completely voluntary. You do not have to participate. You can refuse to answer any questions and can choose to leave the study at any time. Your feedback is highly appreciated and it will help us improve the effectiveness of the program in the future. If you are interested please **add** your name below and **indicate a** time slot that you would like to meet with me. Your help and support during this evaluation is greatly appreciated.

I will be present in your school at the following date (s): _____for the whole business day (9:00 A.M.- 4:00)

Name	Time slot

Appendix B: Ethical approval letter

Western Research

Research Ethics

Western University Non-Medical Research Ethics Board
NMREB Delegated Initial Approval Notice

Principal Investigator: Dr. Jason Gilliland
Department & Institution: Social Science\Geography,Western University

NMREB File Number: 108549
Study Title: Evaluating the impacts of an innovative centrally-procured school food program on student nutrition and the local food economy

NMREB Initial Approval Date: November 29, 2016
NMREB Expiry Date: November 29, 2017

Documents Approved and/or Received for Information:

Document Name	Comments	Version Date
Instruments	PEAS Questionnaire - Balanced School Day	2016/11/29
Instruments	PEAS Questionnaire - Traditional School Day	2016/11/29
Western University Protocol	Received November 29, 2016	
Recruitment Items	Facebook Announcement	2016/11/29
Letter of Information & Consent	Facilitator - Focus Group/Interview (Written)	2016/11/29
Letter of Information & Consent	Facilitator - Interview (Verbal)	2016/11/29
Letter of Information & Consent	Parents - No Observation	2016/11/28
Letter of Information & Consent	Parents - Observation	2016/11/29
Assent	No Observation	2016/09/27
Assent	Observation	2016/09/27
Data Collection Form/Case Report Form	Observational Data - Received September 28, 2016	
Instruments	Parent Survey	2016/08/30
Instruments	Facilitator Focus Group Guide	2016/09/27
Instruments	Youth Focus Group Guide - Received September 28, 2016	
Instruments	Youth Survey	2016/11/03

The Western University Non-Medical Research Ethics Board (NMREB) has reviewed and approved the above named study, as of the NMREB Initial Approval Date noted above.

NMREB approval for this study remains valid until the NMREB Expiry Date noted above, conditional to timely submission and acceptance of NMREB Continuing Ethics Review.

The Western University NMREB operates in compliance with the Tri-Council Policy Statement Ethical Conduct for Research Involving Humans (TCPS2), the Ontario Personal Health Information Protection Act (PHIPA, 2004), and the applicable laws and regulations of Ontario.

Members of the NMREB who are named as Investigators in research studies do not participate in discussions related to, nor vote on such studies when they are presented to the REB.

The NMREB is registered with the U.S. Department of Health & Human Services under the IRB registration number IRB 0000094[redacted].

Western University, Research, Support Services Bldg., Rm. 5150
London, ON, Canada N6G 1G9 t. 519.661.3036 f. 519.850.2466 www.uwo.ca/research/ethics

Appendix C: Letter of information (LOI)

Research Project: Evaluating the impacts of an innovative centrally-procured school food program on student nutrition and the local food economy

Principal Investigator: Dr. Jason Gilliland, PhD Department of Geography, [redacted]

Dear school staff / facilitator / volunteer,

Dr. Jason Gilliland and his research team from Western University invite you and to participate in a focus group/interview to discuss the Ontario Student Nutrition Program (OSNP) at local schools.

What is being studied?

Our team is evaluating the effectiveness of the OSNP program to determine what aspects of the program and its implementation were successful or unsuccessful. We aim to learn about your experience and the benefits and challenges of facilitating the OSNP program in your school to evaluate what changes need to be made to improve the process and improve the effectiveness of the program at increasing the fruit and vegetable consumption at school and strengthening the local food economy.

What will happen in this study?

Participate in a focus group/interview discussion. This discussion primarily asks about your experience with the OSNP process and implementation. The discussion should take about 45-60 minutes to complete and will be done at a time that is most convenient for you. All focus groups and interviews will be audio recorded. If you do not wish to be audio recorded, you will be invited to participate in an interview at a later date that will not be audio recorded; to ensure accurate recall of non-recorded interviews, researchers will take detailed notes.

Do I have to participate in this study?

Your participation in the discussion is **completely voluntary**. You do **not** have to participate. You can refuse to answer any questions and can choose to leave the study at any time. However, as the interview gives us critical information from the point of view of the school staff, facilitator, or volunteer, we would really appreciate your participation, as it will help us understand how to improve the OSNP process and improve the effectiveness of the program.

What are the benefits and risks of participating?

Our research is attempting to prove that increasing fruit and vegetable availability at the school through a nutritious snack program improves children's eating habits, knowledge, and behaviour. By reaching a fuller understanding of this relationship, the Ontario Student Nutrition Program can develop a model that can be used for snack programs across Canada. This will help students can gain the maximum health benefit when receiving snacks at school.

There is little risk to you if you choose to participate in this study, but there is a slight chance that you may be uncomfortable sharing details of your experience with the OSNP program to the

researchers. This is being minimized as follows. You will not be personally identified or identifiable by name in any of the documents related to the study. All of the information collected in this study is kept strictly confidential. Your name will not appear on any materials or data files. Please be advised that although the researchers will take every precaution to maintain confidentiality of the data, the nature of focus groups prevents the researchers from guaranteeing confidentiality. The researchers will remind participants to respect the privacy of your fellow participants and not repeat what is said in the focus group to others. Furthermore, materials and data files will ONLY be viewed by members of the research team and will be stored in a locked filing cabinet until transferred onto a password protected computer in a secure facility at Western University. Representatives of The University of Western Ontario Non-Medical Research Ethics Board may require access to your study-related records to monitor the conduct of the research. The results of this study will only be presented for groups so that you will never be individually identifiable. You do not waive any legal rights by consenting to this study.

Who do I contact if I have any other questions?

Should you have any questions or concerns about participating in this project, you can contact the lead researcher, Dr. Jason Gilliland, at Western University [redacted]

If you have any further questions regarding your rights as a study participant, please contact the Office of Human Research Ethics at 519-661-3036 or at: ethics@uwo.ca

By participating in this interview you are providing your consent.

Appendix D: Consent form

Research Project: Evaluating the impacts of an innovative centrally-procured school food program on student nutrition and the local food economy

Facilitator Consent Form

Principal Investigator: Dr. Jason Gilliland, PhD Department of Geography, University of Western Ontario Phone: [redacted]

To help us learn how the implementation of the Ontario Student Nutrition Program in your school and how it influences student's eating habits and knowledge, we ask that you participate in this focus group. Please review the ***Letter of Information*** before providing your consent.

I, _____ *(print your name)*, agree to participate in this focus group.

_____ _____

Signature **Date**

Appendix E: Process evaluation coverletter

Re: OSNP school food nutrition process evaluation

As a partner of the OSNP, we are very excited to have the opportunity to learn more about the current/new school food nutrition program being offered in your school. Our hope is that by better understanding how things currently work, we can ensure that your school has all the resources and support it needs to offer the best possible school food nutrition program to your students in the future. In order to do so, we will need to ask your school food nutrition program coordinator to complete two forms for us: g*eneral information form* and *a weekly snack log*.

1. **General Information Form:** This form is to be completed ***1 time only*** by snack personnel.

2. **Weekly Log:** We are asking that snack personnel complete this log ***each week a snack is offered***.

Completed forms can remain in our folder as research personnel will be visiting your school periodically and checking these logs for completion OR a friendly reminder check-in email will be send to you on a weekly or bi-weekly basis. Also, the personnel, have the option to either send these logs via email to the following address _[redacted] or by mail to the following: The [redacted] (paid envelope)

3. Close to the end of the intervention *(approximately at week 6 or 7*), we will visit your school to conduct individual interviews with the personnel who were involved with the school food nutrition program such as snack coordinators, teachers, education assistants, and (vice) principles and school staff in general. The purpose of these interviews is to gain additional insights into the opportunities and challenges of running a school food nutrition program in your school. A sign-up sheet (with dates and times) will be posted in the staff lounge, with principle permission, for interested individuals to sign their availability to do the interview. Interviews will be for no longer than 30 minutes and will be audio recorded to make sure any important shared information will not be missed. Privacy and confidentiality will be ensured throughout the process. A study's letter of Information explaining the interview process will be placed in the staff lounge for your convenience.

Thank you very much for your participation in this evaluation. Your help and support during this evaluation is greatly appreciated, and if you have any questions please feel free to contact me
Sincerely,

Dr. Jason Gilliland PhD (Principal Investigator), Associate Professor, School of Health Studies Western University, [redacted]

Dr. Danielle Battram PhD RD (Co-Investigator), Associate professor, School of Food and Nutritional Sciences, Brescia University College, Western University, [redacted]

Appendix F: Weekly log

SCHOOL FOOD NUTRITION PROGRAM- WEEKLY LOG

The purpose of this weekly snack log is to systematically evaluate the quality of the food provided on a weekly basis and to identify any areas for improvement.

The weekly snack log tool provides the means to:

1. Identify quality improvement issues
2. Investigate complaints or reported issues with the food delivered or specific menu items on an ad hoc basis

Please complete the following log for each week of the intervention. If a snack day is missed for any reason, please tell us on this sheet in the comment section for that week, for example, a snow day, PD day, snack personnel unavailable, pizza day, Good Friday, Easter Monday, etc.

This form is to be filled by the snack personnel, preferably the snack coordinator of the program, on a weekly basis for the entire intervention period (10-weeks)

School: _____ Dates: _____ Week:_____

	Ratings	Information	Comments
Please list all food items served this week, including dips, etc. Please list all utensils used this week (spoons, napkins, plates, etc.)			
How would you rate the quality of the fruits and vegetables upon delivery from your distributor/supplier for this week?	1 (poor) 2 (Fair) 3 (Good) 4 (Very good) 5 (Excellent)		
Any waste or spoilage upon delivery for this week? Please comment	None Some (less than 10%) Lots (10% or more)		
Any waste or spoilage at the end of	None Some (less than 10%)		

the week? Please comment	Lots (10% or more)
Were there any left overs this week? And if so, how much?; what do you intend to do with them? Please comment	1 (Yes) 2 (No) 0% (none) 25%(little bit) 50%(half) 75%(most) 100% (all)
How would you rate the freshness of fruit and vegetables served to the students this week?	1 (Very poor) 2 (Poor) 3 (Okay) 4 (Good) 5 (Very good)
How would you rate the appearance of fruit and vegetables served to the students this week?	1 (Very poor) 2 (Poor) 3 (Okay) 4 (Good) 5 (Very good)
Is there a sufficient variety of food options (Fruit and vegetables) offered for the students this week? Please comment	1 (No variety) 2 (Somewhat) 3 (Lots of variety)
If possible, can you tell us whether or not the students enjoyed the snacks received this week? Please comment.	1 (Yes) 2 (Somewhat) 3 (No)
Have you received feedback from students about the food items (Fruit and Vegetables) received this week? If so, please comment	1 (Poor) 2 (Fair) 3 (Satisfactory) 4 (Good) 5 (Excellent)
If possible, can you tell us whether or not your snack personnel used the recipes featured in the Farm to School Recipe Guide for this week?	1 (Yes) 2 (No)

Any feedback? Please comment	
Overall, how would you rate the snack program for this week? Please comment if necessary	1 (Very poor) 2 (Poor) 3 (Fair) 4 (Good) 5 (Very good)
Based on your experiences with the snack program this week, do you have any suggestions/feedback moving forward? If yes, please comment	1 (Yes) 2 (No)

Thank you very much for your support to make an effective school food nutrition program. Your help is greatly appreciated

Appendix G: General information form

SCHOOL FOOD NUTRITION PROGRAM- GENERAL INFORMATION FORM

Name of School: _____

School Schedule (Please check one): ____ Balanced School Day (NB1 and NB2)
___Traditional (R1, Lunch, R2)

Amount of OSNP funding (For the year): _____

School Food Nutrition Program Type:
_____ Meal (3 food groups: FV+ Grain+ Dairy; 1 serving each)
_____Blended (2 food groups: FV+ optional dairy or grain; 1 serving each)
_____Snack (2 food groups: FV+ either grain or dairy; 1 serving each

Number of days per week the school food nutrition program is provided to students: _____

Number of snacks prepared to your students on each school day: _____

When, during the school day, is the snack delivered to the students? _____

Is the snack eaten in the classroom? (Please circle) YES NO Other (please specify)
_____

How do you serve snack to students (Please specify): ___Breakfast Classroom bins ____
Grab and Go ____ Other _____

Who delivers the snack to the classroom? (Please check all that apply)
_____Students
_____Teachers/School staff
_____Snack volunteers
_____Other (Please specify) _____

Do students help with the snack program? _____Yes _____No

If yes, in what way? (Check all that apply)___Helping with snack preparation
___ Helping with snack delivery
___ Helping with snack clean up
____ Other (Please specify) _____

If not, what are the reasons? (Please specify) _____

How often do the snacks provided to students meet the 2016 OSNP guidelines? (Please check
_____ 100% _____80-90% _____70-80% _____50-60%_____ Less than 50%

Number of snack volunteers (on average per snack day): _____
Is this adequate? (Please check) _____Yes _____Sometimes _____No
_____Comments _____

What is the average time commitment per snack day for volunteers (including time to prepare snack, delivery to classroom, cleanup time, prepare for next day)? (Please check)
_____30 minutes _____ 1 hour _____1.5 hours _____ 2 hours __more than 2 hours

Is this time adequate to prepare and clean up afterwards? ___Yes ___No _____Other (Please specify)_____

Have snack volunteers received any training (for example, Safe Food Handling)?
___Yes ____ No _____Other (please specify) _____

If yes, what training? _____
If no, do you think that some training would be helpful? _____not helpful at all
_____Somewhat helpful _____Very helpful

What other training, from your perspective, is helpful for you to make the program successful? Please comment _____

Do snack volunteers adhere to proper food safety procedures when preparing the snacks? (For example, washing their hands, washing produce, disinfecting preparation areas, before and after snack preparation) _____Yes _____No

In terms of facilities and supplies, do you have the following (check all that apply)
_____ Sink
_____ Adequate space to prepare snacks
_____Adequate fridge space to store perishable items
_____ Adequate storage space for utensils, non-perishable items
_____Adequate lightening and temperature and kitchen space to maneuver around
_____ Adequate utensils to prepare snacks (e.g., knives, cutting board, etc.)

Does a school milk program run in your school? _____Yes _____No
If yes, how many days per week?
On average, how many students are partaking in this program? _____

How do parents learn about snack program in your school? Check all that apply
_____School website
_____Letter or materials sent home
_____Through their children
_____Not sure they are
_____Other: _____

Do you have a waste management system in place? _____Yes _____No

If yes, please check all that apply: (e.g.,
_____Composter for organic waste
_____Recycling program for cardboards, etc.
_____Reusable cutlery
_____Other: _____

How often do you use consumable (non recyclable) utensils?
_____100% of the time
_____75% of the time
_____50% of the time
_____25% of the time
_____0% or none of the time

Who purchases the food for your snack program? (Check all that apply)
_____Volunteers (e.g. parents)
_____Teachers/Educational Assistants (EAs)
_____ (Vice) principle
_____OSNP (CPSFP delivery model)
_____ Other (please specify) _____

For those involved in the traditional school food nutrition program only, when does the shopper do their shopping? (check all that apply):
_____within school hours_____ during their free time

For those that do their shopping during their free time, is there any compensation (money for gas, in lieu time during school day)?

Where does the shopper usually go to purchase these food items (Check all that apply)
_____ Nofrills _____Food Basics _____Costco _____ Other _____

Does the shopper match prices; buy items on sales, or any other budgeting procedures?
_____Yes _____No _____Other _____

Does the shopper select Ontario grown or produced foods when possible or when available?
_____Yes _____ No

How many days does your school do shopping? _____Once a week _____Twice a week
_____ 3 times per week or more

For those involved in the new snack program (CPSFP), who is responsible for receiving the food delivered to the school? (Please check all that apply)
_____ Snack volunteer
_____ (Vice) principle
_____ Teacher/Educational Assistant (EAs)
_____Other school staff (e.g. custodian, the shopper)

_____Other (Please specify) _____
Who is responsible for putting away the food at your school? (Please check all that apply)
_____ Snack volunteer
_____ (Vice) principle
_____ Teacher/Educational Assistant (EAs)
_____Other school staff (e.g. custodian, the shopper)
_____Other (Please specify) _____

What day the food usually got delivered to your school?(Check all that apply)
_____Monday _____Tuesday _____Wednesday _____ Thursday _____ Friday

Time of food delivery? (Please check) _____morning _____afternoon

Does your school support the school food nutrition program by other means? _____Yes
_____No
If yes, how (Check all that apply) _____Fundraising
_____Community donations
_____Business donations
_____Parent donations
_____Other funding sources (e.g., Metro grants or Maycourt)
_____Other: _____

What is the financial process and administrative processes for purchasing and recording food purchases? (e.g., reimbursement policies, etc.)
_____
_____
_____
_____

Thank you for your invaluable support to children's health

Curriculum Vitae

Name: Mariam R. Ismail, NM, KTPC

Post-secondary Education and Degrees:

The University of Western Ontario
London, Ontario, Canada
2008-2012 B.Sc (*Honours Specialization in Foods and Nutrition*)

The University of Western Ontario
London, Ontario, Canada
2013-2015 M.A. (*Kinesiology*)

The University of Western Ontario
London, Ontario, Canada
2016-2020 Ph.D. (*Health and Rehabilitation Sciences/Health Promotion*)

Teaching Experience

Cognitive Ergonomics (KIN 3457), 2013, 2014; Ergonomics and Aging (KIN 4457), 2017

- Reviewed course materials, graded assignments for a class of 200 students, held course evaluation, co-graded students' presentations along with course instructor, and provided students with consultation on major term papers

Physical Activity and Exercise Guidelines for Older Adults (KIN 4474), 2015

- Reviewed course materials, graded assignments and exams for a class of 600 students, held course evaluation, proctored exams, and corresponded with students' queries via emails and held office hours

Nutrition, Exercise and Wellness (KIN 4477B) and Exercise Nutrition (KIN 3339A), 2016

- Attended lectures, reviewed course materials, graded assignments for a class of 1000 students, held course evaluation, proctored exams, responded to students' queries via emails, held office hours, performed body composition test (***BodPod)*** for body and provided nutrition advice to participants, offered "extra help" sessions for students interested prior to major examinations

Social Determinants of Health (HS1002B), 2018

- Reviewed course materials, graded assignments for a class of 1000 students, held course evaluation, proctored exams, corresponded with students' queries via emails, held office hours, delivered a 2-hour lecture on "***The Social Determinants of Chronic Diseases (Obesity): A call-to -action***" and "***Food Insecurit***y", obtained students' feedback of "***Good***" on the lecture's delivery and content, and worked collaboratively with the course instructor to effectively to design course materials , assignments, and midterms and final exam questions

Exercise Physiology (KIN 3330F), 2019

- Responsible for the delivery of lab-based course material and assisted 300+ students, contributing to their theoretical and practical knowledge of exercise physiology principles, and responsible for marking lab assignments, exams and quizzes.

Teaching Development

Western Certificate in University Teaching and Learning, 2014-2020

Completed an in-depth professional development program which included:

- *Teaching Assistant Training Program (TATP)*, an interdisciplinary course for graduate teaching assistants on the strategies and practices of university teaching.
- *Advanced Teaching Program (ATP)*, an interdisciplinary course for graduate teaching assistants on the strategies and skills necessary to teach their own courses.
- 12 (2 hours each) workshops in the "*Future Professor Series*" including "***writing teaching philosophy***", "***preparing your teaching dossier***", "***marking and proctoring strategies***", "***course design***", "***knowledge exchange***" and "***preparing your diversity statement****"*
- Teaching Mentor Program (TMP), a unique opportunity for graduate students to receive feedback on their teaching and classroom management approaches from peers in their own teaching environment.
- Development of a teaching portfolio
  Written project: "***Integrating non-traditional teaching techniques in teaching university-level nutrition courses***"

Western Certificate in Leadership Education Training Program, 2017-2020
Completed an in-depth co-curricular program which help students develop leadership skills they can then put into use in any environment. Tier one of the program offers workshops and skill development geared toward "***individual leadership****"*. Tier two of the program offers workshops and skill development geared toward "***group leadership****"*. Tier three asks participants to exercise the leadership skills they have developed through volunteering in their community "***Community Leadership***".

Professional Development

Youth Sustainable Development Goals Training, 2017
Completed an in-depth one-day training workshop which focuses on the advocacy and local implementation of the United Nations Sustainable Development Goals (SDGs).

Toronto Knowledge Translation Professional Course, 2019
Completed an in-depth five-day teaching curriculum which focuses on the core competencies of Knowledge Translation (KT) in Canada

Meta-Analysis and Network Meta-analysis Workshop, 2019
Completed a 4-day training workshop which focuses on how to perform simple and more advanced meta analyses.

Health Outcomes, Costs and Cost-effectiveness Analysis, part I and II workshop, 2019
Completed a two-day training workshop on the fundamental concepts and analytical methods used in the analysis of health outcomes, costs and cost-effectiveness studies, valuing quality-of-life instruments, analyzing health outcomes data, and interpreting cost-effectiveness results in practice.

Canadian Professional Grant Development Workshop, 2020
Completed an in-depth two-day training course which included interactive presentations and case study discussion on Tri-Council and corporate donors funding sources, proposal writing grants, and realistic budgets.

The Canadian Nutrition Society Trainee Mentorship Program, 2020
Completed a one-year program in which practical career advancement skills on teaching, research, service and administrative, were nurtured through collaboration on research projects, manuscripts reviewing and writing, presentations and invitation to workshops and seminars, and supervision of undergraduate and master students.

Technical Skills

- Data entry and analysis utilizing Elizabeth Stewarts Hands and Associate (ESHA) software
- The Psychology of Experimental Building Language (PEBL)
- The Statistical Package for the Social Sciences (SPSS) software program
- NVIVO qualitative software program
- RevMan Meta-analysis software program

Professional Affiliations

- 2012-Present***, Member***, Canadian Society of Nutrition Management (CSNM)
- 2018-Present, ***Member***, Canadian Nutrition Society (CNS)
- 2019-Present, ***Member***, Knowledge Translation Community Of Practice (KTPC)
- 2019-Present, ***Member***, The Society of Implementation Science in Nutrition Sciences (SISN)