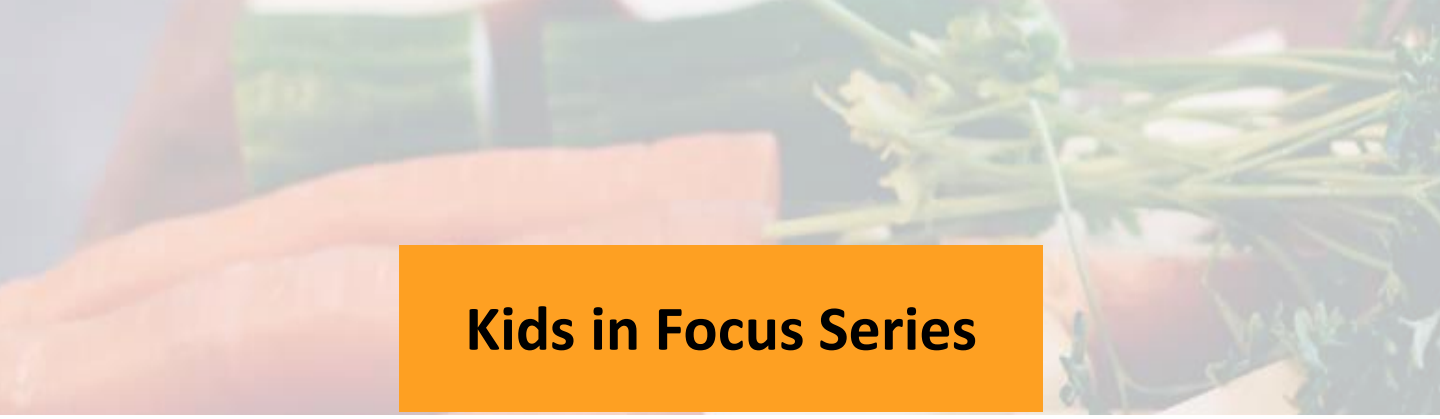

Kids in Focus Series

Effective Interventions to Increase Vegetable and Fruit Intake in School-Aged Children

November 2016

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This scoping review has been produced as part of a series to support the Ministry of Health and Long Term Care's Healthy Kids Strategy – Healthy Kids Community Challenge.

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Key Messages

1. Multi-component interventions, which include multiple health promotion and behaviour change strategies, that are implemented in various settings, such as school, community, and home, are most effective.
2. Target an increase in consumption of whole vegetables and fruit, rather than fruit juice, to ensure children and families are eating a balanced diet of both vegetables and fruit in accordance to dietary guidance.
3. Develop and deliver family-focused, tailored nutrition education to parents and caregivers, as well as children, to influence eating behaviours of the family as a whole.
4. Include role models such as peer leaders, parents, teachers, community champions and cartoon media characters in interventions and social marketing campaigns.

Overview

Background

In alignment with theme three for the Healthy Kids Community Challenge, the authors conducted a review of current literature to develop an inventory of evidence-informed, community-based intervention strategies and samples of social marketing campaigns to increase vegetable and fruit consumption among school-aged children.

Research Question
What community-based interventions and strategies are effective to increase vegetable and fruit consumption among school-aged children?

Purpose
The purpose of this report is to provide evidence-based recommendations for interventions and specific health promotion strategies that would be cost-effective and feasible to implement in community-based settings to increase vegetable and fruit consumption among school-aged children.

Methods

Review of Evidence
This report is based on a collection of systematic reviews from three databases. Primo Central, Pubmed, and the Cochrane Library. The following keywords were used to capture relevant reviews: “fruit”, “vegetable”, “consumption”, “child”, “children”, “youth”, “recreation”, “schools”, “community”, “gardening”, “intervention”, “education”, “systematic review”. The first round of screening involved identifying systematic reviews that looked at community and school-based interventions to increase vegetable and fruit consumption in children under 18. Twenty-two systematic reviews were discovered during the search. The second round of screening involved assessment of studies within the reviews and removing older reviews with studies that were included in higher quality reviews. Also during the second round, reviews that did not meet the following inclusion and exclusion criteria were removed:

Inclusion Criteria	Exclusion Criteria
Public Schools Public/Municipal Community/ Recreation Centres Community Settings School-aged children Systematic reviews	Adults High school aged adolescents (unless elementary aged children were also included)

A total of eight systematic reviews were included in this report, which discussed school, home, community, and gardening interventions to increase vegetable and fruit consumption in school-aged children. A table summarizing the systematic reviews is included in Appendix A.

Selection of Social Marketing Campaigns
Six social marketing campaigns were discovered through the scoping review and a Google search using the terms: “children”, “child”, “youth”, “fruit”, “vegetable”, and “social marketing”. School-based and community-based campaigns were chosen that included key messages that would be helpful for community partners to adapt to their communities. A table summarizing the social marketing campaigns is included in Appendix B.

Main Findings and Recommendations

Interventions Design

The majority of systematic reviews reported that interventions that were multi-strategic (e.g., snack distribution programs, education, gardening, food preparation, social marketing campaigns, including character branding, and school nutrition policy) and implemented in various settings (e.g., schools, home and community), were effective at increasing vegetable and fruit intake in school-age children (Aloia et al., 2016; Evans et al., 2012; Knai et al., 2005; Bourke et al., 2014, Kraak & Story, 2015). However, the interventions that included multiple health promotion and behaviour change strategies were found to be diverse with respect to the specific components of the programs, thus many insignificant findings were also found (Aloia et al., 2016). Interventions were more likely to be effective when they were implemented over a longer period of time (≥ 12 months) rather than as a one-time event (Evans et al., 2012). Knai and colleagues (2005) recommend that interventions to promote vegetable and fruit consumption should be implemented for a minimum of 12 months to increase effectiveness. Therefore, school-based programs should also include community-based activities implemented during the summer months when students are away from school.

Schools:

a. Food service and distribution programs

School programs that increase access to and availability of vegetables and fruit, such as snack distribution programs, have shown to moderately increase vegetable and fruit consumption (Evans et al., 2012). Interventions that included working with food service staff within the school to provide a variety of vegetable and fruit and fruit options to children, have also shown to improve consumption of vegetables and fruits (Aloia, 2016). Cohen and colleagues (2014) provided five different vegetable and fruit options weekly and found a significant increase in vegetable consumption, as well as increased consumption of vegetables and fruit combined. It is also recommended that food service staff provide verbal encouragement and incentives (e.g., stickers) for choosing vegetables and fruit to promote intake (Knai et al., 2005, Aloia et al., 2016). This review also indicates that school nutrition policies, regarding vegetable and fruit distribution, should be developed through established advisory committees and should aim to increase access and availability of vegetables and fruit, as well as to limit access to unhealthy "junk" food (Knai, et al., 2005).

b. Education and curriculum based activities

Curriculum-based education approaches within schools were found to be effective in increasing vegetable and fruit consumption in children, particularly in combination with theory-based behaviour change and teaching strategies (e.g., experiential learning, positive reinforcement, goal setting and problem solving) (Aloia et al, 2016, Knai et al, 2005, Ciliska et al., 2000, Bourke et al., 2014, Dudley, 2015). It is important that nutrition education is integrated into school curriculum and provides specific content and clear messaging that targets vegetable and fruit consumption (Ciliska et al., 2000; Knai et al., 2005). Special training should be provided to

teachers, by registered dietitians, regarding nutrition education content/curriculum and best practices for the delivery of education on vegetables and fruit (Ciliska et. al, 2000). Educational strategies should include culturally-tailored lessons, parental involvement, using literary or animated characters to promote and/or act out behaviour of eating vegetables and fruit, healthy homework and, most importantly, the opportunity for experiential or "hands-on" learning, such as food preparation, taste testing, and gardening, to increase knowledge, preferences and consumption of vegetables and fruit (Ciliska et al., 2000, Langellotto & Gupta, 2012). Moreover, curriculum-based education that was delivered across two or more traditional school subjects was found to be an effective strategy for increasing consumption of vegetables and fruit, thus cross-curricular approaches are recommended (Dudley, 2015). Social marketing has shown to increase effectiveness of curriculum-based nutrition education, specifically with promoting key messages that target vegetable and fruit intake at point-of-decision (e.g., the cafeteria setting, canteen, concession) and around the school; for example, messaging on posters or on material disseminated through information booths (Evans et al., 2012, Knai et al., 2005, Ciliska et al., 2000).

In some interventions that targeted families with younger children (4 – 9 years), school-based nutrition education was tailored and delivered to parents only and was also found to be effective in increasing daily vegetable and fruit consumption among children (Bourke et al., 2014). As such, it is important to develop and deliver family-focused, tailored nutrition education to parents/caregivers, as well as children to influence eating behaviours of the family as a whole. Furthermore, the use of dietitians and paraprofessionals (parents or peers trained by dietitians) in the delivery of nutrition education tailored to low-income families was shown to be effective (Ciliska et al., 2000). In lessons, targeting low-income families, there was an emphasis on dietary intake for the whole family and tailoring lessons/activities to the families' existing knowledge, skills and resources (Ciliska et al., 2000).

Home

While there is limited evidence supporting home-based interventions on their own as effective in increasing vegetable and fruit intake among children, the home setting is an important component of an effective comprehensive intervention; implementing multiple health promotion strategies in a variety of settings (Aloia et al., 2016; Knai et al., 2005). Parent or caregiver involvement should be a priority in school interventions, as well as in the home where parents can modify the home environment to make vegetables and fruit available for children (Knai et al., 20015). Home-based interventions should include family-focused educational strategies (e.g., healthy homework, education that targets parents and children), involving parents/caregivers in the delivery of the intervention, and on-going communication to parents/caregivers (Evans et. al, 2012, Knai et a., 2005, Dudley, 2015).

Gardening

Gardening interventions targeting children have been implemented in schools and communities, and provide an ideal setting to teach children about vegetables and fruit (Evans et al., 2012). Garden-based activities allows for experiential learning about food and nutrition, which is shown to be a highly effective strategy to increase not only knowledge, but preference for and consumption of vegetables and fruit (Dudley, 2015, Langellotto & Gupta, 2012). In comparison to nutrition education programs with no gardening component, garden-based nutrition education programs had a greater impact on consumption of vegetables and fruit, with a more pronounced impact on vegetable consumption, specifically (Langellotto & Gupta, 2012). It is recommended that garden-based nutrition education programs provide the opportunity for children to plan, maintain, and harvest vegetables and fruit, as well as to use the harvested produce to prepare dishes (Langellotto & Gupta, 2012). School-based gardening programs in Ontario may face challenges due to the timing of summer vacation when there are the greatest opportunities to garden. Therefore, community-based gardening programs may be a more feasible option and they provide the opportunity to deliver a long-term intervention beyond the school-year (≥ 12 months), which is shown to be effective for sustained increase in consumption of vegetables and fruit (Evans et al., 2012, Knai et al., 2012).

Community

There is limited evidence in support of community-based interventions to have a significant impact on vegetable and fruit consumption among children, when not also implemented in other settings, such as school and home (Ganann et al., 2014). However, community activities have been components of school-based interventions that were effective to increase vegetable and fruit consumption (Bourke et al., 2014). Community-based interventions are particularly important because they can be implemented during the summer months when students are not in school. To increase effectiveness and sustainability of a comprehensive intervention, community-based interventions should include community partners, such as youth service providers, and the local vegetable and fruit producers and vendors (e.g., food markets or grocers, farmers, and community gardens) (Knai, 2005).

Role Modeling

To build peer support and student involvement, student leaders should be involved with the program (Knai et al., 2005). Knai and colleagues (2005) also recommend that programs should involve parents and caregivers not only at home, but also in the school setting. Parents and caregivers can act as role models by exposing children to vegetables and fruit and providing encouragement (Bourke et al., 2014). Additionally, the use of animation or literary characters to model health eating behaviours has shown to be an effective strategy to increase vegetable and fruit consumption among school-aged children (Dudley, 2015, Kraak & Story, 2015).

Social Marketing – Character Branding

When developing a comprehensive intervention, consider the use of character branding and cartoon media characters as role models in social marketing campaigns to promote vegetables and fruit in schools and in the community. The use of character branding to promote healthy foods, vegetables and fruit, has been associated with an increased willingness to try and preference for vegetables and fruit and increased consumption of vegetable and fruit among children. (Kraak & Story, 2015). With the use of character branding to market foods, studies show that children prefer a character versus no character on packaging; a familiar character versus an unfamiliar character; and a conceptually congruent character-product pair (e.g., rabbit and carrot) rather than an incongruent conceptual character-product pair (e.g., rhino and a carrot). Moreover, the character branding effect is stronger with unhealthy foods; children prefer energy-dense foods over vegetables and fruit when both are branded with the same character. Thus, it would be important to assess the environment for food product marketing that uses character branding to promote unhealthy foods, as these may be negatively influencing the child's preferences, selections and intake and impeding social marketing strategies to promote health behaviour change.

One intervention that included character branding in social marketing used a branded media cartoon character, Elmo from the television show Sesame Street, on packaging of vegetables and fruit (Keller et al., 2012). Specifically, Keller and colleagues (2015) found that the use of fun, coloured packaging of vegetables and fruit with a picture of Elmo, along with stickers inside the packaging that children can collect and win prizes for, was associated with increased consumption of vegetables and fruit. Another example, not included in Keller and colleague's (2015) systematic review, is a school-based intervention that promoted the cafeteria's salad bar using a vinyl banner with images of vegetable characters that was fastened around the sides of the salad bar (Hanks et al., 2016) This strategy was found to increase vegetable consumption (Hanks et al., 2016). Another single study exposed pre-school children to two, 30-second commercials that used vegetable and fruit characters as role models, encouraging consumption of vegetables and fruit, found an increase in preferences for vegetables and fruit (Nicklas et al., 2011). A table summarizing additional individual studies on social marketing strategies is included in Appendix C.

Vegetable versus Fruit Intake

Although the majority of interventions included in this scoping review have promoted vegetable and fruit intake, most studies reported that improvements in consumption were mainly due to increases in fruit consumption; not from vegetables (Evans et al., 2012). When fruit juice and fruit were combined to measure consumption, the improvement in intake was even greater. However, when planning an intervention to increase fruit and vegetable consumption, it is important to note that 100% fruit juice is high in sugar. Despite the fact that 100% fruit juice contains free sugar rather than added sugar, the consumption of excess sugar has been associated with increased risk for a range of diseases, such as obesity, cardiovascular disease, diabetes, and cancer (Heart and Stroke Foundation, 2014). As such, Canada's Food

Guide advises that vegetables and fruit be consumed more often than juice (Health Canada, 2011). Moreover, the Institute of Medicine has recommended that whole vegetables and fruit are the preferred option over fruit juice for children and, specifically, for vulnerable populations, substitutions of water and whole fruit should be made over any fruit juice (Murphy, 2011). For these reasons, interventions should target an increase in consumption of whole vegetables and fruit, rather than fruit juice.

Among the systematic reviews included in this scoping review, only two strategies were found to increase vegetable intake over fruit intake. The successful strategies included a school-based intervention that increased the vegetable variety by providing at least five different options of vegetables and fruit each week, and gardening interventions as identified through a meta-analysis. Separate measurement of vegetable and fruit intake among participants is recommended at baseline and throughout the duration of the intervention to identify how many servings of each are being consumed and to ensure consumption is increased such that children are eating a balanced diet of both vegetables and fruit in accordance to dietary guidance. Based on the assessment of participants' consumption, if vegetable intake is low, interventions could be adjusted to have a greater focus on increasing vegetable intake as the primary objective for the intervention. Specifically, garden-based nutrition education programs are shown to have a robust positive impact on increasing vegetable consumption among children in part of a comprehensive, multi-strategic intervention (Langellotto & Gupta, 2012).

Indigenous Population

There were no systematic reviews included that specifically focused on children from indigenous communities, however, there exists individual studies that evaluate vegetable and fruit intakes following interventions targeting these communities in Canada. In one school-based intervention, targeting First Nations children in Canada, food distribution in the school included healthy snacks (i.e., fruit or fruit juice as an afternoon snack) and vegetables when time and availability allowed. The results of this intervention showed that vegetable and fruit intake was higher among program participants in comparison to children who did not participate in the program (Skinner, 2012). Another study examined the impact of a school gardening program, supplemented with a healthy snack distribution program, for First Nations children and found improvements in children's preference towards vegetables and fruit (Triador et al., 2015). Although this intervention found no improvements in home-based consumption of vegetables and fruit, Triador and colleagues (2015) suggest that a lack of family participation may have influenced this outcome. Another intervention, called *Action School! BC,* focused on Aboriginal children and targeted the school, home and community settings (Dudley, 2015). The *Action School! BC* program was found to be effective in increasing the variety of vegetables offered in schools (Dudley, 2015).

Limitations of Review

Among the 22 systematic reviews that met inclusion criteria, eight reviews were selected based on the quality of evidence provided. The main limitation of this scoping review was the heterogeneity between the types of single study interventions included in the systematic reviews, which limits the ability to compare and draw conclusions from the results. As such, no one intervention could be promoted; rather, specific strategies are recommended when found repeatedly to be effective. Moreover, comprehensive interventions, with multiple health promotion and behaviour change strategies that are implemented in a range of diverse settings, can be difficult to replicate and dependent on the availability of resources. Although the systematic reviews with the highest quality of evidence available were included in this scoping review, the quality of the studies included in the systematic reviews ranged from poor to high quality.

Appendix A

Evidence Chart

Interventions that Increase Vegetable and Fruit Consumption

Systematic Review – Brief Description and Target Population	Interventions Details and Main Findings	Comprehensive Approach – Health Promotion and Behaviour Strategies	Sources
Systematic review of school-based environment interventions to increase vegetable and fruit consumption Students in kindergarten to grade 8 (US) March 2016	• This systematic review included 14 articles published between 2006 and 2014 that looked at the effects of school-based nutrition interventions on students' vegetable and fruit consumption. • 13/14 studies were comprehensive, multi-strategic interventions. • Examples of intervention components of the studies included fruit and vegetable distribution programs, curriculum-based nutrition education, homework, social marketing campaigns through various communication vehicles (e.g., school posters, daily announcements) interactive children's books, children's cookbooks, gardening, and involvement of students, teachers and parents. • Interventions that included working with food service staff to provide a variety of vegetable and fruit options for students had modest positive outcomes. • Standard nutrition education had modest	**Education and awareness program:** Providing standard nutrition education to promote fruit and vegetable intake (e.g., information on food groups, balanced meals, food nutrients, healthy snacks, benefits of vegetables and fruit, providing interesting facts about vegetables and fruits, gardening lessons, computer-based lessons (iPad app based lessons). **Social marketing campaign:** Various themes, such as "5-A-Day" and "Fruit and Vegetable of the Day", with simple messaging and consistent messaging delivered multiple ways (e.g., announcements, posters, stickers) and education on extending the fruit and messaging information to others. **Supportive environment:** Work with food service staff to provide access to a variety of vegetable and fruit options. (e.g. offering at least 2-3 different choices of vegetables and	Pertinence of the recent school-based nutrition interventions targeting vegetable and fruit consumption in the United States: A systematic review (Aloia et al., 2016). http://www.ncbi.nlm.nih.gov/pmc/articles/PMC4847108/

Systematic Review – Brief Description and Target Population	Interventions Details and Main Findings	Comprehensive Approach – Health Promotion and Behaviour Strategies	Sources
	positive outcomes (e.g., classroom education, parent nutrition education, and providing education for teachers) and the more effective interventions included a nutrition education component. • Multi-strategic interventions were found to be effective, which is in agreement with other systematic reviews. (e.g., nutrition education, providing a variety of vegetable and fruit, homework, parent involvement) • Recommend focus on increasing both fruit and vegetable consumption and measure consumption both separately and jointly.	fruit). Weekly fruit and vegetable tastings. Verbal praise and incentives provided (e.g. stickers) for eating the fruit and vegetable of the day. **Peer support/student involvement** Launch a fruit and vegetable consumption challenge with a goal for daily consumption of fruit and vegetables and incentives for reaching behavioural goals (e.g., "5-A-Day" challenge). **Community engagement:** Provide nutrition training to parents, teachers, and food service staff involved in the program. **Behaviour change strategies:** Use theory-based health behavior change strategies (e.g., self-monitoring/tracking behaviour, goal setting and contingent/positive reinforcement).	
Systematic review and meta-analysis of school-based interventions to increase vegetable and fruit consumption	• This systematic review looked at 27 articles, with a meta-analysis on 21 articles. • Examples of intervention components of the studies included nutrition education curriculum, communication (e.g., newsletters to parents, or with students and teachers at school), incentivized food marketing (e.g., incentives to buy more	**Education and awareness program**: Provide nutrition education that is curriculum-based and builds both knowledge and skills (e.g., nutrition education, food preparation, taste-testing, gardening). Embed social marketing into healthy eating curriculum (e.g., social marketing messages and/or videos).	Systematic review and meta-analysis of school-based interventions to improve daily fruit and vegetable intake in children aged 5 to 12 (Evans et al., 2012) http://www.ncbi.nlm.n

Systematic Review – Brief Description and Target Population	Interventions Details and Main Findings	Comprehensive Approach – Health Promotion and Behaviour Strategies	Sources
Children aged 5-12 years (UK, US, Norway, Denmark, Netherlands, New Zealand) September 2012	vegetables and fruits and point-of-purchase incentives), social marketing (e.g., videos), food preparation and tasting, home-based projects (e.g., homework), food provision and distribution programs (e.g., fruit and vegetable availability at lunch or in tuck shop), modifying school environment, parent involvement and community and industry involvement (e.g., supermarkets and industry partners), goal setting and problem solving. • Improvement in vegetable and fruit intake was mostly due to increases in fruit consumption. • This review found that multi-strategic interventions, implemented in various settings, resulted in greater improvements in vegetable and fruit intake compared to single strategy interventions. • Programs that distribute vegetables and fruit in schools may moderately improve children's intake. • Intervention/programs that were ≥ 12 months in duration showed a moderate impact on long-term vegetable and fruit impact, suggesting that, interventions should take place over a long period of time instead of one-time events to have an impact on children's health.	**Supportive environment:** Increase availability and access to vegetables and fruit (e.g., distributing free fruits and vegetables as snacks or offering for sale in tuck shops). **Parent, family and caregiver partnerships:** Home-based projects with parent involvement and communication with parents verbally and through newsletters. **Community engagement:** Community and industry involvement, such as the involvement of supermarkets and industry partners. **Behaviour change strategies**: Use theory-based health behavior change strategies (e.g., goal setting and problem solving).	ih.gov/pubmed/22952187

Systematic Review – Brief Description and Target Population	Interventions Details and Main Findings	Comprehensive Approach – Health Promotion and Behaviour Strategies	Sources

Systematic review of school and community-based interventions to increase vegetable and fruit consumption
 	
Primary school children aged 5 to 12 years and secondary school children aged 13 to 18 years. (US, UK, and Ireland)
 	
February 2006
	• This systematic review included 15 articles, where 11 were randomized controlled trials.
	• Examples of intervention components included nutrition education (e.g., nutrition curriculum, classroom-based, homework, vegetable and fruit exposure and preparation skills), school food service changes, behaviour change strategies (e.g., self-monitoring, goal setting and problem solving), teacher and parent training and involvement, industry involvement, vegetable and fruit competitions with incentives for participation, school-wide social marketing campaign, and healthy eating policy.
	• Effective interventions, associated with an increase in vegetable and fruit consumption, included:
	  ○ Specific attention to vegetable and fruit consumption, instead of general nutrition recommendations, that is integrated into school curriculum and supported by social marketing materials promoted in the cafeteria and around the school.
	  ○ Hands-on activities with vegetables and fruit, including developing food skills and taste testing.
		Education and awareness program: Provide nutrition education that targets vegetables and fruit specifically, and integrate it into the curriculum. Ensure the education is interactive, hands-on and provides direct exposure to vegetables and fruit. Include teacher training.
		
		Social marketing campaign: Promote vegetable and fruit consumption through social marketing campaigns, such as "5-a-day Power Play!" Use various communication channels (e.g., posters, newsletters, point-of-purchase education/messaging, public service announcements through local media). Use fictional cartoon characters as role models and a vehicle for communicating social marketing messaging to younger children.
		
		Supportive environment: Encourage food service staff to promote vegetable and fruit choices (e.g., at point of purchase) and make healthy school meal changes to create an enabling environment. Complement environmental access interventions with educational and social marketing messaging in the environment, particularly at point-of-decision making.
			Getting children to eat more fruit and vegetables: A systematic review (Knai, et al., 2005) http://www.ncbi.nlm.nih.gov/pubmed/16375956

Systematic Review – Brief Description and Target Population	Interventions Details and Main Findings	Comprehensive Approach – Health Promotion and Behaviour Strategies	Sources
	○ Special training for teachers. ○ Having role models or peer/student leaders, including fictional cartoon characters. ○ Having verbal encouragement from the school food service staff to choose vegetables and fruit. ○ Including involvement of parents at school and home. ○ Developing school nutrition policy through established advisory committees. ○ Involving community partners such as youth service providers, local vegetable and fruit industry. ○ Having interventions for a minimum of 12 months for long-term behaviour change. • Barriers to change in children and adolescents include individual barriers, such as erratic eating behavior, and environmental barriers, such as marketing of fast food, poor access to healthy foods and high cost of vegetables and fruit. • Barrier to school-based interventions include poor coordination and communication between teachers, school staff and parents and that nutrition is not seen as a priority in some schools with a	**Supportive policy:** Develop school nutrition policy through established advisory committees to increase access and availability of vegetables and fruit and to limit access to unhealthy "junk" foods. **Peer support/ student involvement:** Include student peer leaders as role models. Initiate fruit and vegetable competitions or challenges, with incentives for participation. **Parent, family and caregiver partnerships:** Provide training to and involve parents and caregivers at school and at home (e.g., home activities, newsletters, serving vegetables and fruits at school). **Community engagement:** Involvement of local vegetable and fruit industry, such as producers and markets. Involvement of youth service providers from the community. Including local media such as TV or radio. Provide training to and involve teachers and food service staff to increase access to healthier foods and encourage healthy choices. Provide information about local organizations that offer low or no-cost nutrition programs for families/parents.	

Systematic Review – Brief Description and Target Population	Interventions Details and Main Findings	Comprehensive Approach – Health Promotion and Behaviour Strategies	Sources
	busy curriculum.	**Behaviour change strategies**: Use theory-based health behavior change strategies (e.g., self-monitoring through food diaries, goal setting and problem solving).	
Systematic review and meta-analysis of school-based interventions to increase vegetable and fruit consumption Children in grades K-6 (USA, UK, Canada, Australia, Italy, Norway, New Zealand, Iceland, Netherlands, Spain) February 2015	• This systematic review included 37 studies that looked at vegetable and/or fruit intake, with a meta-analysis. • The teaching strategies and approaches exhibited across the studies included enhanced nutrition curriculum (e.g., specialty education programs, beyond existing health curriculum, delivered by teachers or specialists), culturally-tailored lessons (e.g., nutrition for Aboriginal communities), cross-curricular (e.g., education delivered across two or more traditional school subjects), parental involvement (e.g., within or outside school environment), contingent/positive reinforcement (e.g., incentives given to students), literary or animation abstraction (e.g., where a character promotes or exemplifies a positive behavior), games-based (e.g., to promote positive behavior and knowledge), web-based (e.g., internet-based resources for students to access at home or at school) and social marketing messaging to support curriculum lessons.	**Education and awareness program:** Deliver high quality nutrition education on vegetables and fruit across two or more traditional school subjects. Complement cross-curriculum education with experiential-learning or "hands-on" learning strategies to see greater impact on consumption and nutritional knowledge (e.g., gardens, cooking skills, food preparation, and taste testing). Incorporate a variety of teaching strategies and approaches (e.g., enhanced nutrition curriculum, culturally appropriate lessons, parental involvement, healthy homework, and literary or animation abstraction). **Social marketing campaign:** Use social marketing messaging, such as "5 a Day – for Better Health," to support and reinforce educational and environmental interventions. **Parent, family and caregiver partnerships:** Include parents or caregivers in the intervention (e.g. assisting with delivering the intervention, home-based activities, and training/education to parents to support a	Teaching approaches and strategies that promote healthy eating in primary school childre n: a systematic review and meta-analysis (Dudley, 2015) http://www.ncbi.nlm.nih.gov/pubmed/25889098

Systematic Review – Brief Description and Target Population	Interventions Details and Main Findings	Comprehensive Approach – Health Promotion and Behaviour Strategies	Sources
	• The review indicated there were statistically significant increases in vegetable and fruit consumption in 60% of curriculum-based approaches. The meta-analysis also indicated that curriculum-based approaches were effective. • However, many studies that used curriculum-based approaches, also included other health promotion and behaviour change strategies, such as experiential-learning to build skills, parental-involvement, positive reinforcement, social marketing, goal setting and problem solving. • Specifically, experiential-learning strategies (e.g., school/community gardens, cooking skills or food preparation) and cross-curricular approaches (e.g., delivered across two or more traditional primary school subjects) were found to be effective to improve vegetable and fruit consumption.	contingent/positive reinforcement approach in the home). **Behaviour change strategies:** Use theory-based health behavior change strategies (e.g., goal setting, problem solving). Contingent/positive reinforcement is particularly shown to be a highly effective strategy for behaviour change among primary school children.	
Systematic review of school and community-based interventions to increase vegetable and fruit consumption	• This systematic review included 15 studies that looked at the effectiveness of school and community-based interventions to increase vegetable and fruit consumption for individuals over the age of 4 years. Six studies were targeting school-aged children.	**Education and awareness program:** Provide clear messages about increasing vegetable and fruit intake versus broad messages about nutrition. Support for dietitian and nutrition paraprofessionals (parents or peers trained by dietitians) to develop and deliver education and skill-based programming, particularly for	Effectiveness of Community-Based Interventions to Increase Fruit and Vegetable Consumption (Ciliska et al., 2000)

Systematic Review – Brief Description and Target Population	Interventions Details and Main Findings	Comprehensive Approach – Health Promotion and Behaviour Strategies	Sources
Children in kindergarten to grade 12 (US) December 2000	• Examples of school intervention components of the studies included nutrition education within the school curriculum and to parents (e.g., meal planning, shopping and food preparation tailored to family resources), increasing availability and variety of vegetables and fruit, mass media campaign with social marketing materials that support curriculum (e.g., point-of-decision promotion/messaging, posters, table tents in cafeterias), activity sheets, experiential learning (e.g., taste testing, snack preparation, cooking, preserving, food safety), comic books about nutrition, team competitions, training for food service staff, and industry involvement. • Interventions for school-aged children that included clear messaging about vegetables and fruit in the school curriculum, along with social marketing (e.g., posters around the school and cafeteria) that supports the curriculum were effective with increasing consumption. • Interventions that involved the family and provided parent education (e.g., brochures, taste-testing, recipes, and food tips) were more effective. • Multi-strategic interventions were most	low-income families, and emphasize dietary intake for the whole family when working with low-income families. Tailor lesson activities, food preparation, and practices to existing knowledge, skills and family resources. **Social Marketing:** Initiate a mass-media campaign using a variety of communication channels; particularly, in environments where dietary decisions are made and food is consumed (e.g., cafeteria, canteen, concession). Use point-of-decision promotion, messaging and nutrition labelling to influence dietary behaviour. **Supportive environment:** Distribute posters around school and cafeterias with clear messaging about vegetables and fruit to serve as cues to action. Increase availability and access to vegetables and fruit in cafeteria and food service areas. **Peer support/student involvement:** Partner kids with a "buddy" to complete activities and mutually support. **Parent, family and caregiver partnerships:** Include family in the program (e.g. family fun nights at school). Provide parent education	http://www.sciencedirect.com/science/article/pii/S0022318200705942

Systematic Review – Brief Description and Target Population	Interventions Details and Main Findings	Comprehensive Approach – Health Promotion and Behaviour Strategies	Sources
	effective to increase fruit and vegetable consumption. • Interventions that took place over a longer time were more effective than those with only a few sessions or one-time events. • Interventions that used dietitians or paraprofessionals (peers and parents trained by dietitians) to deliver education and skill-based programs to low-income populations were successful.	(e.g. send education packages with brochures, recipes, and food tips to parents and involve parents in taste-testing) **Behaviour change strategies:** Use theory-based health behavior change strategies (e.g., goal setting, problem solving, self-monitoring behaviour, self-assessment and behavioural reinforcement).	
Systematic review and meta-analysis of school and community-based garden-based interventions to increase vegetable and fruit consumption Children in kindergarten to grade 8 (US) August 2012	• This systematic review and meta-analysis looked at 20 studies on garden-based nutrition education programs impact on vegetable and fruit consumption. • Examples of intervention components of the studies included gardening activities (e.g., planting, maintaining gardening, harvesting, composting, food safety, culturally relevant gardening), nutrition education focused on increasing consumption of healthy foods and/or decreasing consumption of unhealthy foods (e.g., food guidance, serving sizes, healthy consumption behaviours, food preparation with garden grown produce, taste testing, increasing consumption of vegetables and fruit, culturally relevant vegetables and snacks), monthly visits to local farmers'	**Education and awareness program:** Provide garden-based learning activities that are integrated into a nutrition education program focused on increasing consumption of vegetables and fruit and other healthy eating behaviors, as well as decreasing consumption of unhealthy foods. Provide a variety of gardening-related experiential learning opportunities and topics (e.g., planting, maintaining garden, harvesting produce, taste testing, and food preparation using the harvest to make simple dishes (i.e. salsa, salad). **Supportive environment:** Increase access and availability to vegetables and fruit by growing edible produce through community gardening and garden programs. Increase learning	Gardening Increases Vegetable consumption in School-Aged Children: A Meta-Analytical Synthesis (Langellotto & Gupta, 2012) http://horttech.ashspublications.org/content/22/4/430.full

Systematic Review – Brief Description and Target Population	Interventions Details and Main Findings	Comprehensive Approach – Health Promotion and Behaviour Strategies	Sources
	market, newsletters to parents, student goal setting, social marketing signage in cafeteria and food service staff increasing variety and attractiveness of vegetables and fruit in serving line. • The meta-analysis found that participation in nutrition education programs lead to increased nutrition knowledge, whereas, increases in preferences and consumption was primarily seen in gardening programs. • There was a significant increase in vegetable and fruit consumption, preference and nutrition knowledge in nutrition education interventions that integrated a gardening component. • In comparison to education programs with no gardening component, where no significant increase was observed for either vegetables or fruit, gardening programs increased consumption of both vegetables and fruit; with a larger, robust positive impact on increasing vegetable consumption.	potential by providing food/nutrition education in the environment in which food is produced and prepared. **Community engagement:** Provide garden-based nutrition education at community-based gardens. Developing partnerships with community members, organizations and institutions (e.g., school, hospital, local producers, community group) to develop a community garden and/or gardening program or to implement programming in a garden that already exists.	
Systematic review of experimental studies that used brand mascots and cartoon media	• This systematic review looked at 11 studies to learn about the effect of brand mascots and cartoon media characters on children's vegetable and fruit consumption. • Examples of food branding/marketing	**Social marketing campaign:** Promote vegetables and fruit in schools and communities by using character branding as part of a broader social marketing campaign (e.g., offer prepared vegetables and fruit in	Influence of food companies' brand mascots and entertainment companies' cartoon

Systematic Review – Brief Description and Target Population	Interventions Details and Main Findings	Comprehensive Approach – Health Promotion and Behaviour Strategies	Sources
characters to increase vegetable and fruit intake Children aged 2 to 11 years (US, Netherlands, Belgium, Guatemala, Turkey) February 2015	interventions included, using various types of character branding (e.g., Elmo from Sesame Street, Dora the Explorer) in combination with healthy and non-healthy food items (e.g., fresh cut bananas vs. banana flavoured candy) to measure child's food selection and intake; the effect of branding on children's willingness to taste food; the relationship between a child's recognition of popular characters on packaging and a child's taste or snack preference; and the relationship between exposure to media commercials that featured cartoon characters paired with a food product and the child's preference for the product. • The 11 studies used a total of 21 different popular cartoon media characters, however, no study tested brand mascots owned by food, beverage or restaurant companies. • Children showed a high recognition of the popular characters used in studies (60-90%). • Children preferred: character versus no character on packaging; a familiar character vs. an unfamiliar character; and a conceptually congruent character-product pair (e.g., rabbit and carrot) rather than an	packaging or with a sticker on it that is branded with an animated character). When using unfamiliar characters, increase preference for product by ensuring the product-character pair is conceptually congruent. When healthy foods compete with unhealthy foods, use a familiar character for a more powerful influence shown to increase a child's appetite, choice and intake of healthy foods. **Supportive environment:** Assess the environment for food product marketing that uses character branding to promote unhealthy foods, as these may be negatively influencing the child's preferences, selections and intake and in direct competition with promotion of healthy foods. **Supportive policy:** Develop policy that limits the marketing of unhealthy foods to children in municipal settings (e.g., schools).	media characters on children's diet and health: a systematic review and research needs (Kraak & Story, 2015) http://www.ncbi.nlm.nih.gov/pubmed/25516352

Systematic Review – Brief Description and Target Population	Interventions Details and Main Findings	Comprehensive Approach – Health Promotion and Behaviour Strategies	Sources
	incongruent conceptual character-product pair (e.g., rhino and a carrot). • Character branding increased children's willingness to try and preference for healthy foods (e.g., fruit vs. candy). • Character branding effect was stronger with unhealthy foods; children preferred energy-dense foods over vegetables and fruit when both are branded with the same character. • The use of familiar cartoon media characters to brand vegetables and fruit increased consumption compared to no character branding and was associated with a decreased body mass index (z-score) over a 7 week period.		
Systematic review of school and community based interventions to increase vegetable and fruit intake • Families, including parents or caregivers and children and/or adolescents aged	• This systematic review looked at five studies of randomized controlled trials, including a total of seven family-focused interventions that looked at increasing daily vegetable and fruit consumption among children and adolescents. • All studies were family-focused, involving both parents or guardians and the children. In studies involving the youngest children (4-9 years), the educational component was delivered to parents only. • Examples of intervention components of	**Education and awareness program:** Provide tailored nutrition education to both parents/caregivers and children to increase knowledge, skills and self-efficacy related to vegetables and fruit and healthy eating. **Supportive policy:** Develop healthy school policies to promote healthy eating in the school setting. **Supportive environment:** Provide opportunities and settings that enable family	Are dietary interventions effective at increasing fruit and vegetable consumption among overweight children? A systematic review (Bourke et al., 2014.) http://www.ncbi.nlm.nih.gov/pubmed/22867074

Systematic Review – Brief Description and Target Population	Interventions Details and Main Findings	Comprehensive Approach – Health Promotion and Behaviour Strategies	Sources
4 to 12 years, who were identified as having excess weight for height or obesity or a modifiable risk factor which may be linked to weight (e.g., low-density lipoprotein cholesterol, elevated blood pressure (USA or Australia) January 2014	the studies included parent/caregiver education, child-centered education, family interventions that include children and parents/caregivers, and one comprehensive intervention was implemented in multiple settings. • The interventions that were most effective used a comprehensive approach that targeted changes in the school, home and community settings. • The researchers recommend that interventions not only aim to increase knowledge among children, but also provided opportunities and settings that enable children to make healthy changes and to develop community, family and policy support. • Interventions that focus on a single aspect of behaviour are unlikely to achieve long-term change.	and children to make healthy changes, such as increasing availability of vegetables and fruit within school cafeterias. Plan intervention strategies that target healthy changes in multiple settings, including home, school and community. **Parent, family and caregiver partnerships:** Provide family-focused intervention strategies that target parents, as well as children, to support sustained increases in vegetable and fruit consumption among children. Offer parental support groups and increase nutrition knowledge in parents/caregivers. Encourage parents to act as role models. **Community engagement:** Implement intervention components within the community and incorporate community support.	

Appendix B

Social Marketing Campaign Examples

Campaign Example – Brief Description	Campaign Details	Sources
Recreation centres-based campaign - "Eat Right to Stay Super Active" - to promote vegetable and fruit intake using cartoon character branding and brand mascots (a.k.a. the Super Snackables) Canada – Ontario (Kingston)	• A social marketing campaign by KFLA Public Health that uses vegetable and fruit cartoon character mascots, the Super Snackables, to identify healthier food options, including vegetables and fruit, at KFLA recreation centers. • Messaging is simple, action-oriented and clearly targets vegetables, fruit and water. • The Super Snackables have three mascots each with a key message: ○ Super Sam – "Snacks on veggie sticks after practice!" ○ Awesome Apple – "Stays hydrated with water!" ○ Crunchy carrot – "Munches on orange slices at half-time!"	(KFL&A Public Health, 2016) https://www.kflaph.ca/en/The-Super-Snackables.aspx
School-based campaign promoting vegetable and fruit intake "Colour Your World with Vegetables and Fruit" Canada-Alberta *Evaluated	• A month-long campaign by Alberta Project Promoting active Living & healthy Eating (APPLE) Schools. • Includes daily announcements with messages that have been approved by dietitians to promote vegetable and fruit intake. • Campaign pieces can be adapted to reflect other school communities. • Examples of announcements for Colour Your World monthly campaign: ○ "Are you looking for something sweet? Instead of candy, chocolate bars or "fruit" roll-ups, try eating fresh fruit, a fruit salad or dried fruit as a snack. By eating real fruit, you get a lot of great things your body needs such as vitamins, minerals and fibre!" ○ "Fast food isn't all bad! Vegetables and fruit are super-fast to take anywhere, because you don't even need a container!! Apples, bananas, pears or oranges are all easy 'fast' foods that you can take with you to school or anywhere with your friends or family." ○ "Did you know that you should choose whole vegetables and fruit more often	(APPLE Schools, 2014) https://sites.google.com/site/appleschools2014/top20 http://www.appleschools.ca/

Campaign Example – Brief Description	Campaign Details	Sources
	than juice? You'll get more fibre and other important nutrients. Remember to try all different colours of vegetables and fruit to keep your world colourful!" ○ "Vegetables and fruit come in all colours of the rainbow, and their colours tell a story about their health-promoting powers. Count how many different colours of vegetables and fruit you have in a day! Tell your teacher how many different colours are in your lunch today." • Students that have participated in the APPLE Schools program have been found to eat 10% more vegetables and fruit.	
Community-based campaign promoting vegetable and fruit intake to adults "Half Your Plate" (Canada)	• A program that encourages Canadians to "Fill half you plate with fruits and vegetables at every meal and snack for better health." • The website provides free resources to support consumers with consuming vegetables and fruit. • Partner with grocery stores to provide in store displays, special flyers, and recipes. • Includes social media component of Instagram, Pinterest, Facebook, and Twitter.	(Half Your Plate, 2014) http://www.halfyourplate.ca/wp-content/uploads/2014/12/One-Pager-for-Launch-Media-Kits.pdf http://opha.on.ca/Nutrition-Resource-Centre/News/Nutrition-Resource-Centre-Blog/March-2016/Half-Your-Plate,-A-Program-To-Love-And-Share!.aspx
Community-based campaign to promote vegetable and fruit intake in children using social media "Half-Your-Plate with Fruits & Vegetables"	• This campaign promotes USDA's MyPlate and the Half Your Plate concept by providing social media and website. • It provides social media marketing tools such as sample posts for Facebook and Twitter. • Includes an online pledge campaign to encourage and motivate consumers nationwide to fill half their plates with vegetables and fruit.	**(Pbh Foundation, n.d.)** (USA) http://pbhfoundation.org/pdfs/pri_sec/retail/mar_tools/half_the_plate/SocialMediaMarketingTools.pdf

Campaign Example – Brief Description	Campaign Details	Sources
(USA) "Fruits & Veggies! Half Your Plate." (Canada) "Eat Well Plate" (Canada)	*Please note this campaign is based on dietary guidelines in the U.S. Refer to Canada's Food Guide to inform your campaign.* • A similar Canadian campaign exists, called *Fruits & Veggies! Half Your Plate (mentioned above)*. • *Eat Well Plate* - Health Canada has complementary resources to support this type of campaign and are based on the Eating Well with Canada's Food Guide	(USA) http://pbhfoundation.org/pub_sec/st_coor/mar_tools/half_the_plate/ (Canada) http://www.halfyourplate.ca/ (Canada) http://healthycanadians.gc.ca/eating-nutrition/healthy-eating-saine-alimentation/tips-conseils/interactive-tools-outils-interactifs/eat-well-bien-manger-eng.php

Community- and school-based campaign promoting vegetable and fruit intake
"5 a Day- Power Play!"
(USA - California)
 	
*Evaluated
	• The Campaign helps bring vegetable and fruit messages to children, aged 9 to 11, through school classrooms and cafeterias, community youth organizations, after-school programs, summer programs, farmer's markets, supermarkets, restaurants and media through advertisements and public relations.
	• Campaign was found to increase children's daily vegetable and fruit consumption by ¼ cup per day or more in comparison to control group.
	• The campaign augmented their reach by:
	  ○ Paid advertising - "Three Wishes" commercial with the key messages:
	  1. Fruits and vegetables make you faster, stronger, and learn more.
	  2. Fruits and vegetables give you power.
	  3. 5-a-Day is important.
	  ○ Public Service Announcement – "Shaq's Secret" with the key messages:
		(California Department of Public Health, 2014).
		https://www.cdph.ca.gov/programs/cpns/Pages/PowerPlayResearchEvaluation.aspx
		
		https://www.cdph.ca.gov/programs/cpns/Documents/Network-FV-PP-

Campaign Example – Brief Description	Campaign Details	Sources
	1. 5-a-Day is important. 2. Fruits and vegetables give you power. *Please note this campaign is based on past dietary guidelines in the U.S. Refer to Canada's Food Guide to inform your campaign.*	PowerPlayFactSheet.pdf To see how other states are implementing the 5-a-Day campaign visit: http://www.cdc.gov/nccdphp/dnpa/nutrition/health_professionals/programs/5aday_works.pdf "Shaq's Secret" commercial - https://www.youtube.com/watch?v=dF7aJkWwMhU

Community-based campaign using celebrities to promote vegetable and fruit intake in teenagers. "Fruits 'n' Veggies" (USA)	• A nation-wide marketing campaign launches by *Partnership for a Healthier America* (PHA) to build fruits and veggies as a brand, "FNV."
	• FNV uses social media and over 50 celebrity and athletes endorsers, including Jessica Alba, Kristen Bell, Victor Cruz, and Cam Newton.
	• The first year of the campaign focused on reaching teenagers and parents to promote vegetable and fruit consumption.
	• Examples of taglines:
	  ○ "The scientific name for tomato is lycopersicum, meaning wolf peach. Make every meal a bit more alpha."
	  ○ "Color makes a statement and reveals your true personality. And with our all-new Apple Collection, you can choose from 4 amazing colours to express who you really are inside."
		(Crawford, 2015). http://www.foodnavigator-usa.com/Markets/Fruits-veggies-FNV-ad-campaign-endorsed-by-FLOTUS-and-celebrities
		
		http://ahealthieramerica.org/fnv/
		
		http://www.fnv.com/

Campaign Example – Brief Description	Campaign Details	Sources
		https://twitter.com/TeamFNV

Appendix C

Implementation Considerations – Additional Research on Social Marketing

Initiative- Brief Description	Implementation Details	Sources
Social marketing technique to increase intake of vegetables and fruit 	• Study assesses the use of behavioural marketing approach to increase the incentive for eating vegetables and fruit. • Licensed characters, fun colouring packaging, and use of prizes were placed within the packaging of vegetables and fruit. • Children receiving the packages with the decorated containers consumed more servings of vegetables and fruit than the control group.	The impact of food branding on children's eating behaviour and obesity. (Keller et al., 2012) http://www.ncbi.nlm.nih.gov/pubmed/22450261
Fruit and vegetable commercial impact on children's vegetable and fruit preferences  Reggie Veggie  Judy Fruity	• Study assess whether two 30-second commercials using vegetable and fruit characters that were embedded into a 15-minute TV program. • The two characters were Reggie Veggie and Judy Fruity. Key messages included: ○ *"Judy Fruity takes a huge bite of an apple." "Reggie Veggie tosses up a carrot and eats it."* ○ *"I'm Reggie Veggie, veggies are a blast." "Yum, yum-yummy! In my Tum-Tummy."* ○ *"The circus audience gives a thunderous applause when Judy Fruity takes a big bite of the apple."* ○ *"Apples are my favorite, apples give me energy." "Broccoli makes me big and strong to play all day."* • Preference for broccoli and carrots was significantly higher	Impact of commercials on food preferences of low-income, minority preschools. (Nicklas et al., 2011). http://www.ncbi.nlm.nih.gov/pubmed/20851053

	for pre-school children who were exposed to the commercials.	
School-based campaign using brand media to promote vegetable intake. 	• Ten elementary schools were evaluated to identify if exposure to branded vegetable characters increases vegetable consumption. • A colorful vinyl banner with branded vegetable characters that was fastener around the base of the salad bar and short television segments with education delivered by the characters were both shown to increase selection of vegetables from the salad bar. • Results showed 90.5% more students selected vegetables when exposed to the vinyl banner alone, and 239.2% more students selected vegetables when exposed to both the banner and video, in comparison to baseline measures.	Marketing vegetables in elementary school cafeterias to increase uptake (Hanks et al., 2016). http://pediatrics.aappublications.org/content/pediatrics/138/2/e20151720.full.pdf

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