Nutrition Services, Population and Public Health
Evidence Review: Children and Youth

A Review of Effective Parent-Targeted Health Promotion Strategies to Promote Healthy Eating Behaviours in School-Aged Children and Youth

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Alberta Health Services

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This report has been prepared by Nutrition Services, Alberta Health Services

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- Sue Buhler, MSc, RD, Research & Academic Lead, Nutrition Services (NS), AHS
- Sheila Tyminski, MEd, RD, Director, Population and Public Health Strategy, NS, AHS

Evidence Review Project Group members who contributed to the report (past and present):

- Charity Alcocer, RD, Calgary Zone, NS, Population and Public Health (PPH), AHS
- Margaret Banmann, Health Promotion Facilitator, SHWP, Healthy Living, PPIH, AHS (past)
- Dabin Choi, MPH, RD, Calgary Zone, NS, PPH, AHS
- Jill Lambden, MSc, RD, Health Promotion Facilitator, SHWP, Healthy Living, PPIH, AHS
- Tanya L'Heureaux, RD, Central Zone, NS, PPH, AHS (past)
- Marcia Stodalka, RD, South Zone, NS, PPH, AHS
- Theresa Riege, RD, Provincial, NS, PPH, AHS (past)
- Danielle Todd, RD, North Zone, NS, PPH, AHS

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This report was written by: Charity Alcocer, Danielle Todd and Theresa Riege, Child and Youth Evidence Review Project Group Members, NS, PPH, AHS.

For more information, please contact:

Sheila Tyminski
Director
Population and Public Health, Nutrition Services
publichealthnutrition@ahs.ca

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Executive Summary

Purpose

This report presents the evidence around effective strategies to engage parents and families to influence nutritional behaviours of their children aged 6-18 years. Findings will be used to 1) inform program planning in Nutrition Services, Population and Public Health (NS PPH); 2) support alignment of key messages and strategies and; 3) identify collaborative opportunities within and external to AHS.

Methods

- A multi-step, systematic process was used for article search, retrieval, selection, critical appraisal, and synthesis.
- Studies were included if they:
  - Outlined a parent-targeted strategy, as a single or multi-component/multi-activity intervention in the home, school, or community settings
  - Reported on a potentially scalable, innovative strategy with applicability to the current Alberta public health nutrition context.

Parent-Targeted Strategy Evidence

2708 articles from database searches and citation lists
228 for full text review
36 appraised and synthesized
9 systematic reviews
27 primary research

Current State

Recent surveys about the eating behaviours of children & youth show:

- Inadequate intake of vegetables & fruit
- High prevalence of daily sugar sweetened beverage intake
- A decline in food skills of children as fewer families prepare meals “from scratch”.
- A preference by adults aged 18-34 years to obtain nutrition information from social media versus reliable professional sources (potential parent population)

Key Findings

Home, School, and Community Based Strategies to Engage Parents

- In schools, multi-component, ongoing approaches offered by trained teachers or health experts using developmentally appropriate, behaviour-specific activities and purposeful face-to-face parent engagement are likely to be effective.
- Community-based, multi-component strategies may be effective when:
  - Messages and activities align across settings/sectors.
  - Parents and children work together.
- There is some evidence that home visitation programs can promote healthy eating practices in the home. Web-based methods also show some promise.

Nutrition Messaging

- Children express interest and can adopt healthy eating practices. They can also influence their families. Messages created by children show promise.
- Promoting family meals is associated with healthier diets. This provides an opportunity for parents to practice positive parenting and role modelling skills to influence healthy eating behaviours in families.
- Large media campaigns may increase awareness of health messages. There is little evidence to suggest that they impact behaviour change.

Barriers and Facilitators to Healthy Eating Practices at Home

- Barriers include time, children's preferences, and absence of role modelling practices, social norms and media influences.
- Tailored information via media and other sources, planning ahead and having consistent mealtime rules are facilitators to family meals and healthy meal provision.
- Children's fruit and vegetable (FV) consumption is affected by home availability/ accessibility and parent role modelling.

Implications for Program Planning and Practice in NS PPH

- Continue to use a comprehensive school health approach when developing parent-targeted strategies.
- Investigate opportunities with before and after school programs and in-home support programs for targeted populations as part of multi-component strategies.
- Use innovative methods to promote healthy eating topics such as vegetable and fruit intake, family meals and food skills.
- Communicate to parents with clear, purposeful, and targeted messages using multiple methods and platforms.
- Implement effective and ongoing train the trainer opportunities with partners through conferences, webinars, online modules, websites, newsletters, and social media forums.
- Consider the feasibility, cost-effectiveness, audience reach, and parent identified barriers and facilitators to healthy eating practices for all program plans.
- The research around effective parent engagement to promote healthy eating was limited by weak study designs and modest results that measured only short-term outcomes.

Summary and Recommendations

Build on existing initiatives and partnerships to:

- **Implement strategies using the AHS Comprehensive School Health (CSH) approach**
  - Repackage existing NS resources such as the Cooking Club Manual, recipes, and newsletters using personalization and integrated learning strategies to increase uptake by families.
  - Reinforce promising strategies from school settings, such as taste testing and food skills, by promoting their use in the home using online engagement tools.

  - Consider complementary and/or social marketing methods through existing tools and programs such as *Healthy Parents Healthy Children*, *Kid Food Nation* and *Healthier Together*, and social marketing through school settings, AHS, Alberta Health, and Health Canada.
- **Leverage existing partnerships and initiatives**
  - Investigate 'below-the-line' social marketing, opportunities, using multiple methods and existing local initiatives with well-established community networks and health champions, such as Ever Active Schools, APPLE schools, before and after school programs, and agencies serving vulnerable populations.
  - Consider current and future opportunities with 1) parent/school advisory councils and the AHS NS Nutrition Youth Advisory Panel; 2) Communities Choose Well and Benchmarking Food Environments projects; 3) workplace wellness initiatives, such as Alberta Blue Cross, Alberta School Employees Benefit Plans and AHS Workplace Wellness and; 4) primary care networks, *Connect Care* and *Together4Health*.
- **Incorporate a health equity lens**
  - Consider identified parent barriers to mitigate unintended negative consequences faced by vulnerable groups such as low-income families, those living remotely, those with limited access to transportation or technology, new Canadians and Indigenous peoples. In addition, it is essential to address cultural and religious relevancy and family practices and beliefs.
- **Monitor drivers, trends and evaluation**
  - Ensure priorities and programs stay relevant to families by 1) following the drivers and trends affecting Alberta parents and their families in various settings and; 2) monitoring national and provincial survey and surveillance data around nutrition and health outcomes.
  - Develop and implement a strong evaluation plan with clear and measurable outcomes.

To achieve health outcomes, a combination of all 5 health promotion strategies is needed to influence policy, social norms, systems, and networks while reducing health inequities in the population.

Introduction

Nutrition Services, Population and Public Health (NS PPH) uses a population and public health and evidence-based practice approach to develop and implement tools, resources, programs, and services that aim to improve the nutritional health of Albertans. NS Public Health Dietitians lead and participate in collaborative activities with Alberta Health Services (AHS) and external partners to engage in upstream work to impact the determinants of health that contribute to the health of Albertans.

Background

In 2010, NS PPH Dietitians from the School Nutrition Working Group (SNWG) reported on the evidence around key public health nutrition-related issues across Alberta[1] to inform NS PPH priorities for this population. Parents and families play a key role in supporting healthy growth and development in children and youth. This role is enhanced when they partner with their schools and communities to promote consistent messages and practices while creating positive environments in their home, school and community settings. However, there is a gap in understanding the most effective ways to engage parents to support them in adopting and role modelling healthy eating behaviours in the home setting.

This report, based on the question outlined in Figure 1, summarizes the published literature on effective universal and targeted strategies to engage parents in role modelling healthy eating behaviours with their school-aged children and youth.

The purpose of the report is to:

- Inform NS PPH priorities and programs.
- Share key findings and recommendations with other AHS departments.
- Support alignment and cross-department collaborations within AHS and leverage opportunities with external stakeholders.

Figure 1.
Evidence Review Question

What are the most effective strategies to engage and build capacity in parents around role modelling healthy eating behaviours and offering supportive physical and social environments to achieve optimal growth and development in school-aged children and youth?

- What information do parents want or need?
- Where and how do we reach parents?
- What strategies will engage and encourage action in parents to impact family behaviours?

A list of definitions used throughout the report is provided in *Appendix A*.

Scope

This review focuses on:

- Strategies and innovative methods with an intentional parent component that could be assessed for scalability, regardless of setting or health outcomes measured.
- Studies in a school or community setting if they had an intentional parent component.
- Studies in primary care settings if an implemented strategy had the potential to be modified to a PPH upstream approach.
- Interventions with an innovative strategy to promote family meals or to gather information around facilitators and barriers to family meal practices.

The following topics were not within the scope of this review, acknowledging that further exploration of the literature on some topics may be needed depending on strategies selected to reach this target audience:

- Strategies that did not include an intentional parent component, such as parents only receiving information about nutrition programming targeted at their children, but not being included in the programming.
- Studies that assessed health, weight and/or specific nutrition outcomes but did not assess the strategy used to achieve these outcomes.
- Studies reporting on specific population health strategies, settings and environments or various health determinants that did not include a direct parent component.
- Studies that focused on content only, but did not assess or report on implementation strategies to deliver the content.

The complexity and inter-relatedness of these factors and components is recognized, as is the need to apply a health equity lens when selecting and implementing public health strategies focused on influencing healthy eating practices.

Methodology

This report includes findings from a situational analysis and the peer-reviewed literature based on a systematic process.

Situational Analysis

A situational analysis was undertaken to describe the current state of the nutritional status and healthy eating behaviours of children and youth in Alberta and Canada to add additional context for recommendations in the report. The results, shown in Table 1, includes demographic, health assessment, health behaviour, and health equity data. Where possible, data is presented in the context of parents and school-aged children; when age-specific data is not available, relevant data is presented for either the broad childhood context and/or as general data for populations of interest.

Of particular relevance in this report is the projected 2.0% annual increase in the number of children and youth between 2018 and 2025 in Alberta.[2]

While there is limited nutrient intake data available for this age group specifically, areas to note include:

- Data from the Canadian Health Measures Survey (CHMS) 2014-15 indicates that 14.7% of children (aged 3-17) reported drinking soft drinks, fruit drinks or sports drinks every day[3] with higher rates reported among First Nations youth.[4]
- Only 30% of youth aged 12-17 years consumed the recommended amounts of vegetables and fruit in 2017.[5]

Information on food skill trends suggests that there has been a reduction over time in transfer of food skills to children. This information may provide general insight into food and meal patterns of Canadian families. Data to support this assertion include:

- Reduced number of adults in Canada who prepare meals "from scratch."[6]
- An increase over time on the percentage of household budgets spent on highly processed foods and foods from eating establishments.[6]

Finally, nutrition trend data from 2018 indicates that Canadians aged 18-34 years prefer sources such as social media for nutrition information. This same age group reports being least likely to follow Canada's Food Guide (CFG) and are significantly more likely to follow vegetarian or vegan dietary patterns. Furthermore, this age group is significantly more likely than older Canadians (greater than 35 years) to indicate "getting energy or stamina" as influential in their food choices. As this age group includes our target population of parents, it is important to consider these trends in our messaging and approaches.[7]

Table 1. Nutritional Status and Health of Albertans and Canadians

Statistics	Relevant Details	Sources
Alberta Population **Alberta Population Estimates (ref)**	• Total population 4,300,732 (2018 census, AB).[8] • 18.3% were 5-19 years of age. (2018 census, AB).[8] • The population who identify as Indigenous accounted for 6.5% of the total Alberta population (2016 census data).[9] Approximately 47% of Alberta's Indigenous population is under 25 years of age (2016 census, AB).[9] • Immigrants make up 21.2% of Alberta's population with 5.2% having arrived in Alberta between 2011-2016 (2016 Census, AB).[10] Of the 2016 immigrant population, 14.9% are refugees (2016 census, AB).[10] • The population aged 5 to 17 years is expected to increase at an average annual rate of 2.0% between 2018 and 2025.[2]	*2018, Interactive Health Data Application, Government of AB (Data source: Statistics Canada Population estimate)* 2016 Census of Canada Aboriginal People *https://open.alberta.ca/dataset/0c91afae-9640-4ef7-8fd9-140e80b59497/resource/7d5fa9fa-0525-4619-9d3e-1b5a5145b6a3/download/2016-census-aboriginal-people.pdf* Statistics Canada, Focus on Geography Series, 2016 Census *https://www12.statcan.gc.ca/census-recensement/2016/as-sa/fogs-spg/Facts-pr-eng.cfm?Lang=Eng&GK=PR&GC=48&TOPIC=7* Population Projections, Alberta and Census Divisions, 2019-2046 *https://www.alberta.ca/population-statistics.aspx*

Statistics	Relevant Details	Sources
Health Assessment/Status	• 2014-15 Canadian data reports that 30.3% of Albertan children aged 5-17 years were overweight or obese.[3] • 2008-2010 data of reported overweight and obesity in children and youth (aged 12-17 years) in Alberta First Nations communities shows a prevalence of 34.2%.[11] • Self-reported Statistics Canada 2018 data indicates 24% of Albertan youth aged 12-17 years as overweight or obese.[12]	*Canadian Health Measures Survey (CHMS) 2012-13 data* First Nations Regional Health Survey 2008/10 *http://www.afnigc.ca/main/includes/media/pdf/digital%20reports/RHS-Report-FINAL.pdf* Statistics Canada. *Table 13-10-0096-21 Body mass index, overweight or obese, self-reported, youth (12 to 17 years old)*
Nutrition Related Health Behaviours	• Canadian Health Measures Survey (CHMS) 2014-15 data indicates that 14.7% of children (aged 3-17) reported drinking soft drinks, fruit drinks or sports drinks every day.[3] • 2008-2010 data from the First Nations Regional Health Survey indicate that 42.4% of youth drink sugar-sweetened beverages (SSB) at least once a day.[4] • 2017 Statistics Canada data reports that approximately 30% of youth 12-17 years consume fruits and vegetables (FV) five or more times per day.[5]	Canadian Health Measures Survey (CHMS) 2012-13 data *http://www.phn-rsp.ca/thcpr-vcpsre-2015/data-table-eng.php* *First Nations Information Governance Centre. National Report of the First Nations Regional Health Survey. Phase 3: Volume Two. 2018* *Statistics Canada, Health Fact Sheets, Fruit and Vegetable Consumption, 2017*.
Health Behaviours/ Health Status Relationship	• Fruit and vegetable intake is an indicator of diet quality and higher fruit and vegetable consumption is related to a reduced risk of nutrition-related chronic diseases.[3] • Canada's Dietary Guidelines (2019) cite an increase over time in household budget spent on highly processed foods and food from eating establishments, which has been associated with an increase in calories, sodium, sugars and saturated fat. A reduction in the transfer of food skills to children and adolescents has also been noted.[6] • A 2015 Canadian time use survey noted that in the previous 24 hour period, 8% of respondents ate three meals or more with their children under 15 years of age, while the majority ate zero (34%) or one (39%) meal with them. Close to 60% of the respondents noted that they sometimes ate while doing other activities such as using technology, watching television, preparing meals, listening to the radio, reading, working, and studying.[13] • 2018 nutrition trend data of interest indicates that while Canadians view dietitians and other health professionals as credible sources of nutrition information, they are most likely to use other sources including the internet and social media (2018 data).[7]	*Statistics Canada, Health Reports Trends and correlates of frequency of fruit and vegetable consumptions, 2007-2014* *Health Canada, Canada's Dietary Guidelines, 2019* Statistics Canada 2018 Time to Eat *https://www150.statcan.gc.ca/n1/pub/11-627-m/11-627-m2018003-eng.htm* 2018 Tracking Nutrition Trends report *Tracking Nutrition Trends Canadian Foundation for Dietetic Research. 2018*

Statistics	Relevant Details	Sources
	• This is particularly noted for younger Canadians ages 18-34 years (2018 data).[7] • 16% of Canadians report following Canada's Food Guide, a drop from 24% in 2013 (2018 data).[7] • Younger Canadians (aged 18-34 years) report being least likely to follow CFG and significantly more likely to become vegetarian/vegan (2018 data).[7] • Younger Canadian (aged 18-34 years) are significantly more likely than older Canadians (greater than 35 years) to indicate "getting energy or stamina" as influential in their food choices (2018 data).[7]	2018 Tracking Nutrition Trends report *Tracking Nutrition Trends Canadian Foundation for Dietetic Research. 2018*
Health Inequities	• Canadian data indicates lower fruit/vegetable consumption among Inuit, First Nations, and Metis populations.[3] • Canadian data indicates lower fruit/vegetable consumption among recent immigrants.[3]	Government of Canada, Health Inequalities data tool https://health-infobase.canada.ca/health-inequalities/data-tool/

Peer-Reviewed Literature

A multi-step, systematic process was used for article search, retrieval, selection, critical appraisal, and synthesis (*Figure 2*).

Search Strategy

Knowledge and Resource Services (KRS), AHS, was consulted to help to define the question and scope based on the identified topic. Searches were completed by project group members with annotated bibliographies generated using ProQuest RefWorks. Systematic reviews (SRs), meta-analysis (MA), primary research and grey literature articles from 2000-2014 were included in these database searches. In addition, hand search articles were identified from reference lists and other sources, covering 2015 to early 2020. An extensive grey literature search was not conducted due to limited staff capacity and the determination that it would not further inform the question. Details around the PICO question, limits, databases, concept map, MeSH terms, and search strings are outlined in *Appendix B*.

Eligibility Criteria and Study Selection

Articles were reviewed for inclusion/exclusion at the title, abstract and full-text reading stages, using defined criteria noted in *Figure 2* and outlined in detail in *Appendix C*. A minimum of two reviewers screened and determined the articles for inclusion at each step in the process.

Articles were included if they reported on interventions that outlined a parent-targeted strategy, in the home, school or community settings, either as a single intervention or as part of a multi-component or multi-activity intervention. Research studies that did not include an intentional, parent-targeted strategy or that focused on content without reporting on implementation strategies were excluded. Commentaries, opinion papers, narrative reviews, unpublished evaluation reports and studies conducted in low and middle-income countries were also excluded. Studies were included regardless of study design, sample size or effect size if they reported on a potentially scalable, innovative strategy that could be applied in the current Alberta public health nutrition context.

A total of 2778 potential articles were retrieved from the database search. Twenty-five articles were included after multiple pass application of inclusion/exclusion criteria at both the abstract and full-text review stage. An additional 29 articles were identified through hand search strategies. These 54 articles were considered for final review and critical appraisal and a final 36 articles (9 reviews and 27 primaries) met the inclusion criteria.

Data Extraction

Data for all included articles were extracted by one reviewer using a data extraction table and checked for accuracy and consistency by a second reviewer. Studies are presented in this review by study design and appraisal rating (Figure 2). *Appendix D* lists study design definitions while *Appendix E* provides additional detail around study design, data collection methods, nutrition outcomes measured and reported on, findings, conclusions and implications for PPH nutrition practice.

Quality Appraisal

A minimum of two reviewers rated each article either independently or with the second reviewer verifying the first reviewer assessment. Discrepancies in quality assessment ratings were resolved by project group consensus.

- Articles were critically appraised using standard public health practice evidence appraisal tools. Review articles (E.g. SRs and reviews with a systematic search strategy) were appraised with the *Health Evidence Quality Assessment Tool – Review Articles.*[14]
- Quantitative studies were appraised using the *Effective Public Health Practice Project Quality Assessment Tool for Quantitative Studies* (EPHPP).[15]
- Qualitative Studies were reviewed using the *Critical Appraisal Skills Program (CASP) Qualitative Checklist.*[16]

While most SR articles were appraised as moderate or strong, only select sections answered the question of interest. In addition, there were few high-quality primary research articles. However, all critically appraised articles meeting the inclusion criteria were included in this evidence review to identify innovative, potentially scalable or modifiable strategies applicable to the Alberta context. This information was used to inform recommendations for consideration by NS PPH.

Data Synthesis

Study findings were themed by intervention, strategy or setting, and by outcomes (knowledge, attitude and behaviour, nutrition-related behaviour change, and other measurable outcomes). Table 2 outlines these themes and specific details which are then further synthesized and presented in the findings section of this report.

Table 2. Initial Themes

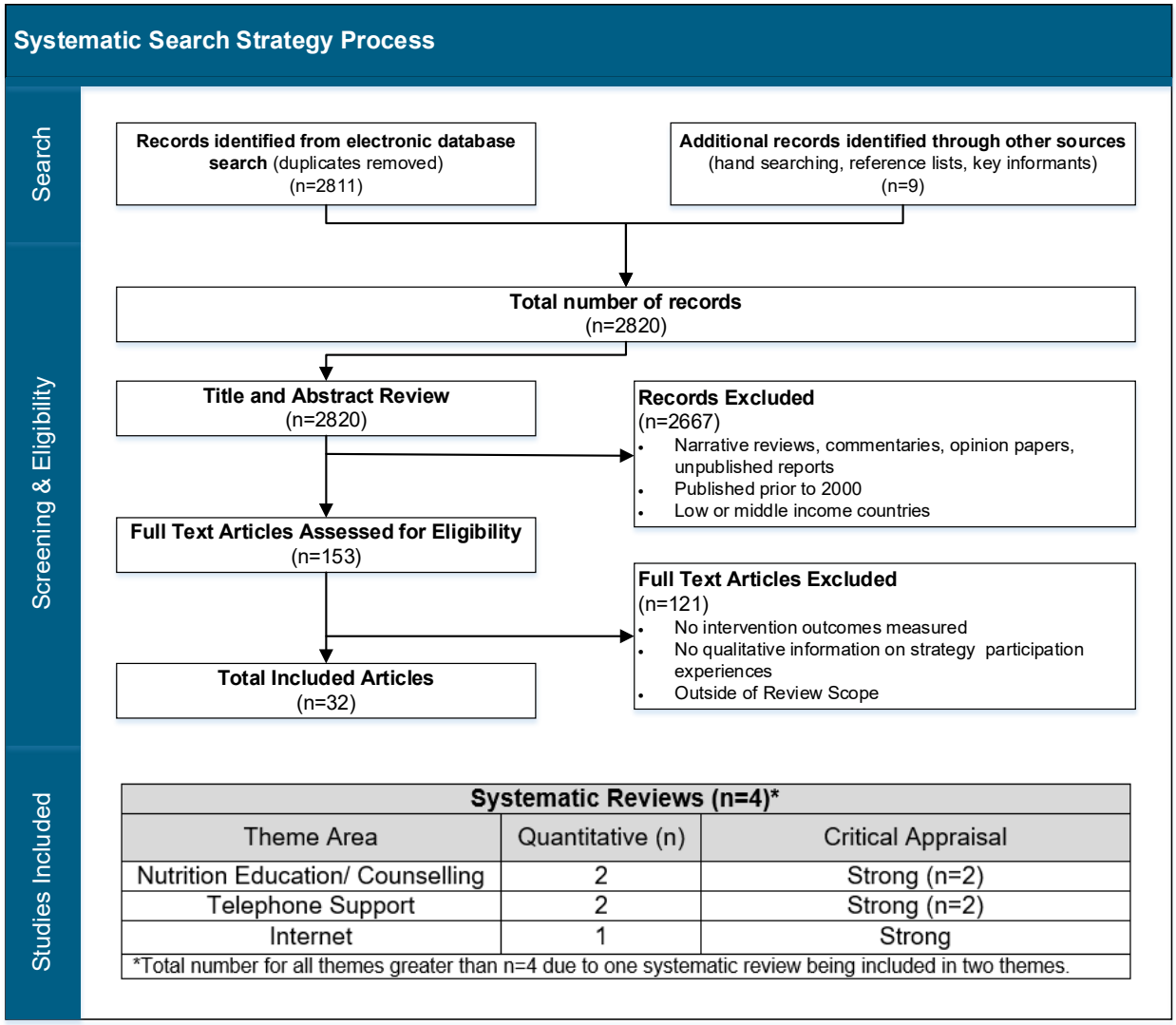
Theme	Details
Intervention/Strategy/Setting	• Before and after school/camp setting • Workplace setting • Home setting • Take home education –parent targeted • Parent and child education • Parent education • Parent/family home visits/phone calls/text messages • Web-based family targeted tools • School/community environment change • Community-based cooking and education classes • Parents included in classroom education • Tailored feedback/tailored approaches to parents • Social marketing/social media
Knowledge, attitude, and behaviour outcomes	• Parent self-efficacy • Child self-efficacy • Parent role modelling • Home environment/food availability changes • Participation in school activities • Parenting style
Nutrition-related behaviour change outcomes	• Child sugar-sweetened beverage (SSB) intake • Child whole grain intake • Child macronutrient intake • Child fruit and vegetable (FV) intake • Child healthy snack intake • Parent FV intake • Eating away from home • Family meal frequency
Other measurable outcomes	• Parent and child BMI • Child BMI and other measures

Limitations

The challenges and limitations experienced while conducting this review:

- SRs included various questions, definitions and methods to report on the outcomes of interest. This report only includes the relevant sections of several systematic reviews that met the inclusion criteria. Other SRs were used to identify relevant primary research.
- Most primary research studies were appraised as weak due to factors including small sample sizes and measurement of only short-term outcomes. In order to present an overview of the totality of literature reviewed, all included studies were reported on and the strength of the evidence considered in the recommendations and conclusions.
- The nature of the PICO question, targeting parent interventions, resulted mainly in research that examined developing personal skills. However, multiple pass reviews ensured that only articles with potential PPH application in the Alberta context were included.
- Few studies were conducted in Canada with most taking place in the United States (US), the United Kingdom (UK), Europe and Australia. Consideration was given to the specific application of the findings to the Canadian context given the systemic differences in culture, education, health, economics, and social systems.

Figure 2: Systematic Search Strategy Process



Systematic Reviews (n=4)*		
Theme Area	Quantitative (n)	Critical Appraisal
Nutrition Education/ Counselling	2	Strong (n=2)
Telephone Support	2	Strong (n=2)
Internet	1	Strong
*Total number for all themes greater than n=4 due to one systematic review being included in two themes.		

Primary Research (n= 28)*									
Theme Area	Total (n)	Quantitative				Qualitative			
		Total (n)	Critical Appraisal			Total (n)	Critical Appraisal		
			Strong	Moderate	Weak		Strong	Moderate	Weak
Print Materials	10	3			3	7	4	3	
Nutrition Education/Counselling	6	5		3	2	1	1		
Multimedia	5	5		3	2				
Mobile Health	8	3		1	2	5	1	3	1
Internet	8	0				8	4	3	1
*Total number for all themes greater than n=28 due to primary research being included in more than one theme.									

Findings

The findings in this report are based on the synthesis of 9 SRs and 27 primary research articles. The nine SRs reported on various interventions and health outcomes; however, this report presents only those findings related to the topic of interest. Of the 27 primary research studies included, 15 were conducted in the US, while the remaining studies were conducted in Canada (3), UK (4), Europe (4), and Australia (1). Twenty-four studies used a quantitative study design, while three used qualitative methods. *Figure 2* and *Appendix E* contain additional details.

Although the literature in this review reported on multiple topics and components, this report synthesizes the findings into nutrition themes and subthemes related to the question of interest. Table 3 outlines these identified themes and sub-themes while supporting evidence is summarized below.

Table 3. Nutrition Related Themes and Subthemes

Overall Theme or Setting	Sub-theme or strategy
School-Based Multi-Component Strategies with a Parent Component	• Parent take home education materials • Parent education sessions • Parent and child cooking sessions
Community-Based Strategies	• Cooking and education classes • Child-developed messaging • Community health advisors • Before- and after-school programming • Family meal promotion • 'Below the line' social marketing
Home-Based Strategies	• Web-based family tools • Home-based community health advisors • Taste exposure interventions
Nutrition Messaging Campaigns	• Child-developed messaging • Tailored messaging
Barriers and Facilitators to Family Meals/Healthy Meal Provision and Children's Fruit/Vegetable Provision	**Barriers** • Child preferences • School/child care influences on child preferences • Time constraints • Food rules at home • Media influence • Social norms/role modelling • Low socio-economic position (SEP) parents are more likely to have unhealthy foods at home (not wanting to deprive children) **Facilitators** • Information through media and from others • Planning ahead • Child input • Medium-high SEP - fixed meal times/stricter eating rules more likely • Tailored family meal messages (budget/low cost, creative meals, child involvement) • FV availability and accessibility • Parental role modelling and maternal intake of FV

School-Based Multi-Component Strategies with a Parent Component

As this review is focused on parent engagement strategies, school-specific strategies are only reported on when they are part of multi-component strategies that included a parent component. Examples of these other components include school food environment changes, classroom-based nutrition education and food sampling, and parent education materials, In these cases, the focus is on the parent engagement component and the effectiveness of the overall strategy.

Key Findings

- Engaging parents through schools to promote healthy eating behaviour with children and youth is most likely to succeed as part of a multi-component strategy.
- To encourage children and youth to practice healthy eating behaviours, activities must be developmentally appropriate, behaviour-specific, offered over a minimum of 6 months, and be a part of multi-component approaches with purposeful face-to-face parent engagement opportunities offered by trained teachers or health experts.

Multiple School-Based Strategies

Five SRs[17–21] and two primary research studies[22,23] reported on school-based strategies with parent involvement:

- Hingle and colleagues[18] examined the effects of parent involvement in various interventions designed to improve children's diets. These were delivered through both indirect and direct methods in school settings. Due to study limitations and variations in indicators and measurement techniques, the findings could not support a conclusion that parental involvement overall increases intervention effectiveness; however, there was some evidence to support specific strategies using direct methods of engagement (parents requested to attend an event or information session) can result in more positive effects.
- Van Lippevelde and colleagues[21] reported on the effectiveness of parent involvement in school-based strategies. They found inconsistent evidence from the five studies that met their inclusion criteria. There was some positive effect on children's nutrition behaviours or nutrition knowledge, but not both. The authors suggested that more research is needed to determine positive effects when a variety of strategies are used and when more home-related determinants and parenting practices are addressed.
- Hendrie and colleagues[17] reviewed the effectiveness of behaviour change techniques in multi-component school strategies aiming to impact weight status and health risk factors. They found that more intensive parental involvement impacted role modelling, practicing or demonstrating the behaviour, and prompting self-monitoring of behaviour.

- Nathan and colleagues[20] reported on strategies targeting home-packed lunches, including various take-home materials and classroom activities. They reported a modest impact on vegetable provision and consumption in packed lunches, but an inconsistent impact on the provision of sugary drinks and sweet and savoury snacks in packed lunches. They concluded that when the aim is to improve lunches brought to school that such interventions are part of a comprehensive school health promotion program.
- In a systematic review by Murimi and colleagues,[19] authors reported on the factors that contribute to effective nutrition education interventions in children. Considering both elementary and secondary school impacts, the authors reported that among other factors, developmentally appropriate, behaviour-specific multi-component approaches offered over at least 6 months, and with purposeful face-to-face parent engagement opportunities offered by trained teachers or health experts were most likely to succeed.
- Bjelland and colleagues[22] conducted a large multi-component study. Parent components included targeted take-home education materials on specific topics to parents of children aged 11-13 years and parent-provided FV snacks. The authors reported that the children reduced their consumption of SSB and showed an increase in their intake of fruit. The authors also found that the children of parents with lower education levels showed a greater decrease in SSB consumption as a result of the intervention than children of parents with higher education levels.
- Christian and colleagues[23] conducted a process evaluation of *Project Tomato*, a teacher-delivered, 10-month, multi-component program that included a home kit (games, quiz books, FV snack boxes), newsletters and handouts. Overall program uptake by teachers and parents was low. However, when the home kits were used by parents, they were appreciated and reported to impact their children's FV intake. The authors suggested that future efforts should include training for teachers and increased support for classroom implementation.

Parent Education Materials

One SR[20] and four primary research studies[22,24–26] examined take-home material to parents and measured changes in children's knowledge or behaviours:

- An SR by Nathan and colleagues[20] reported on strategies targeting lunch sent from home. A variety of take-home materials, passively delivered to parents, were used in the studies they reviewed. As noted above, overall results were limited with the recommendation to use a comprehensive school-based approach that included purposeful activities to engage parents.
- Baghurst and Eichmann[24] reported that newsletters or hand-outs targeted at parents, along with classroom-based nutrition education for children, resulted in improved child self-efficacy more than with classroom education alone. While nutrition knowledge and self-reported dietary habits improved in both groups, the difference was not significant and could not be attributed to the parent component.

- As noted above in the study by Bjelland and colleagues,[22] parent engagement via targeted take-home education materials and participation in FV snack provision impacted their children's dietary behaviours around reduced SSB and increased fruit intake.
- An increase in children's nutrition knowledge was reported in a study by Flood and colleagues[25] that utilized take-home lessons and a book bag for the child to share with parents. This study demonstrated the opportunity to include nutrition education as part of reading literacy promotion.
- Horne and colleagues[26] conducted a study where FV were provided at no cost to schools for 16 days to encourage consumption, followed by the provision of containers and small incentives to encourage packing vegetables and fruit from home. The authors reported increased FV provision from home and child consumption, concluding that peer and parent role modelling and incentives were effective.

Parent Education Sessions

- Van Lippevelde and colleagues[27] conducted an intervention that involved a 1-hour classroom session for children, an in-person parent education session, and a take-home CD of personalized feedback. The outcomes measured were adolescent fat intake from snacks and parental support for healthy choices. There was no change in fat intake as a result of the intervention. There was also limited or no change reported in adolescents' diet knowledge, attitude and behaviours. However, the authors noted a positive trend/trajectory for parental support for healthy choices for their adolescents.

Parent and Child Cooking Sessions

- In one study by Bisset and colleagues,[28] parents and grade 5-6 children taking part in cooking sessions led by dietitians, showed improvements in knowledge, attitudes, food preparation skills, and self-efficacy of children participating in the program compared to those children who didn't participate. Parent outcomes were not measured.

Community-Based Strategies

One SR[18] and four primary research studies[29–32] targeted parents specifically through community programming and before- and after-school settings.

Key Findings

- Community-based strategies may be effective in engaging parents when multi-component approaches are used, messaging and activities across settings and sectors are aligned and coordinated, and there are opportunities for parents and children to work together.
- Children have the interest and ability to adopt healthy eating practices and influence their families to do the same.
- Promoting family meals may be an effective way for parents to role model healthy eating behaviours and implement positive parenting practices that promote a healthy relationship with food in children and youth.

Cooking and Education Classes

- Hingle and colleagues[18] examined the effects of parent involvement in various interventions designed to improve children's diets delivered in community settings. As with programs in school settings, the findings could not support a conclusion that parental involvement increases intervention effectiveness; however, there was some evidence to support direct methods of engagement (parents requested to attend an event or information session) leading to more positive effects.
- Carson and Reiboldt[29] reported on the *Food and Fitness Fun Education Program* (FFFEP), an intervention integrated into an existing before- and after-school program. The 17-week program involved hands-on education, cooking and weekly snacks. Parents were invited to two meetings. The authors reported significant relationships between program participation and the following behaviours: parent's grocery shopping with their children, their children's influence on purchases, children's requests to pack healthy snacks, and parents' willingness to agree to these requests.
- Gribble and colleagues[30] reported on a 10-week series of 2-hour sessions for parents and children, where child-focused, interactive, skill-building and taste-testing lessons about fruit were delivered by study trained research assistants. Separate parent-focused lessons contained positive child feeding messages. Results included increased nutrition knowledge, increased fruit intake, and positive parenting practices around feeding.
- Prelip and colleagues[31] reported on an intervention where registered dietitians facilitated weekly, 90-minute sessions for 5 weeks, targeted at low-income families. Parent participation required a commitment to all sessions. Over the duration of the study, statistically significant positive changes in parent knowledge and home food provision were reported, including an increase in the variety and availability of FV and whole grains, reading labels when shopping, and a reduction in available snack food and soda.
- Borden and colleagues[32] reported on an evaluation pilot of the *BodyWorks* program, a 10-week curriculum for parents that included a toolkit for parents and their daughters. Daughters were invited to attend two sessions. The authors reported significant gains in parent knowledge and making healthier food choices, greater self-efficacy in goal setting, and supporting their daughters to change their eating habits. Daughters agreed that their parents helped them make better food choices.

Child Developed Messaging

- Evans and colleagues[33] and Tanner and colleagues[34] reported on different aspects of the same intervention where children in an after school setting participated in 12, 2-hour sessions over 6 weeks to learn about nutrition, health communication, and media literacy and to design nutrition messages and a media campaign to deliver to their parents. Two family fun nights were a part of the intervention. Evans and colleagues[33] reported that while there were no significant changes in FV consumption between intervention and control groups, there was increased motivation to consume more FV among children who participated in the campaign development and delivery. Parents reported changes in behaviour around FV availability and accessibility at home. Tanner and colleagues[34] reported on focus groups with children, noting that they learned about the importance of eating FV, were inspired to try new FV, and perceived parental support as a result of the campaign.

Community Health Advisors

- In a study by Crespo and colleagues,[35] trained community health advisors (non-health professional community members with specialized training; 'promotoras' in Latino communities), facilitated various activities in their communities, including changes in schools, restaurant promotions, nutrition education sessions, community giveaways and tasting events. The authors noted that while there were beneficial effects of the program as a whole, they could not be attributed to any single component.

Before- and After-School Programming

- An SR by Collins and colleagues[36] aimed to identify the effectiveness of parent-focused interventions implemented in community settings to modify weight-related outcomes. The majority of the studies in this SR were conducted in before-and-after school settings (n=10), while the remainder were home-based. Seven of the 10 studies in the before-and-after school setting reported a positive impact on weight change in the intended direction. The most common parental component in these studies included educational sessions either with or separate from children. Other components included newsletters, information packs or access to study websites. All but one of these studies were only evaluated immediately post-intervention, while one study continued to show positive outcomes at 2 years post-study, but not after 3 years.

Promoting Family Meals

- In an SR conducted by Dwyer and colleagues,[37] the effects of strategies specifically targeting families to promote frequency of family meals was examined. Four out of 6 studies implemented in home, community, medical, and workplace settings, and via the internet, reported a positive effect on family meal frequency, measured as an increase in the average times/week, increased frequency pre-test to post-test or greater than 4 or 5 times/week. In addition, 38 quantitative studies examined associations between family meals and other constructs, while 5 qualitative articles reported on barriers and facilitators to family meals. The successful interventions used a variety of strategies including learning modules delivered to targeted vulnerable groups through an existing program, utilizing an employee wellness platform, use of 'promotoras' (trained community members), and education sessions carried out in community centres or churches. Common factors to family meals included cooking and food preparation, cost, shopping behaviours and adolescent influence. Key correlates to family meals included employment, socioeconomic and demographic factors, family structure, perceived importance and attitudes, and home environment factors (TV watching during meals, mealtime rules, and food availability). Finally, barriers to family meals were reported as time and scheduling challenges, cost, and food preferences.

'Below the Line' Social Marketing

- A controlled before- and after- study by Glasson and colleagues[38] measured the effects of a 'below-the-line' social marketing strategy. This was defined as "marketing via methods other than mass media, designed to be a more localized community-based approach to supplement or support larger mass media campaigns". The Eat It to Beat It Campaign aimed to complement existing mass media campaigns. This involved training community peer educators to facilitate education sessions about FV and support other local campaign components including an FV fundraiser, a newsletter campaign for primary schools, shopping centre cooking/tasting demos, editorials in local print media and community service announcements. Results from this intervention showed an increase in parent knowledge and increased FV intake for parents who recalled the program.

Home-Based Strategies

Studies around home-based strategies in this review include both single interventions and those that were part of multi-component interventions, including a camp program, a social marketing campaign and school curriculum with complementary activities for parents. Where various health outcomes were measured, only nutrition-related outcomes are reported here. Other nutrition-related program components are reported under the most relevant theme and will be discussed further as part of the report recommendations.

Key Findings

- Web-based methods aimed at impacting family eating behaviours show promise.
- There is evidence that home visitation programs may be effective in affecting healthy eating practices in the home environment.
- Nutrition messages for parents need to be targeted, actionable, flexible, non-patronizing and appeal to parents' needs as being responsible and nurturing.
- Messages created by children can effectively impact parent and family eating behaviours at home.

Web-Based Family Tools

Nine studies used some type of web-based tool or method, either as single-component interventions[39–44] or part of other programs or interventions.[27,45,46]

- In a small sample, short-duration study, Fabri and colleagues[39] studied an online cooking website geared to parents and children. Based on parent self-reporting, children were more willing to cook and try new foods and parents were more willing to consume FV. The majority of parents were willing to consume FV; however, there were varying degrees of actual healthy eating behaviours reported with time-related to working patterns identified as the key barrier. Most families introduced new recipes, but changes to the family diet and family meal behaviours were limited.
- Knowlden and Sharma[40] studied the impact of a series of five online modules for parents of 4 to 6-year-olds on children's FV intake, and sugar-free beverage intake. The authors reported an increase in child FV intake that was sustained at the 1-year follow-up, as well as an increase in sugar-free beverage intake that was sustained at 1-month post-intervention, but not at 1-year. The authors noted that changes to the home environment impacted child FV consumption, but not sugar-free beverage intake.
- Schwinn and colleagues[42] studied the impact of a three-session online health promotion program for mothers and their preteen daughters. Various health and relationship outcomes were studied. Nutrition-related behavioural outcomes included improved vegetable intake in parents and improved fruit intake in children. These outcomes were found to be related to relationship variables such as better mother-daughter communication, parental monitoring, teen stress reduction and improved refusal skills that support positive behaviours.
- Wilson and colleagues[44] conducted a pilot study using a one-time online module with African American low-income parents and adolescents. The module provided custom feedback, information and goal-setting strategies to increase FV intake. The authors reported an increase in FV intake for both adolescents and parents at a 1-week follow-up.
- In a Canadian study, Dumas and colleagues[41] reported on the effects of a registered dietitian written, weekly, interactive blog targeting mothers around FV and milk and alternatives intake. Blog participation was highest in the first week and also peaked when practical cooking tips and involving children in meal preparation topics were covered. There was no difference in reported FV and milk and alternatives consumption but

scores for meal planning habits increased, suggesting an increase in family meal planning behaviours.

- Vereecken and colleagues[43] reported on a formative evaluation of a tool that was intended to provide tailored online feedback to parents regarding their child's eating habits. Parents reported on qualitative aspects of the tool and indicated that it was a helpful tool and they intended to use it. Participant outcomes were not indicated or measured in this study.
- In a study conducted by Baranowski and colleagues,[45] the *Food, Fun and Fitness Project* (FFFP) was one component of a large, multi-component, multi-site study. A four-week summer camp for African American girls included various food skill activities followed by an 8-week internet intervention for girls and parents. The results, while not statistically significant, showed an increase in child FV intake (including juice), a reduction in sweet beverages, more water and lower caloric intake. There was little uptake of the internet intervention, so its impact on behaviour could not be determined.
- In the study by Van Lippevelde and colleagues[27] noted earlier in this report, the free CD with individually tailored feedback on adolescent fat intake resulted in a positive change in parental support for adolescents choosing lower-fat snacks, although there was no change in actual adolescent fat intake and limited or no reported change in their diet knowledge, attitude and behaviours.
- Croker and colleagues[46] reported on the impacts of the *Change for Life* mass media/social marketing campaign which included TV and print media, a website and various community partnerships and activities. Parents in the intervention group received print materials and personalized feedback based on an online *How are your kids* questionnaire. While it was reported that all the provided materials increased awareness of the campaign, there was little effect on parent attitudes and parent and child behaviours. Parents in both the intervention and control groups reported satisfaction around their family's eating and behaviour change. While most parents were positive about the materials, some higher SEP (social-economic position) parents considered them patronizing.

Home-Based Community Health Advisors

- As part of a 3-year, community-based, multi-component behavioural intervention targeted at the Latino community, Crespo and colleagues[35] studied the impact of the home visit component provided by trained community health advisors (non-health professional community members with specialized training; 'promotoras' in Latino communities), to reinforce nutrition and other health messages. While there was no effect on the primary outcome of decreasing BMI, the study did report positive effects on parenting practices such as increased monitoring and reinforcement of healthy eating and decreased control over eating. These practices resulted in favourable outcomes of child FV and SSB consumption. It is important to note that different Community Health Advisors also facilitated community change (reported above) and that the findings could not be attributed to any single component, but instead, a result of the intervention as a whole.

Taste Exposure Interventions

- One systematic review by Touyz and colleagues[47] reported on the effectiveness of home-based interventions (home visits, telephone-delivered and online) to increase children's FV consumption. The authors found that taste exposure strategies in the home can be an effective method to increase FV consumption in the short term with a greater effect reported when combined with a reward. The authors note caution in using rewards as they may result in an over-justification effect, where repeatedly offering a reward for eating a target vegetable diminishes the child's liking and acceptance. In other words, it may signal that immediate compensation is needed to try the unfamiliar vegetable because it is unpleasant. More research is needed to determine whether a short-term reward increases or decreases long-term willingness to taste a target vegetable. The review also found that online delivered interventions appeared to be more effective compared to home visiting and telephone-delivered programs.

Nutrition Messaging Campaigns

Key Findings

- While they may create increased awareness of health messages, there is little evidence to suggest that large media campaigns have an impact on behaviour change.
- Targeted involvement of children in creating health messaging for their family is a strategy that shows promise in positively influencing behaviour at home.
- Pivonka and colleagues[48] reported on the formative research to inform the development of the Fruits and Veggies – More Matters campaign in the US, a rebranding of the 5 A Day Program. Findings from focus groups and interviews concluded that the most effective messages 1) appealed to mothers' emotional needs to be responsible and nurturing, employing a more nurturing tone rather than preaching, bullying or frightening; 2) did not quantify specific amounts to consume; 3) allowed flexibility and created awareness that various forms (e.g. canned, frozen) of food are healthy choices for their family. In their discussion, the authors cited a report showing that after the campaign launch public health impacts included increased awareness and motivation to eat more FV. However, consumption data showed that the median percentage of adults who ate 5 or more daily servings of FV did not change from 2007 (24.8%) when the campaign was launched, to 2009 (24.4%)
- In the UK Change for Life campaign study by Croker and colleagues[46] reported on earlier in this review, one component encouraged families to complete a questionnaire to receive personalized feedback in the form of a family intervention pack. As part of the overall study of the impact of the campaign components, the authors reported that the family information pack increased awareness of the campaign but did not result in any significant changes in healthy eating attitudes or behaviours.
- As noted earlier in this report, Evans and colleagues[33] and Tanner and colleagues[34] reported on an intervention around a child-developed and delivered media campaign

targeting nutrition messages to their parents. They found that children stated an increased knowledge about the importance of eating FV, motivation to consume FV and support from parents, while parents reported changes in behaviour around FV availability and accessibility at home.

Barriers and Facilitators to Family Meals, Healthy Meal Provision, and Children's FV Consumption

Two SRs[37,49] and four primary research studies[48,50–52] reported on barriers and facilitators to family meals, healthy meal provision, and FV consumption in children.

Key Findings

- Parents consistently identify barriers such as time, children's preferences, role modelling, social norms, and media influences as factors that impact their ability to adopt healthier eating practices at home.
- Facilitators to family meals and healthy meal provision include receiving tailored information through media and other sources, planning ahead and having consistent rules around meal times.
- Facilitators to promote FV consumption in children include home availability and accessibility and parent role modelling FV consumption.
- Dwyer and colleagues[37] used a systematic approach to review the literature around strategies to promote family meals among families with school-aged children and adolescents. Ong and colleagues[49] conducted an SR to examine the factors in the home environment related to FV consumption in children aged 6-12 years. In two primary studies, focus groups were used by Haerens and colleagues[50] to inform the development of a community-based intervention program and by Fulkerson and colleagues[52] to learn about barriers regarding family meals from a group of working parents. In addition, a self-reported survey by Hawthorne[51] was used with parents to ask about barriers and facilitators to packing a healthy lunch. This was part of a study that compared parental reports on packed lunches with direct observation of packed lunch contents to learn more about the accuracy of these self-reported behaviours. Finally, through focus groups conducted to inform the rebranding of a FV campaign, Pivonka and colleagues[48] reported on barriers and facilitators to FV consumption. Common themes around barriers and facilitators from these reviews and studies are outlined in Table 4.

Table 4. Barriers and Facilitators to Family Meals, Healthy Meal Provision, and Children's FV Consumption

Barriers	Author
Preferences of child or parent or limited range of children's preferences/palates	Fulkerson[52] Haerens[50] Hawthorne[51]
Time constraints (E.g. limited shared family meals/time spent cooking)	Dwyer[37] Fulkerson[52] Haerens[50] Hawthorne[51] Pivonka[48]
Media influence/external influences (E.g. peers, unhealthy food availability, complex health messages from various sources)	Haerens[50] Pivonka[48]
Social norms/role modelling	Haerens[50] Hawthorne[51] Pivonka[48]
Low SEP parents are more likely to have unhealthy foods at home (not wanting to deprive children of desired products)	Haerens[50] Pivonka[48]
Facilitators to family meals and healthy meal provision	**Author**
Information through media and other sources/consistent, relevant and clear messages	Haerens[50] Hawthorne[51] Pivonka[48]
Planning ahead	Hawthorne[51] Pivonka[48]
Child input	Hawthorne[51]
Medium to high SEP parents are more likely to have fixed meal times and stricter rules around eating	Haerens[50]
Parent-suggested – tailored messages about family meals according to family type (E.g. budget/low cost, creative meals and child involvement)	Dwyer[37]
FV Availability and accessibility	Ong[49]
Parental role modelling	Ong[49] Pivonka[48]
Maternal intake of FV	Ong[49] Pivonka[48]

Discussion

Research examining effective strategies to engage parents of school-age children to promote healthy eating is limited. The majority of strategies reporting positive outcomes targeted parents as a part of multi-component strategies that occurred in a variety of settings and used a wide range of approaches. There were limitations to the studies. These included: most studies measured short-term outcomes; study results were modest; and study designs were weak. Given these limitations, no single, specific parent-targeted strategy stood out as especially effective for impacting longer-term outcomes. However, several strategies are noteworthy, as they reported short-term positive outcomes in parent's knowledge, attitudes and beliefs, and home environment nutrition-related practices. Moreover, parent's role modelling of healthy eating behaviours has been shown to have a positive effect on their children's behaviours.

The focus of the evidence review was parent-targeted strategies. The evidence that emerged suggests that, in addition to home and community-based strategies, reaching parents via the school setting can also be effective. When a comprehensive school health approach is employed to promote healthy eating behaviours in children, the inclusion of a parent-targeted strategy can result in more effective outcomes. Such strategies include specific and personal communication,[18] direct education opportunities[17–20] and integrated learning such as promoting reading literacy paired with healthy eating messages.[25] These approaches should be developmentally appropriate and behaviour-specific. Adding to the strength of multi-component school approaches, McKernan and colleagues[53] have shown that students in schools that use a comprehensive school health approach can effectively share health messages with their parents and families, which in turn has a positive impact on the families' health behaviours in the home.

While some findings suggest that face-to-face programming by trained teachers or experts should be considered in these multi-component strategies, other studies reported that more evidence is needed to conclude that they are effective with parents. Additionally, some of these interventions use dietitians to facilitate the sessions,[21,28,31] yet this approach may not be feasible, cost-effective or reach a broad audience. Qualitative research has also shown that parents' time constraints are one of the most common barriers to family meals.[37,50–52] This suggests that parents may have difficulty finding time to attend classes and education sessions. A recent evidence brief from Ontario found that research on the impact of education programs focused on food skill development targeted at parents is lacking. In addition, tools to measure and evaluate these programs are limited.[54]

There is some evidence that enhanced training of individuals who provide in-home support for families may increase the self-efficacy of parents to improve their food environment in the home. This approach may be more effective for targeted populations and as part of a multi-component intervention. There is limited evidence on how to implement taste exposure strategies in the home and although some evidence suggests that such strategies may improve FV consumption, there is concern about whether the impact is sustained over the long term.

Studies that examined home-based strategies alone also seem to favour online tools that target specific behaviours and provide some tailored feedback. In addition, there appears to be little research on strategies that utilize social media to engage parents around healthy eating behaviours. While a recent Canadian study[41] of an interactive registered dietitian written blog did not impact the behaviour changes measured, increased participation was observed when practical cooking tips and involving children in meal preparation were covered. Parent engagement via online modules or online access to information is an emerging area of research. When considering this as a strategy, it may be important to consult with the parent target group to identify specific areas of need and interest.

Before-and after-school programs may also present an opportunity to connect with parents. The majority of interventions included educational sessions; other components included family access to websites. This suggests that before-and-after school settings can be effective in implementing strategies that connect parents to online programming.

The concept of 'below-the-line' social marketing is a multi-component strategy that utilizes a variety of methods other than mass media. They are strategies that tend to be localized and community-based and support larger public campaigns. Many of the multi-component strategies reported here have the potential to inform community strategies using a 'below the line' social marketing approach. This type of approach has the potential to increase FV intake, as shown by Glasson.[38]

Larger mass media social marketing campaigns that have examined the impact on parents of school-age children show limited evidence on changing parent behaviours.[46,48] Formative evaluation of these campaigns has suggested that to be meaningful, messages should be clear, purposeful, targeted and aligned across campaigns. In addition, child-developed messaging and small scale media campaigns may be an innovative way to engage both children and leverage their ability to engage parents around promoting and adopting healthy eating behaviours.[33,34]

Recommendations and Implications for NS PPH

The Population Health Promotion Model[55] outlines an approach to maintain and improve the health status of the entire population, reduce the incidence of disease and injury, and eliminate inequities in health status between population groups. The majority of strategies emerging from this review represent one of the five strategies in this model, *Personal Health Practices*. This strategy involves different forms of health education and focuses on enhancing the knowledge, attitudes and beliefs of individuals. It is well established that multiple population health strategies are required to have an impact on health outcomes at the population level, versus health education alone.[56,57] Many of the programs and interventions that were reviewed in this report used multiple health promotion strategies that included health education, a consequence of the topic being addressed. The inclusion of purposeful parent engagement opportunities often contributed to better outcomes.

While it is difficult to single out specific and effective parent engagement strategies, multi-component strategies in both school and community settings are required to effect positive change. Examples include:

- Engaging parents with multiple communication avenues and methods such as hands-on activities, tailored information, and online platforms.
- Ensuring messaging and activities across settings and sectors is aligned and coordinated, emphasizing the promotion of family meals.

Considering both the Alberta context and the strategies that show promise, recommendations are outlined to incorporate the findings and build on existing initiatives and partnerships. All strategies need to consider identified parental barriers to mitigate unintended negative consequences faced by vulnerable groups. The following outlines some of these existing opportunities:

Implement Strategies Using the AHS Comprehensive School Health (CSH) Approach

AHS follows a CSH approach to support and improve the health of children and youth in Alberta. This approach is based on a school-based approach that employs multiple strategies including health education, addressing the social and physical environments in the school and the surrounding community, and school policy. School multi-component strategies with a parent component in this review included in-school interventions such as direct or indirect parent education, school curriculum with communication to parents and changes to the food environment. A CSH approach is recommended as a first step. In addition, including parent engagement activities as part of a CSH approach can enhance the overall impact of the work. Examples of parent engagement strategies identified in the review as showing promise and with potential applicability within the CSH approach are outlined below:

- Repackage existing NS resources such as the Cooking Club Manual and HESH recipes and newsletters by incorporating strategies such as personalization and integrated learning, to increase uptake by families. As NS PPH strategies are further developed, these and other existing resources can be reviewed for potential relevance by target audiences.
- Reinforce promising strategies from school settings, such as taste testing and meal preparation materials, by promoting their use in the home setting through the use of online engagement tools.
- Consider complementary and/or social marketing and the opportunity to leverage other existing tools and programs such as:
  - *Healthy Parents Healthy Children* – an AHS information source for parents of young children, including information to support children when starting school.
  - *Kids Food Nation* – a national food skills initiative, designed for kids aged 7-12 years, funded in part by the Public Health Agency of Canada.
  - *Healthier Together* – an AHS online resource designed to help communities, including schools, take collaborative action through sharing evidence-based resources and strategies.

  As well, monitor social marketing done by other AHS programs, Alberta Health and Health Canada for alignment and cross-promotion opportunities.
- Explore the possibility of developing online tools that are “targeted” to easily direct parents to specific and actionable activities and information according to their defined areas of interest.

- Ensure that NS content is presented in a way that reflects parents' areas of interest and likelihood of engagement. For example, healthy eating messages may need to be reframed for topics of specific interest to parents. Further, content can be designed to be mindful of parents' barriers, such as time, and facilitators, such as interest in quick and healthy meals. Content that is targeted and brief and then layered with more detailed complementary information may be most appropriate. For example, content that addresses basic knowledge and key messages around positive feeding relationships and healthy relationships with food can be embedded within resources that assist with food skills, meal planning, and preparation.
- Consider school websites and social media accounts that target parents to include regular healthy eating components, particularly those focusing on practical food skills at home. It should be noted that although studies involving strategies that utilize social media are limited, nutrition trend data on the preference of younger adults to obtain nutrition information via social media suggests that it be considered as an emerging area to engage parents.

Leverage Existing Partnerships and Initiatives

Working with partners internal and external to AHS will help to identify and provide opportunities to engage parents within existing strategies. This can involve exploring the idea of 'below-the-line' social marketing where multiple methods and existing local initiatives with well-established community networks and health champions help leverage messages to reach a greater range of people. Examples might include:

- Everactive Schools, APPLE Schools and community/school-based before- and after-school programs may assist with implementation of hands-on strategies, promotion of online resources and reinforcement of key messages. Another related opportunity may be to build relationships with community agencies that provide support to vulnerable populations such as new immigrants and refugees. It will be important to consider existing agency programming and focus on targeted staff training and engagement to help deliver activities and messages.
- Parent/School Advisory Councils as well as the AHS NS Nutrition Youth Advisory Panel may provide forums for stakeholder consultation on proposed initiatives.
- Communities that are involved with initiatives such as *Communities Choosewell*, *Wellness Fund* grants and *Benchmarking Food Environment* projects can be approached to determine if they have opportunities to build on hands-on skill development ideas for families and to use or promote online products developed by NS.
- Existing and wide-reaching workplace wellness initiatives, such as *Alberta Blue Cross*, *Alberta School Employees Benefit Plans* and *AHS Workplace Wellness* may be approached to consider embedding and including links to our messaging and strategies within their existing online health content.
- Consideration may also be given to additional messaging through existing programs where parents interact with health professionals such as primary care networks.

- Future opportunities within AHS may also include *Connect Care* and *Together4Health* where healthy messages can be sent directly to target audiences.

Health Equity
A key consideration for all of the suggestions above is to consider barriers identified by parents with consideration of potential negative impacts related to health equity. The AHS Health Equity Assessment Tool[58] should be used to plan future actions. Few studies addressed specific populations who may face health inequities, such as low-income families, those living remotely, those with limited access to transportation or technology, new Canadians and Indigenous peoples. Moreover, cultural relevancy is a key consideration for messages and actions related to parenting practices. This includes the role and importance of traditional foods, health beliefs for various cultures, the role of the extended family, and religious beliefs. Further, an appropriate balance will be needed, between building on existing successful initiatives and exploring options for vulnerable and geographically isolated populations that may not be reached through existing networks.

There are several current activities led by NS PPH where deliberate parent engagement can be considered, including educator professional development, healthy relationship with food and the nutrition youth advisory panel. Cross collaboration among NS and other PPH groups and priority areas will be valuable to build on internal successes and streamline efforts.

Recommendations in this report focus on potential opportunities; however, as strategies are selected, additional examination of the evidence is required to better understand and guide specific actions (i.e. program effectiveness). In addition, following the drivers and trends affecting Alberta parents and their families in various settings and monitoring national and provincial survey and surveillance data around nutrition and health outcomes will ensure priorities and programs stay relevant. Finally, a strong evaluation plan with clear and measurable outcomes is needed to monitor and determine the impact of new actions on parents and children.

Conclusion

This evidence review identified literature around the effectiveness of various population health promotion strategies and activities that engage parents in promoting healthy eating behaviours with their families. It is founded on the importance of nutrition in the healthy growth and development of children and youth and the role parents play in influencing the nutritional practices of their children. However, in addition to developing personal skills, the other health promotion strategies (build healthy public policy, create supportive environments, strengthen community action and reorient health services) must continue to be addressed to influence policy, social norms, and systems and networks to maximize overall impact and mitigate the risk of increasing health inequities in the population. As such, these

recommendations build on the work undertaken by NS PPH over many years and identify current and future opportunities to leverage existing work and coordinate efforts with partners and stakeholders both within and external to AHS. As NS undertakes new planning in alignment with Alberta Health and AHS priorities, consideration of these recommendations and is warranted to benefit Alberta families to achieve lifelong health.

References

1. Alberta Health Services. Maternal Newborn Child and Youth Strategic. The Alberta Antenatal Pathway. 2019;(Version 1.3).
2. Government of Alberta. Population projections. Alberta and census divisions, 2019-2046. Edmonton, AB: Treasury Board and Finance. 2019;3.
3. Pan-Canadian Public Health Network. Towards a healthier Canada - data table [Internet]. Available from: http://www.phn-rsp.ca/thcpr-vcpsre-2015/data-table-eng.php.
4. First Nations Information Governance Centre. National Report of the First Nations Regional Health Survey phase 3: volume two. [Internet]. Ottawa, Ontario; 2018. Available from: https://fnigc.ca/sites/default/files/docs/fnigc_rhs_phase_3_volume_two_en_final_screen.pdf
5. Government of Canada SC. Health fact sheets. Fruit and vegetable consumption, 2017. Catalogue no. 82-625-X [Internet]. Ottawa, Ontario: Her Majesty the Queen in Right of Canada; 2019. Available from: https://www150.statcan.gc.ca/n1/en/pub/82-625-x/2019001/article/00004-eng.pdf?st=66LTkPUP
6. Health Canada. Canada's dietary guidelines for health professionals and policy makers [Internet]. Ottawa, Canada: Her Majesty the Queen in Right of Canada; 2019. Available from: https://food-guide.canada.ca/en/guidelines/
7. Canadian Foundation for Dietetic Research. Tracking Nutrition Trends Report. Toronto, Ontario: Leger; 2018.
8. Government of Alberta. Alberta Interactive Health Data Application (IHDA). [Internet] [Internet]. 2020. Available from: http://www.ahw.gov.ab.ca/IHDA_Retrieval/selectSubCategoryParameters.do.
9. Government of Alberta. 2016 census of Canada. Aboriginal people. Edmonton, AB: Treasury Board and Finance Office of Statistics and Information - Demography. 2017;6.
10. Government of Canada SC. Focus on Geography Series, 2016 Census. Province of Alberta. Statistics Canada Catalogue no, 98-404-X2016001 [Internet]. Vol. 2020. 2017. Available from: https://www12.statcan.gc.ca/census-recensement/2016/as-sa/fogs-spg/Facts-pr-eng.cfm?Lang=Eng&GK=PR&GC=48&TOPIC=7
11. Pace D, Konczi AE. First Nations Regional Health Survey (RHS) 2008/10. Alberta report 2012 [Internet]. Alberta: The Alberta First Nations Information Governance Centre; 2012. Available from: http://www.afnigc.ca/main/includes/media/pdf/digital reports/RHS-Report-FINAL.pdf
12. Government of Canada SC. Table 13-10-0096-21. Body mass index, overweight or obese, self reported, youth (12 to 17 years old) [Internet]. Vol. 2020. 2020. Available from: https://www150.statcan.gc.ca/t1/tbl1/en/tv.action?pid=1310009621. DOI: https://doi.org/10.25318/1310009601-eng
13. Government of Canada SC. Time to eat [Internet]. Vol. 2020. 2018. Available from: https://www150.statcan.gc.ca/n1/pub/11-627-m/11-627-m2018003-eng.htm
14. McMaster University. Health Evidence Quality Assessment Tool. Review articles. [Internet]. 2016 [cited 2021 May 28]. Available from: https://healthevidence.org/our-appraisal-tools.aspx
15. McMaster University. Effective Public Health Project (EPHPP). Quality Assessment Tool for Quantitative Studies [Internet]. 2009 [cited 2021 May 28]. Available from: https://www.ephpp.ca/quality-assessment-tool-for-quantitative-studies/
16. Critical Appraisal Skills Program. CASP qualitative checklist: 10 questions to help you make sense of a qualitative research [Internet]. Vol. 2020. 2018. Available from: https://casp-uk.net/casp-tools-checklists/
17. Hendrie GA, Brindal E, Corsini N, Gardner C, Baird D, Golley RK. Combined home and school obesity prevention interventions for children. Heal Educ Behav [Internet]. 2012 Apr;39(2):159–71. Available from: https://journals.sagepub.com/doi/full/10.1177/1090198111420286

18. Hingle MD, O'Connor TM, Dave JM, Baranowski T. Parental involvement in interventions to improve child dietary intake: A systematic review. Prev Med (Baltim) [Internet]. 2010;51(2):103–11. Available from: https://www.clinicalkey.es/playcontent/1-s2.0-S0091743510001696

19. Murimi MW, Moyeda-Carabaza AF, Nguyen B, Saha S, Amin R, Njike V. Factors that contribute to effective nutrition education interventions in children: a systematic review. Nutr Rev [Internet]. 2018 Aug 1;76(8):553–80. Available from: https://www.ncbi.nlm.nih.gov/pubmed/29800311

20. Nathan N, Janssen L, Sutherland R, Hodder RK, Evans CEL, Booth D, et al. The effectiveness of lunchbox interventions on improving the foods and beverages packed and consumed by children at centre-based care or school: A systematic review and meta-analysis. Int J Behav Nutr Phys Act [Internet]. 2019 Apr 29;16(1):38. Available from: https://www.ncbi.nlm.nih.gov/pubmed/31036038

21. Van Lippevelde W, Verloigne M, de Bourdeaudhuij I, Brug J, Bjelland M, Lien N, et al. Does parental involvement make a difference in school-based nutrition and physical activity interventions? A systematic review of randomized controlled trials. Int J Public Health [Internet]. 2012;57(4):673–8. Available from: https://www.narcis.nl/publication/RecordID/oai:pure.atira.dk:publications%2F404a9a35-22b0-486a-abe3-92798dae5f22

22. Bjelland M, Hausken SES, Bergh IH, Grydeland M, Klepp KI, Andersen LF, et al. Changes in adolescentsâ€™ and parentsâ€™ intakes of sugar-sweetened beverages, fruit and vegetables after 20 months: results from the HEIA study â€“ a comprehensive, multi-component school-based randomized trial. Food Nutr Res. 2015 Mar 20;59:10.3402/fnr.v59.25932.

23. Christian MS, Evans CEL, Ransley JK, Greenwood DC, Thomas JD, Cade JE. Process evaluation of a cluster randomised controlled trial of a school-based fruit and vegetable intervention: Project Tomato. Public Health Nutr [Internet]. 2012 Mar;15(3):459–65. Available from: https://www.ncbi.nlm.nih.gov/pubmed/21835081

24. Baghurst T, Eichmann K. Effectiveness of a child-only and a child-plus-parent nutritional education program. Int J Child Adolesc health [Internet]. 2014 Jul 1;7(3):229. Available from: https://search.proquest.com/docview/1626548201

25. Flood C, Murphy A, Hammerschmidt P. A family bookbag program reaches parents with messages about healthful eating and physical activity and improves family reading time. J Nutr Educ Behav [Internet]. 2008;40(5):322–3. Available from: https://www.clinicalkey.es/playcontent/1-s2.0-S1499404608000353

26. Horne PJ, Hardman CA, Lowe CF, Tapper K, Le Noury J, Madden P, et al. Increasing parental provision and children's consumption of lunchbox fruit and vegetables in Ireland: the Food Dudes intervention. Eur J Clin Nutr [Internet]. 2009 May;63(5):613–8. Available from: http://dx.doi.org/10.1038/ejcn.2008.34

27. Van Lippevelde W, van Stralen MM, Verloigne M, de Bourdeaudhuij I, Deforche B, Brug J, et al. Mediating effects of home-related factors on fat intake from snacks in a school-based nutrition intervention among adolescents. Health Educ Res [Internet]. 2012;27(1):36–45. Available from: https://www.narcis.nl/publication/RecordID/oai:research.vu.nl:publications%2F344f0a41-bf62-4426-b533-e59bdc23c677

28. Bisset SL, Potvin L, Daniel M, Paquette M. Assessing the impact of the primary school-based nutrition intervention petits cuistots - parents en reseaux. Can J Public Heal [Internet]. 2008 Mar 1;99(2):107. Available from: https://search.proquest.com/docview/232014712

29. Carson DE, Reiboldt W. Parents' agreement to purchase healthy snack foods requested by their children. J Fam Consum Sci [Internet]. 2010 Jan 1;102(1):42. Available from: https://search.proquest.com/docview/744486330

30. Gribble LS, Falciglia G, Davis AM, Couch SC. A curriculum based on social learning theory emphasizing fruit exposure and positive parent child-feeding strategies: A pilot study. J Am Diet Assoc [Internet]. 2003 Jan;103(1):100–3. Available from: https://www.sciencedirect.com/science/article/pii/S0002822302000159

31. Prelip M, Le Thai C, Toller Erausquin J, Slusser W. Improving low-income parents' fruit and vegetable intake and their potential to impact children's nutrition. Health Educ [Internet]. 2011 Aug 30;111(5):391–411.

Available from: http://www.emeraldinsight.com/doi/abs/10.1108/09654281111161220

32. Borden VM, Labiner-Wolfe J, Blake SM, Marr A, Rowe J, Wasserman J. BodyWorks: A parent-focused program to promote healthful eating and physical activity for children and adolescents. J Nutr Educ Behav [Internet]. 2012;44(2):192–3. Available from: https://www.clinicalkey.es/playcontent/1-s2.0-S1499404611005331

33. Evans A, Dave J, Tanner A, Duhe S, Condrasky M, Wilson D, et al. Changing the home nutrition environment: Effects of a nutrition and media literacy pilot intervention. Fam Community Health [Internet]. 2006 Jan;29(1):43–54. Available from: http://ovidsp.ovid.com/ovidweb.cgi?T=JS&NEWS=n&CSC=Y&PAGE=fulltext&D=ovft&AN=00003727-200601000-00006

34. Tanner A, Duhe S, Evans A, Condrasky M. Using student-produced media to promote healthy eating. Sci Commun [Internet]. 2008 Sep;30(1):108–25. Available from: https://journals.sagepub.com/doi/full/10.1177/1075547008319435

35. Crespo N, Elder J, Ayala G, Slymen D, Campbell N, Sallis J, et al. Results of a multi-level intervention to prevent and control childhood obesity among Latino children: The aventuras para niños study. Ann Behav Med [Internet]. 2012 Feb;43(1):84–100. Available from: https://www.ncbi.nlm.nih.gov/pubmed/22215470

36. Collins CE, Burrows TL, Bray J, Asher R, Young M, Morgan PJ. Effectiveness of parent-centred interventions for the prevention and treatment of childhood overweight and obesity in community settings: a systematic review. JBI Database Syst Rev Implement Reports. 2013 Sep;11(9):180–257.

37. Dwyer L, Oh A, Patrick H, Hennessy E. Promoting family meals: a review of existing interventions and opportunities for future research. Adolesc Health Med Ther [Internet]. 2015;6:115–31. Available from: https://www.ncbi.nlm.nih.gov/pubmed/26124690

38. Glasson C, Chapman K, Wilson T, Gander K, Hughes C, Hudson N, et al. Increased exposure to community-based education and 'below the line' social marketing results in increased fruit and vegetable consumption. Public Health Nutr [Internet]. 2013 Nov;16(11):1961–70. Available from: https://www.ncbi.nlm.nih.gov/pubmed/23806675

39. Fabri M, Wall A, Trevorrow P. Changing eating behaviors through a cooking-based website for the whole family. In: Marcus A, editor. Design, user experience, and usability: user experience in novel technological environments. Berlin: Springer; 2013. p. 484–93.

40. Knowlden A, Sharma M. One-year efficacy testing of enabling mothers to prevent pediatric obesity through web-based education and reciprocal determinism (EMPOWER) randomized control trial. Heal Educ Behav [Internet]. 2016 Feb;43(1):94–106. Available from: https://journals.sagepub.com/doi/full/10.1177/1090198115596737

41. Dumas A-A, Lemieux S, Lapointe A, Provencher V, Robitaille J, Desroches S. Effects of an evidence-informed healthy eating blog on dietary intakes and food-related behaviors of mothers of preschool- and school-aged children: A randomized controlled trial. J Acad Nutr Diet [Internet]. 2020 Jan;120(1):53–68. Available from: http://dx.doi.org/10.1016/j.jand.2019.05.016

42. Schwinn TM, Schinke S, Fang L, Kandasamy S. A web-based, health promotion program for adolescent girls and their mothers who reside in public housing. Addict Behav [Internet]. 2013;39(4):757–60. Available from: https://www.clinicalkey.es/playcontent/1-s2.0-S0306460313004255

43. Vereecken C, Covents M, Maes L, Moyson T. Formative evaluation of the feedback component of Children's and Adolescents' Nutrition Assessment and Advice on the Web (CANAA-W) among parents of schoolchildren. Public Health Nutr [Internet]. 2013 Jan;16(1):15–26. Available from: https://www.ncbi.nlm.nih.gov/pubmed/23174271

44. Wilson DK, Alia KA, Kitzman-Ulrich H, Resnicow K. A pilot study of the effects of a tailored web-based intervention on promoting fruit and vegetable intake in African American families. Child Obes [Internet]. 2014 Feb 1;10(1):77–84. Available from: https://www.liebertpub.com/doi/abs/10.1089/chi.2013.0070

45. Baranowski T, Baranowski JC, Cullen KW, Thompson DI, Nicklas T, Zakeri IEF, et al. The Fun, Food, and Fitness Project (FFFP): the Baylor GEMS pilot study. Ethn Dis [Internet]. 2003;13(1 Suppl 1):30. Available from: https://www.ncbi.nlm.nih.gov/pubmed/12713209

46. Croker H, Lucas R, Wardle J. Cluster-randomised trial to evaluate the 'Change for Life' mass media/ social marketing campaign in the UK. BMC Public Health [Internet]. 2012 Jun 6;12(1):404. Available from: https://www.ncbi.nlm.nih.gov/pubmed/22672587

47. Touyz LM, Wakefield CE, Grech AM, Quinn VF, Costa DSJ, Zhang FF, et al. Parent-targeted home-based interventions for increasing fruit and vegetable intake in children: a systematic review and meta-analysis. Nutr Rev [Internet]. 2018 Mar 1;76(3):154–73. Available from: https://www.ncbi.nlm.nih.gov/pubmed/29319789

48. Pivonka E, Seymour J, McKenna J, Baxter SD, Williams S. Development of the behaviorally focused fruits & veggies—more matters public health initiative. J Am Diet Assoc [Internet]. 2011;111(10):1570–7. Available from: https://www.clinicalkey.es/playcontent/1-s2.0-S0002822311012089

49. Ong JX, Ullah S, Magarey A, Miller J, Leslie E. Relationship between the home environment and fruit and vegetable consumption in children aged 6–12 years: a systematic review. Public Health Nutr [Internet]. 2017 Feb;20(3):464–80. Available from: https://www.ncbi.nlm.nih.gov/pubmed/27869044

50. Haerens L, De Bourdeaudhuij I, Barba G, Eiben G, Fernandez J, Hebestreit A, et al. Developing the IDEFICS community-based intervention program to enhance eating behaviors in 2- to 8-year-old children: findings from focus groups with children and parents. Health Educ Res [Internet]. 2009 Jun;24(3):381–93. Available from: https://www.ncbi.nlm.nih.gov/pubmed/18603656

51. Hawthorne DL, Neilson LJ, Macaskill LA, Luk JMH, Horner EJ, Parks CA, et al. Parental reports of lunch-packing behaviours lack accuracy: Reported barriers and facilitators to packing school lunches. Can J Diet Pract Res [Internet]. 2018 Sep 1;79(3):99–105. Available from: https://www.ncbi.nlm.nih.gov/pubmed/29893145

52. Fulkerson JA, Kubik MY, Rydell S, Boutelle KN, Garwick A, Story M, et al. Focus groups with working parents of school-age children: What's needed to improve family meals? J Nutr Educ Behav [Internet]. 2011 Jan 1;43(3):189–93. Available from: https://www.openaire.eu/search/publication?articleId=od_____267::5d1d02b37ab9bc8750da76b81cfed60d

53. McKernan C, Montemurro G, Chahal H, Veugelers PJ, Gleddie D, Storey KE. Translation of school-learned health behaviours into the home: student insights through photovoice. Can J Public Health [Internet]. 2019 Dec;110(6):821–30. Available from: https://www.ncbi.nlm.nih.gov/pubmed/31309443

54. Nutrition Connections. Effective approaches to increase food skills in children, youth, and their parents. Toronto: Ontario Public Health Association. 2019;7.

55. World Health Organization. Health Promotion: The Ottawa charter for health promotion. [Internet]. 1986 [cited 2021 Aug 16]. Available from: https://www.who.int/healthpromotion/conferences/previous/ottawa/en/

56. Government of Canada. Population health promotion: An integrated model of population health and health promotion [Internet]. Vol. 2020. 2001. Available from: https://www.canada.ca/en/public-health/services/health-promotion/population-health/population-health-promotion-integrated-model-population-health-health-promotion/developing-population-health-promotion-model.html

57. Centers for Disease Control and Prevention (CDC). The social-ecological model: A framework for prevention [Internet]. Vol. 2020. 2020. Available from: https://www.cdc.gov/violenceprevention/publichealthissue/social-ecologicalmodel.html

58. Population Healthy Public Policy Unit P and IH. Health equity impact assessment: A user guide for embedding a health equity lens into AHS health programming. Calgary, AB: Alberta Health Services; 2018.

59. The World Bank Group. World Bank Group Glossary [Internet]. 2015 [cited 2021 May 28]. Available from: https://datahelpdesk.worldbank.org/knowledgebase/articles/906519-world-bank-country-and-lending-groups

60. Lynch JW, Kaplan GA. Socioeconomic position. In: I BLF and B, editor. Social Epidemiology. New York: Oxford University Press; 2000. p. 13–35.

61. National Collaborating Centre for Determinants of Health. Let's talk: universal and targeted approaches to health equity [Internet]. Antigonish, NS: National Collaborating Centre for Determinants of Health, St. Francis Xavier University; 2015. Available from: http://nccdh.ca/resources/entry/lets-talk-advocacy-and-health-equity

62. Grimes DA, Schulz KF. An overview of clinical research: the lay of the land. Lancet [Internet]. 2002 Jan 5;359(9300):57–61. Available from: http://dx.doi.org/10.1016/S0140-6736(02)07283-5

63. Cochrane Effective Practice and Organisation of Care (EPOC). What study designs should be included in an EPOC review? EPOC resources for review authors [Internet]. Vol. 2020. 2017. Available from: https://epoc.cochrane.org/sites/epoc.cochrane.org/files/public/uploads/Resources-for-authors2017/what_study_designs_should_be_included_in_an_epoc_review.pdf

64. GreyNet International. Grey Literature Network Service. Research, publication, open access education, and public awareness to grey literature. [Internet]. 2016 [cited 2021 Oct 1]. Available from: http://www.greynet.org/home.html

65. McMaster University. Health Evidence Glossary. Evid Based Nurs. 2016 Oct 1;12(4):128–128.

Appendix A: List of Definitions

Term	Definition
High Income	A high-income country is a country with a high-income economy as defined by the World Bank. Income is measured using gross national income (GNI) per capital, in U.S. dollars, calculated from local currency using the World Bank Atlas method. Other terms such as "developing country" and "Third World" are terminology previously used. In this report, the World Bank Economies 2015 document was used to determine studies conducted in developed countries.[59]
Low and Middle Income	Low, low-middle and high-middle income economy groupings are three of the four income groupings as defined by the World Bank. As for the high-income economy grouping, income is measured using gross national income (GNI) per capital in U.S. dollars. The middle-income category is divided into lower, middle, or upper-middle. Other terms such as "developing country" and "Third World" are terminology previously used. In this report, the World Bank Economies 2015 document was used to determine studies conducted in developed countries.[59]
Multi-component	For this review, multi- component strategies are defined as those that apply more than one population public heath strategy to achieve a goal. For example, multi-component strategies may include strategies that focus on developing the personal skills of parents and families along with creating supportive environments in settings including home, childcare/ school, and in the community. Comprehensive School Health is an example of a multi-component approach.
Socioeconomic position	Socioeconomic position refers to "the social and economic factors that influence what positions individuals or groups hold within the structure of a society".[60]
Targeted population approach	Intended to apply to a priority sub-group within the broader, defined population. "Eligibility and access to services are determined by selection criteria, such as income, health status, employment status or neighbourhood".[61] For example, many programs are implemented for parents and are accessed through existing programs that aim to target a certain population. In the literature, this was noted when the parent interventions were trialled for parents who accessed certain support based on their needs (i.e. low income, ethnicity, etc.) and was not accessible to the larger population in the community.
Universal population approach	Designed to apply to an entire population. "Eligibility and access are based simply on being part of a defined population".(61) For example, programs available and accessible to all parents without consideration to specific characteristics, such as income, ethnicity etc.

Appendix B: Search Strategy

What are the most effective strategies to engage parents in role modelling healthy eating behaviours and in building their capacity (knowledge, skills and motivation) in creating supportive physical and social environments to support optimal growth and development of school-age children and youth?*	
1. How do we reach parents? Need to start looking outside the school environment and parental influences. Where do parents go for information? 2. What do they want to hear and how do they want to hear? 3. Effective messaging to parents – What are the strategies and/or key messages that engage and encourage action? E.g. family meals etc. **Consideration given to settings, methods and targeted messages*	
Limits	
Age: Child 6-12 years Adolescent 13-18 years Publication date for database search: 2000 to 2014 Hand search: 2000-2019 Geography: Canada, U.S., U.K. Australia, New Zealand, and Scandinavia (Denmark, Norway, Sweden, Finland, Iceland) Language: English	
Databases**	
Business Source Complete; Business Source Elite; CAB Abstracts; CINAHL; Education Research Complete; EMBASE; ERIC; Evidence-Based Medicine (EBM Reviews-includes Cochrane Database of Systematic Reviews); Family & Society Studies Worldwide; Family Studies Abstracts; Health Source (Consumer and Nursing/Academic Edition);MEDLINE; PsycINFO; Psychology & Behavioural Sciences Collection; PubMed; PubMed Central; Scopus; Social Work Abstracts; SocINDEX with Full Text; Web of Science ***Grey Literature databases was not extensively searched due to capacity and determination that it would inform the question further. Two grey literature documents identified by hand search.*	
Concept	**Synonym**
Parent[1] *[1] Focus on parent vs caregivers, care workers which mainly refers to caring for the ill and elderly.*	parent* [Keyword]; parents [MeSH]; "legal guardian" [Keyword];
Healthy Eating Behaviour[2]/Healthy Feeding Relationship *[2] Spelling variations are also important to account for (behaviour vs. behaviour, etc.).*	"healthy eating" [Keyword]; feeding behaviour [MeSH]; "feeding behaviour*" [Keyword]; "feeding behaviour*" [Keyword]; food habits [MeSH]; "food habit*" [Keyword] "healthy diet" [Keyword]; "feeding relationship" [Keyword]; "eating behaviour*" [Keyword]; "eating behaviour*" [Keyword];
Parental Role Modeling/Engagement	"positive discipline" [Keyword]; parenting [Keyword, MeSH]; "parenting approach" [Keyword]; "effective parenting" [Keyword]; "positive parenting" [Keyword]; "role modeling" [Keyword]; "role modelling" [Keyword]; "knowledge transfer" [Keyword]; "knowledge translation" [Keyword]
Family Meals	"family meal*" [Keyword], "eating together" [Keyword], "Family food practices/traditions"
Social Environment/Socio-Economic Status	"social environment" [Keyword, MeSH]; "socio-economic status" [Keyword]; socioeconomic factors [MeSH]
Children[3] (3-18) *[3]the age limiters found in the databases should also be applied (separately) [i.e. child 6-12 years; adolescent 13-18 years]*	child* [Keyword]; child [MeSH]; adolescen* [Keyword]; adolescent [MeSH]; youth* [Keyword]; teen* [Keyword]; "school-aged children" [Keyword]
Optimum Nutrition/Healthy Growth	"optimum nutrition" [Keyword]; nutrition [Keyword]; "healthy growth" [Keyword]; child development [MeSH]; adolescent development [MeSH]; "healthy weight" [Keyword]; "obesity prevention" [Keyword]; "growth curves"; "normal growth"

Keyword Search Strings
(parent* OR “legal guardian*” OR guardianship) AND (“healthy eating” OR “feeding behaviour*” OR “feeding behaviour*” OR “food habit*” OR “healthy diet” OR “feeding relationship” OR “eating behaviour*” OR “eating behaviour*”) AND (child* OR adolescen* OR youth* OR teen* OR “school-aged children”) AND (“optimum nutrition” OR nutrition OR “healthy growth” OR “child development” OR “healthy weight” OR “obesity prevention”)
(parent* OR “legal guardian*” OR guardianship) AND (“healthy eating” OR “feeding behaviour*” OR “feeding behaviour*” OR “food habit*” OR “healthy diet” OR “feeding relationship” OR “eating behaviour*” OR “eating behaviour*”) AND “family meal*” AND (child* OR adolescen* OR youth* OR teen* OR “school-aged children”) AND (“optimum nutrition” OR nutrition OR “healthy growth” OR “child development” OR “healthy weight” OR “obesity prevention”)
(parent* OR “legal guardian*” OR guardianship) AND (“healthy eating” OR “feeding behaviour*” OR “feeding behaviour*” OR “food habit*” OR “healthy diet” OR “feeding relationship” OR “eating behaviour*” OR “eating behaviour*”) AND (“social environment” OR “socio-economic status” OR “socioeconomic factor*”) AND child* OR adolescen* OR youth* OR teen* OR “school-aged children”) AND (“optimum nutrition” OR nutrition OR “healthy growth” OR “child development” OR “healthy weight” OR “obesity prevention”)
(parenting OR “positive discipline” OR “parenting approach” OR “effective parenting” OR “positive parenting” OR “role modelling” OR “role modeling” OR “knowledge transfer” OR “knowledge translation”) AND (“healthy eating” OR “feeding behaviour*” OR “feeding behaviour*” OR “food habit*” OR “healthy diet” OR “feeding relationship” OR “eating behaviour*” OR “eating behaviour*”) AND (child* OR adolescen* OR youth* OR teen* OR “school-aged children”) AND (“optimum nutrition” OR nutrition OR “healthy growth” OR “child development” OR “healthy weight” OR “obesity prevention”)
(parenting OR “positive discipline” OR “parenting approach” OR “parent-child relations” OR “mother-child relations” OR “child rearing” OR “effective parenting” OR “positive parenting” OR “parenting skill*”) AND (“healthy eating” OR “feeding behaviour*” OR “feeding behaviour*” OR “food habit*” OR “healthy diet” OR “feeding relationship” OR “eating behaviour*” OR “eating behaviour*”) AND “family meal*” AND (child* OR adolescen* OR youth* OR teen* OR “school-aged children”) AND (“optimum nutrition” OR nutrition OR “healthy growth” OR “child development” OR “healthy weight” OR “obesity prevention”)
(parenting OR “positive discipline” OR “parenting approach” OR “parent-child relations” OR “mother-child relations” OR “child rearing” OR “effective parenting” OR “positive parenting” OR “parenting skill*”) AND (“healthy eating” OR “feeding behaviour*” OR “feeding behaviour*” OR “food habit*” OR “healthy diet” OR “feeding relationship” OR “eating behaviour*” OR “eating behaviour*”) AND (“social environment” OR “socio-economic status” OR “socioeconomic factor*”) (child* OR adolescen* OR youth* OR teen* OR “school-aged children”) AND (“optimum nutrition” OR nutrition OR “healthy growth” OR “child development” OR “healthy weight” OR “obesity prevention”)

Appendix C: Inclusion/Exclusion Criteria

Component	Inclusion Criteria	Exclusion Criteria
Language	English	Non-English
Publication Date	2000-2015 *Note: Systematic reviews and primary research hand search/reference list reviews to January 2020*	Prior to 2000
Population	Children and youth 6-18	Ages 5 years and below (including the 3 to 5-year-old category
Geography	Canada, U.S., U.K., Australia, New Zealand, Western Europe, Europe. High-income countries (previously developed countries); countries with similar political, social and cultural context to Canada	All countries not identified in the inclusion list
Health status	Healthy population, non-disease, obesity-prevention strategy (E.g. healthy living messages)	Those outside of the "healthy" category; existing diseases/conditions in treatment (e.g. eating disorders, obesity treatment -physical exam, assessment, counselling/support provision, co-morbidities, exploration of motivation/ readiness to change)
Setting	Community, home School (age 6- 18); or preschool if data is presented separately Must have a parent/caregiver engagement component	Institutionalized, hospital School interventions/ programs with no parent/caregiver engagement component; Include preschool as well (i.e. 3-5 year olds/preschool)
Methods	Articles that evaluate a strategy or describe the process or define facilitators or barriers to a strategy. Not content or messages we know, but how delivered, programs that made them effective (E.g. qualitative or quantitative - class, newsletter (KT), PHN involvement, multi-component programs, social marketing, multimedia, etc.)	If the article only postulates/ recommends a strategy that has nothing to do with the outcomes they measured, it would be excluded. We are interested in the **How** not the **What** (we already know the content) **Study type:** case studies, narratives, conference proceedings, books, magazine articles, expert opinion/ opinion papers, etc. Editorials, theses, poster presentations.
Other		Exclude if we cannot locate via google scholar or KRS

Appendix D: List of Study Designs

Term	Definition
Cohort **Cohort Analytic**	A form of longitudinal observational study. The study group shares a common experience or characteristic within a defined period, while the comparison groups may be the general population from which the cohort is drawn.[62]
Controlled before-after Study (CBA)	A study in which observations are made before and after the implementation of an intervention, both in a group that receives the intervention and in a control group that does not.[63]
Cross-sectional study (CS)	A study that collects information on interventions (past or present) and current health outcomes, i.e. restricted to health states, for a group of people at a particular point in time, to examine associations between the outcomes and the exposure to interventions.[63]
Descriptive review with systematic search strategy (DR)	For the report, this is defined as a review of the search strategy outlined, although the search may not be as rigorous as that outlined when conducting a systematic review of the literature.
Grey literature (GL)	Grey literature consists of documents produced by all levels of government, academics, business and organizations "where publishing is not the primary activity of the producing body".[64] Examples include annual reports, conference proceedings, technical reports, theses, white papers, and even informal communication such as blogs, emails, or social media posts.
Meta-analysis (MA)	A statistical technique to combine the results of multiple studies resulting in a single pooled estimate of effect.[65]
Narrative review (NR)	These are evidence overviews or expert commentaries on a given health topic. Unlike systematic reviews, they are not designed to be reproducible as their methodology (E.g. search strategy, inclusion criteria) is usually not described.[65]
Non-randomized controlled trial *or* Non-randomized trial (NRCT)	An experimental study in which people are allocated to different interventions using methods that are not random.[63] The most common types of NRCTs in public health are natural experiments where the intervention takes place and an existing group, not receiving the intervention, is used as a control.
Observational **Observational Analytic**	Observational designs include exploratory studies, descriptive studies such as surveys and analytical studies used to test hypotheses.[62]
Randomized controlled trial *or* Randomized trial (RCT)	An experimental study in which people are allocated to different interventions using random methods.[63]
Systematic review (SR)	A review of a formulated question that uses systematic and explicit methods to identify, select, and critically appraise relevant research, and to collect and analyze data from the studies that are included in the review. Statistical methods (meta-analysis) may or may not be used to analyze and summarize the results of the included studies.[65]

Appendix E: Study Details

Table A. Systematic Reviews

Study Details	Methods	Findings/Conclusions
Collins, 2013 **Study Design:** SR **Country:** Multiple **Population:** Universal **Participants:** Children of pre-school, primary and secondary schools age and/or their parents/guardians ages 18+. **Purpose:** To identify the effectiveness of parent-centred interventions implemented in community settings in modifying eating and physical activity behaviours or weight-related outcomes. **HE Appraisal:** Strong	**Design** • Published articles reporting on community-based, parent-centred interventions; 8 electronic databases; 1975-2009. **Included Studies** • 32 studies included: 22 RCTs, 3 NRCTs, 7 pre-test, post-test. **Nutrition Related Outcomes Measured and Reported** • **Weight-related outcomes**: weight, BMI, waist circumference • **Eating behaviour outcomes**: fruit and vegetable intake, macronutrient composition, core food groups, diet quality	**Findings** • **Home-based interventions**: 3 of 9 studies showed a decrease in anthropometric variables post-intervention; **Before- and after-school interventions**: 7 of 10 studies reported a significant decrease in a weight-related outcome post-intervention; **Remaining studies**: less than 50% reported significant changes in a weight variable post-intervention. **Eating behaviour outcomes**: 4 studies reported a significant decrease in energy intake; 3 studies reported a decrease in sweetened drink consumption. **Strength and Limitations** • Comprehensive search strategy; strong review methods. Ethnically diverse populations in real-world settings, thus generalizable and translatable results. • Inclusion criteria: only English language studies; weight as a primary outcome; short duration studies with methodological weaknesses; wide age range and varied intervention components – interpret with caution. **Conclusions** • Results support the after-school setting as the most promising for community interventions targeting parents as agents of change within child obesity prevention and treatment programs. **Implications for Public Health Nutrition Practice** • Consider opportunities to work with after-school settings and programs as an effective way to engage parents in promoting healthy eating behaviours with their families.
Dwyer, 2015 **Study Design**: Review with systematic process **Country**: US, UK **Population**: Universal **Participants**: Families of school-aged children and adolescents **Purpose**: To review the existing family meals literature that is relevant to strategies to encourage more frequent family meals. **HE Appraisal**: Moderate	**Design** • Published articles reporting on family meal frequency, promotion, setting and target population strategies and key correlates and barriers to family meals; 2 electronic databases; 2000-2014. **Included Studies** • 49 studies included: 6 intervention and 43 other studies **Nutrition Related Outcomes Measured and Reported** • Family meal frequency • Strategies to promote, settings used, populations targeted • Key correlates of barriers to family meals • Factors that contribute to family meals rather than the association between family meals and behavioural outcomes.	**Findings** • 4/6 interventions successfully promoted family meal frequency; 38 quantitative studies examined associations between family meals and other constructs; 5 qualitative articles reported on barriers/facilitators. Intervention settings included home, community, medical, workplace and the internet. • **Common intervention strategies**: goal setting and interactive group activities for parents and children; **Common factors to family meals**: cooking/food preparation, cost, shopping and adolescent influence; **Key correlates to family meals**: employment, socioeconomic and demographic factors, family structure, perceived importance and attitudes, and home environment factors (TV watching during meals, mealtime rules, food availability). **Barriers to family meals**: time and scheduling challenges, cost and food preferences. **Strengths and Limitations** • **Strategies** are limited, vary in scope and it is unknown how these strategies might impact across populations. • **Review** did not include the influence of family meals on behavioural and health outcomes which may have added to the understanding of correlates and moderators of family meals. • **Review** outlines opportunities for future research such as how to make mealtimes easier for subpopulations and considering the complexities of relationships when promoting family meals **Conclusions** • While some effective interventions exist, efficacy is variable. Including youth involvement in mealtime, tailoring interventions to family and providing support for families experiencing time-related barriers are suggested strategies for future research. **Implications for Public Health Nutrition Practice** • Consider multiple methods and messages delivered through various channels tailored to family characteristics and based on identified needs and barriers.

Study Details	Methods	Findings/Conclusions
Hendrie, 2012 **Study Design:** Review, systematic process **Country:** not identified **Population:** Universal **Participants:** Preschool/primary school-age children in various settings **Purpose:** To examine the effectiveness of combined-setting obesity prevention interventions for the association between the effectiveness and food and activity behaviours targeted. **HE Appraisal:** Moderate	**Design:** • Published articles reporting on interventions delivered across both home and school/community settings which target obesity and weight-related nutrition and physical activity behaviours in children; 4 electronic databases and reference list searches; 1998-2010. **Included Studies** • 15 studies evaluating community/school-based interventions with parental involvement. **Nutrition Related Outcomes Measured and Reported** • Intervention effectiveness to change children's weight-related dietary, activity and sedentary based behaviours and the behaviour change techniques used.	**Findings** • 7/15 studies were rated as effective, using more behaviour-based techniques than ineffective studies. Techniques included providing information on behaviour-health links, model/demonstrating behaviour, prompting behaviour practices and planning for social support/social changes. Different techniques were applied in home and school settings. • Most interventions used parents and home environments to reinforce children's learning from school, although the intensity of parent intervention varied. **Strengths and Limitations** • Effectiveness measures didn't allow for variances in sample sizes and design that would limit statistical power. • All studies were short duration, potentially limiting the impact on weight-related outcomes. **Conclusions** • Seven studies provided support for the effectiveness of combined setting interventions changing children's nutrition and activity behaviours or risk of obesity. Family involvement is recommended. **Implications for Public Health Nutrition Practice** • Strategies implemented in multiple settings with aligned messages for parents and children and purposeful parent engagement may be most effective in affecting positive health practices.
Hingle, 2010 **Study Design:** SR **Country:** Multiple **Population:** Universal **Participants:** Parents of children age 2-18 years; in various settings **Purpose:** To identify obesity/disease prevention and health promotion programs involving parents designed to change child and adolescent dietary intake. **HE Appraisal:** Strong	**Design:** • Published literature on individual and population-based obesity/disease prevention and health promotion programs involving parents designed to change child and adolescent dietary intake; 4 electronic databases, 1980-2008. **Included Studies** • 24 studies RCTs of obesity prevention, chronic disease prevention, or health promotion intervention. **Nutrition Related Outcomes Measured and Reported** • Child dietary intake • Direct or indirect parent engagement	**Findings** • Inconsistent evidence about whether parental involvement enhances the effectiveness of interventions to change child specific dietary intake. • Studies using direct methods (parent attendance at nutrition education session, family behaviour counselling, and parent training sessions) or indirect methods where children were required to engage their parents were more likely to report positive or mixed results. **Strengths and Limitations** • Included studies varied in details around study design. • No harm was reported in any studies. **Conclusions** • Limited conclusions may be drawn regarding the best method to involve parents in changing child diet to prevent obesity and improve health. Indirect methods remain the most commonly used strategies to engage parents, however, direct methods of engagement show more promise. **Implications for Public Health Nutrition Practice** • Consider purposeful and targeted parent engagement activities to support their efforts in promoting healthy eating in their children.

Study Details	Methods	Findings/Conclusions
Murimi, 2018 **Study Design:** SR **Country:** Multiple **Population:** Universal **Participants:** 26 elementary and 8 secondary school-based studies. **Purpose:** To identify factors associated with successful nutrition education interventions conducted in children. **HE Appraisal:** Strong	**Design:** • Published articles with a nutrition education intervention among children ages 2-19; 4 databases; 2009-2016 **Included Studies** • 41 studies: 7 preschools, 26 elementary schools; 8 secondary school **Outcomes Measured and Reported** • Study sample • Objective of education intervention • Study design • Length and frequency of intervention • Behavioural theory/construct • Achievement of objectives • Risk of bias • Major findings	**Findings** (elementary and secondary school only) • Multi-component activities of at least 6 months duration to impact behaviour change, not only knowledge. Weight-related outcomes were not meaningfully improved. • Targeting specific behaviours to modify (for example, increasing fruit and vegetable intake). Ensure aligned objectives, activities and expected behaviours. • Provide hands-on activities that are age and developmentally appropriate. At the secondary level, adding policy and environmental changes as well as technology-based activities improved success. • Engage parents directly with hands-on activities and lectures. Passive education was not as beneficial. • Providing training to teachers or health professionals who are implementing nutrition education. **Strength and Limitations** • Review focuses on analyzing several factors contributing to successful interventions vs. single interventions. • Only English studies were included. Some articles had limited information on their methods and results. **Conclusion** • Multi-component, school-based interventions with active parent engagement are more likely to impact nutrition knowledge and behaviour outcomes. **Implications for Public Health Nutrition Practice** • Consider ongoing, multi-component school-based strategies implemented with effective train-the-trainer models and active parent engagement to improve nutrition-related outcome effectiveness.
Nathan, 2019 **Study Design:** SR **Country:** Multiple **Population:** Universal **Participants:** 3-14 year olds in care centres and schools **Purpose:** To assess the effectiveness of lunchbox interventions aimed at improving the foods and beverages packed and consumed by children and subsequent impact on adiposity. **HE Appraisal:** Strong	**Design:** • Published articles of lunchbox interventions with children in centre-based care or school; 9 databases; 1995-2017 **Included Studies** • 10 studies: 4 centre-based care, 6 school; 8 RCTs, 2 NRCTs **Outcomes Measured and Reported** • Number or proportion of servings, grams of food provided or consumed • FV packed from home • Discretionary food (confectionary, snacks) provision.	**Findings** • All studies involved multi-component interventions with some including parent engagement activities (direct and indirect) and education for children (videos, games, curriculum or activities). Some studies provided lunch packs, containers and two offered incentives to try FV. Some incorporated policy. • There was modest impact on vegetable provision; mixed results on changes to discretionary food provision, overall child dietary intake and adiposity. Some evidence that vegetable provision impacted consumption. No effect on fruit provision and consumption (likely due to pre-intervention practices to already pack and consume fruit). The use of active strategies targeting behaviours and those delivered through a comprehensive approach may be more effective (lunch box interventions supported by explicit school policies and related curriculum). **Strength and Limitations** • English only studies; high risk of bias assessed; shorter follow up periods (most at 12 months or less); high levels of heterogeneity among studies limits conclusive findings. **Conclusion** • Interventions should continue to engage parents through active methods. School-based policy may further increase the success of such interventions. Considerations around health disparities are also warranted. **Implications for Public Health Nutrition Practice** • Consider ongoing, multi-component school-based strategies implemented with effective train-the-trainer models and active parent engagement to improve nutrition-related outcome effectiveness.

Study Details	Methods	Findings/Conclusions
Xin Ong, 2017 **Study Design:** SR **Country:** Multiple **Population:** Universal **Participants:** 6-12-year-olds in their home environment **Purpose:** To examine the factors related to children's FV consumption in the home environment. **HE Appraisal:** Strong	**Design:** • Published observational studies reporting on a potentially modifiable measure of the home physical, political and sociocultural environment related to child FV consumption; 6 databases; 2007-2015 **Included Studies** • 33 studies **Outcomes Measured and Reported** • Study design • Participant characteristics • Measures of predictor and outcome variables • Psychometric properties of measures	**Findings** • 205 independent relationships to child FV consumption were identified, suggesting that specific components of the home environment may have more influence than others, but also acknowledging the heterogeneity in study methodology, design and effect estimates. • The most consistent evidence for children's combined FV consumption was found for availability and accessibility of FV, parental role modelling and maternal FV intake. Parent facilitation/support and demand rules were also reported as having positive impacts. **Strength and Limitations** • The review intentionally reported on the consistency vs strength of association and thus useful for hypothesis generation. **Conclusion** • The relationship between the home environment and children's FV consumption is complex and not well understood. However, parents of primary school-aged children are important role models who determine the home availability and accessibility of FV, facilitate easy consumption and enforce rules around FV consumption. **Implications for Public Health Nutrition Practice** • It is important to consider the varied relationships to child FV consumption at home when developing programs and messaging targeting parents to support these behaviours in their children.
Touyz, 2018 **Study Design:** SR and MA **Country:** Multiple **Population:** Universal **Participants:** children aged 2-12 in home environment **Purpose:** To examine the effectiveness of parent-targeted in-home interventions in increasing fruit and vegetable intake in children. **HE Appraisal:** Strong	**Design** • Published RCT and NRCT studies reporting on home-based interventions to increase FV consumption in children; 5 databases; 2000-2016 **Included Studies** • 18 studies reviewed; 12 studied analyzed **Nutrition Outcomes Measured and Reported** • FV vegetable intake in children (including intake of a target vegetable in grams or daily intake of servings of fruit and/or vegetables via parent self-report)	**Findings** • Nutrition education interventions resulted in a small but significant increase in fruit but not vegetable intake. • Parent-targeted, home-based taste exposure interventions led to a significant increase in vegetable intake; • Online and home visiting interventions compared to telephone-based interventions resulted in significant increases in fruit intake. • Interventions involving daily or weekly sessions reported positive outcomes more frequently than those using monthly sessions. **Strengths and Limitations** • Only 2/18 studies targeted non-white, non-English speaking parents, limiting the generalizability across populations. • Few studies included long-term follow-up, thus sustained increases in child FV intake is difficult to determine. **Conclusion** • Taste exposure interventions and in-home or online delivered interventions targeting parents may impact FV intake in children. Such interventions may especially support populations across wide geographical areas, however, it is unclear whether the intervention effects can be generalized across different cultures, ethnicities, and economic backgrounds. **Implications for Public Health Nutrition Practice** • Consider innovative online strategies to engage parents with targeted messages, education and taste exposure activities to encourage FV intake in their children. • Consult with various populations to ensure relevance and accessibility to these messages and activities and adapt methods as appropriate.

Study Details	Methods	Findings/Conclusions
Van Lippenvelde 2012 **Study Design:** SR **Country:** Multiple **Population:** Universal **Participants:** Children and adolescents ages 6-18 years in school delivered programs **Purpose:** To determine the impact and type of parental involvement in school-based obesity prevention interventions. **HE Appraisal:** Moderate	**Design:** • Published RCT studies of school-based, obesity prevention interventions comparing parent component with non-parent component design; 5 databases; 1990-2010 **Included Studies** • 5 studies **Outcomes Measured and Reported** • Study design • Intervention and study characteristics • Parent characteristics • Dietary knowledge, nutrition behaviours, BMI z scores, fat intake, health behaviours in general	**Findings** • Some positive effects of parental involvement on children's behaviours and behavioural determinants. • Parent modules including different strategies and addressing several home-related determinants and parenting practices around eating and physical activity were more likely to be effective. • No conclusive evidence due to limited research and inconsistent evidence. • Theory-based interventions may be more effective. **Strengths and Limitations** • Small number of studies and wide variation in study design precludes difficulty in drawing clear and definitive conclusions. **Conclusion** • There is a lack of evidence to support the claim that parental involvement is important to improve the effectiveness of school-based behavioural nutrition and physical activity interventions. **Implications for Public Health Nutrition Practice** • Given that parent engagement as a component of school-based interventions does not involve harm, consideration to purposeful parent involvement is warranted. • Studies including more strategies in the parental intervention component and focusing on more home-related factors may be more effective.

Table B. Primary Research – Quantitative

Study Details	Methods	Findings/Conclusions
Baghurst, 2014 **Study Design:** CBA **Country:** US **Population:** Targeted **Participants:** 176 low income Grade 2 & 3 students (99 male; 77 female); 1 school **Purpose:** Compare the effectiveness of child-only (control) vs. child + parent (intervention) nutrition education program. **EPHPP Appraisal:** Weak	**Program:** • Classroom nutrition education program (control) • Parent education via information packages (intervention) • Topics: Food Guide Pyramid, vegetables, fruits, snacks **Data collection** • Child self-report surveys: 1 week prior (pre-test); 1 week after (post-test) **Nutrition Outcomes Measured & Reported** • Nutrition knowledge quiz: Reading Across MyPyramid (RAMP) • Dietary behaviour – Day In the Life (DILQ) 17-item instrument; indicator = fruit & vegetable intake • Self-efficacy survey: "Asking and Shopping for Fruits and Vegetables"	**Findings** • Self-reported improvements in nutrition knowledge & dietary habits in both groups (no significant difference between groups). • Improved child self-efficacy in both groups, although significantly greater in the parental education group. **Limitations** • Age and cognitive ability posed the greatest limitation. **Conclusions** • While nutrition education for children improved knowledge and dietary behaviour, including parent education improved child self-efficacy which can be seen as an initial step to empower children to change their behaviour and impact their environment. **Implications for Public Health Nutrition Practice** • Nutrition education incorporated into curricula and teachers acting as role models is one way to influence children's food choices. • Parental involvement is necessary to initiate and sustain the child's environment and behaviour change.
Baranowski, 2003 **Study Design:** RCT pilot **Country:** US **Population:** Targeted **Participants:** 35 African American girls and their parents **Purpose:** Test the impact of the 4-week summer camp and 8-week internet intervention on diet and physical activity behaviours. **EPHPP Appraisal:** Weak	**Program:** • The Fun, food and Fitness Project (FFFP); Incentives provided. • Intervention: 4-week special day camp & 8-week home internet program for girls & parents. • Control group: different 4-week camp & a monthly home internet program. • Camp activities: exposure/availability, food preparation, requesting foods at home, health behaviour goal setting, decision making and problem solving skills, success rewards. • Internet programs: Different internet programs for control and intervention girls & control and intervention parents. Comic books, parenting practices, goal setting, decision making and problem solving, recipes, "ask an expert', website links. **Data collection** • BMI, waist, body fat and maturation measurements (BMI only post-pilot) • Two 4 hour recalls (1- clinic; post-pilot by phone) **Nutrition Outcomes Measured & Reported** • BMI • Fruit, 100% fruit juice & vegetable consumption • Water consumption • Psycho-social measures	**Findings** • Results of the 12-week program showed lower caloric intake, less sweetened beverages, more water and more fruit, juice & vegetables (substantial but not statistically significant); No significant differences in BMI or sweetened beverage preferences. • Use of the internet component was low, thus, its impact on behaviour could not be determined. **Strengths and Limitations** • Low sample size: insufficient power to detect significant differences; between-group trends measured. • Limited intervention dose: less than half the group logged on to the website, even with reminders, incentives. • Self-report of dietary intake: potential for under- or over-reporting • Juice included FV: cannot ascertain FV & juice intake separately; juice potentially replaced sweetened drinks. • Parent impacts on behaviour change not reported; cannot determine parent impact on behaviour change. • Significantly different baseline BMI levels between intervention and control groups despite randomization • Author reported strengths: Social Cognitive Theory = strong theoretical framework; SCT); study design; **Conclusions** • Summer day camps may offer promise as a setting to initiate behaviour change. • Internet programs may have potential; however, methods to encourage consistent use are needed. **Implications for Public Health Nutrition Practice** • Consider summer camp settings to promote healthy eating with methods to engage parents to promote behaviour change in them and their families. Internet-based information may improve awareness about healthy eating but may not impact behaviour as a stand-alone strategy. • Further exploration around multi-component strategies with interactive components, consistent and targeted promotion efforts, and appropriate evaluation methods, outcomes and indicators to measure effectiveness is warranted.

Study Details	Methods	Findings/Conclusions
Bissett, 2008 **Study Design:** CS (observational) **Country:** Canada **Population:** Targeted **Participants** 388 Grade 5 (participants) & Grade 6 students (non-participants); 7 schools **Purpose:** Provide an intermediate impact assessment of the Little Cooks – Parent Networks nutrition program. **EPHPP Appraisal:** Weak	**Program:** • Eight classroom nutrition workshops/year; recipe, food preparation, tasting experience; community dietitian led; teachers support in classroom; parent Networks to assist with workshops & attend parent & family activities • Intervention: grade 5 students (up to 6 years participation); Control: grade 6 students (never participated) **Data Collection** • Classroom administered post-intervention survey **Nutrition Outcomes Measured & Reported** • Nutrition knowledge – nutrient content, Food Guide, locally grown produce, cooking methods, international cuisine • Healthy eating attitudes • Experience tasting new foods • Capacity to prepare food • Parent and/or family participation in school activities (overall, not just program-related)	**Findings** • Participants: greater knowledge of nutrient content of food & cooking methods; more likely to try new foods • No difference in knowledge of the Food Guide, local produce, or international cuisine between groups. • More girls & program participants (vs. boys & non-participants) reported cooking skills as an important component of healthy eating; however, program participants did not report more cooking at home. • Parental/Family participation in overall school activities was proportionally higher among program participants **Strengths and Limitations** • Student self-reported, one-time survey, no direct parent reporting • Findings may be influenced by total participation years and by differences in educational experience and developmental age between groups. **Conclusions** • Intervention effects were moderate on cooking, nutrition knowledge, culinary experience, attitudes about healthy eating and cooking, and experiencing new foods. It is not clear if these effects translate to the home. **Implications for Public Health Nutrition Practice** • Intervention is resource-intensive; relevance of detailed knowledge expected of students. • Consider opportunities to include parents in food literacy programming when offered to students.
Bjelland, 2015 **Study Design:** Cluster RCT **Country:** Norway **Population:** Universal **Participants:** 1418 Grade 6 students (age 11-13 years); 849 mothers, 680 fathers **Purpose:** Determine the influence of a multi-component intervention on students' consumption of fruit, vegetables, and sugar-sweetened beverages and the impact of gender differences, weight status and parent education and any effect on their parents' intakes. **EPHPP Appraisal:** Weak	**Program:** • 20-month school-based, multi-component health promotion intervention; collaboration between school administration, health services, parent committees & teachers; 12 intervention schools; 25 control schools • Individual, group & environmental strategies and activities: monthly classroom lessons, FV breaks (parent provided), key message posters & tailored computer-generated advice; fact sheets & brochures with at home ideas for parents and school-wide kick-off events, committee meetings and a resource box to support F/V offerings. **Data collection** • Internet-based questionnaire for students; paper questionnaire for parents. Pre-post data collection **Nutrition Outcomes Measured & Reported** • Fruit and Vegetable intake – frequency (times/week) • Sugar-sweetened beverages (SSB - soft drinks and fruit drinks) – frequency (times/week) and amount (glasses/day) • Gender, Weight status (students by measurement; parents by self-report), Parental Education	**Findings** • Significant positive effect on fruit intake & on reducing SSB intake. No significant effect on vegetable intake. • Students with low/medium education level parents reduced their SSB intake the most, while there was no significant difference in total SSB intake for those whose parents were highly educated. • Students whose fathers were medium/highly educated reported similar pre- and post- study vegetable intake. • Student weight and gender was not reported as having an impact on these outcomes. **Strengths and Limitations** • Large study sample; high participation. Geographical samples may impact generalizability of findings. • Data was collected directly from parents & students; analyzed for mothers & fathers separately. Modelling analyses techniques did not apply to parent outcomes. **Conclusions** • The intervention positively impacted fruit intake (increased) and SSB intake (reduced). The impact on SSB consumption was greater for students whose parents had a lower education level. • Parents may benefit from nutrition interventions targeted at their children. **Implications for Public Health Nutrition Practice** • School-based interventions may influence parents' knowledge and eating patterns. Further exploration of targeted messaging to mothers, fathers and students is warranted.

Study Details	Methods	Findings/Conclusions
Borden, 2012 **Study Design:** RCT pilot **Country:** US **Population:** Universal **Participants:** 129 parents (94 intervention, 35 control); 57 girls, ages 9-14 years. **Purpose:** To evaluate a community-based parent-focused program to promote healthful eating and physical activity for children and adolescents **EPHPP Appraisal:** Weak	**Program:** • 10-week, 15-hour course for parents offered by trained lay facilitators (free online training). • Resource toolkit, including food and fitness journals, shopping lists, meal planners, recipe book, DVD, nutrition information. **Data collection** • Parent self-reported survey, pre-post intervention • Post-intervention survey for daughters of intervention parents **Nutrition Outcomes Measured & Reported** • Parents' self-efficacy • Parents' knowledge and behaviours • Daughter agreement with parent reports	**Findings** • Significant gains in parents' nutrition knowledge; greater self-efficacy to set realistic goals for their family; and help their daughters change their eating habits. • Intervention parents reported making more healthful food choices, helping their daughters eat better & cooking with less fat. • 85% of daughters who completed the post-intervention survey agreed that their parents helped them make more healthful food choices. **Strengths and Limitations** • Small sample, short duration, however, feedback used to refine and expand program. **Conclusions** • Programs that emphasize information and skill-building may help parents become better role models for & facilitators of child and family behaviour change. **Implications for Public Health Nutrition Practice** • Consider opportunities to engage parents using scalable and sustainable methods to help them support their families to adopt healthy eating behaviours.
Carson, 2010 **Study Design:** CS (observational) **Country:** US **Population:** Universal **Participants:** 1810, K-Grade 5 students in 48 different after-school programs **Purpose:** Examine the effect of an after school education intervention in influencing parents to purchase healthy snack food. **EPHPP Appraisal:** Weak	**Program:** • Food & Fitness Fun Education Program (FFFEP) nutrition & physical activity intervention. Five separate, 17-week intervention & evaluation sessions (over 3 years). Different participants in each session. Parent meetings 2x/session • Weekly snack (mostly FV); affordable, available, nutrient-dense, easy to pack & carry. **Data Collection** • 9 survey questions reported on in this study (46 question survey). 755 (42%) parents survey response rate. **Nutrition Outcomes Measured & Reported** • Parent attitude toward healthy snacks • Parent knowledge of child's program participation & child's exposure to healthier snacks • Parent behaviour: taking children grocery shopping; snack purchasing changes based on child's request. • Child behaviour: talking parent into buying certain foods; tasting snacks offered; child asking parents to pack healthy snacks; asking parents to buy snacks they tried	**Findings** • Parents who were aware of program participation knew their children were introduced to different snacks & were told by their children that they tasted a new snack. • Significant relationships were noted between 1) parents taking children to the grocery store and their children's influence on food purchases; 2) parent knowledge of FFFEP participation and their children's request to pack a healthy snack and; 3) their own willingness to purchase a snack requested by their children. • Parents noted an openness to change and actual eating behaviour changes in their children and themselves. **Strengths and Limitations** • It is not clear who implemented the curriculum (author designed and integrated into after-school programs). **Conclusions** • A nutrition education program with healthy snacks exposed children to new foods resulting in children being more likely to try them and ask their parents to purchase them. Parents reported changes to both their own and their children's healthy snack consumption. This potentially may influence food in the home environment. • After school settings offer a setting that is perceived as fun by children & safe and accessible by parents. **Implications for Public Health Nutrition Practice** • Nutrition education that includes food exposure and tasting with parent engagement may support behaviour change in families by increasing food acceptance through exposure, peer and parent social influences (role modelling). This may, in turn, influence attitudes and beliefs about food and eating. • The after-school setting may be an opportunity to integrate nutrition programming through a train the trainer model to ensure maximum reach and resource effectiveness.

Study Details	Methods	Findings/Conclusions
Christian, 2012 **Study Design:** Cluster RCT evaluation (observational) **Country:** UK **Population:** Universal **Participants:** 54 primary schools, 658, 8-9-year-olds (24 intervention schools; 311 children) **Purpose:** To evaluate appreciation & implementation of the Project Tomato program, designed to maintain fruit and vegetable intake in children aged 8-9 years. **EPHPP Appraisal:** Weak	**Program:** • Project Tomato: teacher-delivered, 10-month, multi-component program with manual, 12 curriculum lesson plans, funding for growing, cooking/tasting elements, home kit bags (games, quiz books, FV snack boxes), newsletters & handouts **Data collection** • Pre- and post-questionnaires: teachers, students, parents • 24-hour dietary assessment tool: field worker completed in school; parent completed out of school **Outcomes Measured & Reported** • Teachers - items used and rating • Parents – child received items, used and rating; family meal frequency, and FV sent to school. • Children – item rating	**Findings** • Low uptake by teachers & parents: 21% of school items; 56% of home items; 8 schools did not implement. • Lessons & tasting sessions used most often. Tasting & cooking lessons were the most appreciated but did not have a positive association with children's diets. • When kit bags were used, appreciation was high and was correlated with a higher FV intake. • Family meal frequency (3-7 times/week vs 02- times/week) improved children's FV intake by 38%. **Strengths and Limitations** • Advanced statistical methods were used to analyze a broad-reaching, multicomponent RCT trial, although it is possible that these were not as suitable for process evaluation. • Process evaluation questionnaires not tested for validity and reliability. • Students and parents may give socially desirable answers; thus, overestimating the intervention effect. **Conclusions** • Poor implementation of activities due to preparation & delivery time & desire for parent/staff support. • Recommend future research studies include professional training for teachers. • Parent involvement, family eating behaviours & meal time environments impact dietary behaviour change. **Implications for Public Health Nutrition Practice** • Involve stakeholders in program development to ensure relevance and to address barriers & facilitators. • Provide multiple method training opportunities for stakeholders, consider multiple delivery settings & leverage existing opportunities to enhance reach & uptake of resources.
Crespo, 2012 **Study Design:** Cluster RCT **Country:** US **Population:** Targeted, Latino communities **Participants:** 13 elementary schools, 808 Latino parent & child dyads, K-Grade 2 (parents recruited directly) **Purpose:** Compare the independent and combined effects of changes in a home/family environments vs. changes in school/community environments to prevent and control childhood obesity. **EPHPP Appraisal:** Weak	**Program:** • 3-year, community-based, multi-level, behavioural intervention; Family/Home only, School/Community only, Family/Home + School/Community, Control (yearly measurements only); Trained Community Health Advisors. • Family/Home: Advisors supported 12-30 families with 7 visits/4 calls to support behaviour change • School/Community: Different trained advisors; 3-year program with nutrition education, home activities, restaurant menus, healthy food provision, posters, tastings newsletters, grocery store messages, giveaways, etc. **Data Collection** • Parent administered survey: pre-post-intervention; follow-up at 2 & 3 years • Parent and child height and weight **Nutrition-related Outcomes Measured & Reported** • BMI and BMI -z score • Physical activity (only reported here if impacts nutrition) • Child diet (49 item FFQ) • Parent behaviours: fat reduction, fibre increase; family meals; away from home eating.	**Findings** • Retention rate: 55% over 3 years. Similar baseline outcomes between drops outs vs. non-drop outs. No significant changes in BMI; Children in all study arms increased in overall mean BMI-z score. • **School/Community**: increased reporting of child's daily FV intake & use of dietary fat reduction strategies. **Family/Home**: marginal decrease in child's snack intake/day; **Combined**: fat reduction strategies higher with strong community intervention at year 1 & 2; tapered off by year 3; SSB – lower mean intake in children at year 1; less effect at year 2 & 3. No change in fibre intake. • **Parent mediated factors**: Fat reduction mediated by monitoring/support of eating & activity; Increase FV intake mediated by monitoring/support, decreased control over child's eating & PA, decreased TV at dinner. **Strengths and Limitations** • Parental self-report measures may be self-report bias and socially desirable answers. • Conclusions about the impact of the intervention on these single measure items is limited. **Conclusions** • Impact on BMI & BMI-z-score may require more intensive/longer & targeted interventions due to complexity. • Family/Home intervention impacted some parenting practices related to child FV consumption, increased active play, decrease SSB and TV viewing School/Community improvements were achieved. **Implications for Public Health Nutrition Practice** • A targeted, resource-intensive intervention (advisors); however, consider opportunities to work with existing provincial, zone or community programs and organizations. • Consider strategies such as 'train the trainer model to ensure maximum reach and resource

Study Details	Methods	Findings/Conclusions
Croker 2012 **Study Design:** Cluster RCT **Country:** UK **Population:** Universal **Participants:** Parents of children 5-11 years old recruited in 40 primary schools. **Purpose:** Examine the impact of personalized feedback and print material from the Change for Life (C4L) social media campaign on parents' attitudes and behaviours about their children's eating and activity. **EPHPP Appraisal:** Weak	**Program:** • National Change for Life (C4L) social marketing campaign: TV, print, poster, helpline, website, partners (schools, councils, charities, workplaces, food stores, health experts) • Intervention parents received print materials; those completing the "How are your Kids" questionnaire received personalized feedback; others received generic materials. **Data collection** • Baseline and 6-month post-intervention demographic and awareness/attitudes for both intervention/control schools • "How are your Kids" questionnaire for tailored feedback • In-home interviews with 12 low/high SES parents **Nutrition-related Outcomes Measured & Reported** • C4L awareness • Attitudes & intent to change with C4L behaviours • Parent monitoring and modelling behaviours • Child health behaviours – diet (snacks, sugary drinks, F/V) physical activity (# day, 60 minutes+); TV (hours/day).	**Findings** • Baseline questionnaire: 3,774 control & intervention families; Follow-up: 1,419 families. 98 returned the "How are your Kids" questionnaire. Intervention schools were more ethnically diverse & less educated. • Baseline awareness of C4L was high in both groups; significantly increased in the intervention group. • Parental attitudes or parenting & child health behaviours was not significantly different between groups. • Higher SES intervention families reported lower ratings for physical activity importance, dietary monitoring & TV viewing; lower SES showed no differences. Regardless of SES, parents reported satisfaction around their families' eating and activity behaviours, with change unnecessary. • Most parents were positive about the materials; some higher SES parents considered them patronizing. **Strengths and Limitations** • High dropout rate with a small subset completing the questionnaire for personalized feedback. • Potential response bias with the follow-up questionnaire: younger, less ethnically diverse & well-educated respondents; possibly more interested in diet and physical activity. **Conclusions** • Material used in the study significantly increased campaign awareness; however, there was little impact on attitudes or behaviour. Low engagement with the initiative appeared a key issue. **Implications for Public Health Nutrition Practice** • Social marketing campaigns may reach a broad audience & improve awareness of healthy behaviours; Impact on attitudes & behaviour change may be limited. • Consider clear, purposeful & relevant messages, segmented by target audience.
Dumas, 2020 **Study Design:** RCT **Country:** Canada **Population:** **Participants:** French-speaking mothers > 18 years with at least 1 child aged 2-12 years; primarily responsible for food purchase/preparation & reported consuming fewer than recommended servings of FV and/or milk and alternatives (CFG, 2007) **Purpose:** Evaluate the effects of an evidence-informed healthy eating blog written by an RD on intakes and food behaviours. **EPHPP Appraisal:** Moderate	**Program** • Six-month intervention delivered through a weekly blog written by an RD integrating behaviour change techniques promoting healthy eating. • Preliminary focus group helped inform the design of the blog. Content was formed around objectives inspired by Eat Well Campaign and nutrition recommendations from WHO. **Data Collection** • 3 automated, self-administered, web-based 24-hr dietary recall (baseline, 3 months, 6 months post intervention) **Nutrition Outcomes measured & reported** • Reported daily FV and milk/alternatives (2007 CFG). • Perceived meal planning and cooking skills • Body weight • Engagement with the blog • Sociodemographic variables such as internet use habits, ethnicity, employment, education, income, number, children's' ages	**Findings** • No statistically significant difference between the 2 groups for FV consumption or milk/alternatives. No effect on body weight of mothers • Increased score for meal planning habits suggests increased family meal planning among blog participants. • Highest number of log in events/participant in the first week then decreased log-in events over time. Peaks in log-in events noted when the blog shared cooking tips & attitudes of involving children in meal preparation. • No significant association between blog engagement metrics & mothers' FV or milk/alternatives consumption. **Limitations** • Small sample size, self-reported measures and sample of high SES, primarily white mothers. • Participants reported using various other forms of social media which may have decreased blog impact. **Conclusions** • A healthy eating blog had no impact on eating behaviours of mothers. **Implications for Public Health Nutrition Practice** • More research is needed to understand the impact of healthy eating blogs on parents' food-related behaviours. However, as a low-cost intervention, consider the potential for targeted populations or as part of a multi-component strategy.

Study Details	Methods	Findings/Conclusions
Evans, 2006 **Study Design:** Quasi-experimental (observational) **Country:** US **Population:** Universal **Participants:** 39, Grade 4 & 5 students and parents; 2 schools: 1 intervention (18 students), 1 control (21 students) **Purpose:** Evaluate the effectiveness of a nutrition and media literacy intervention targeting 4th and 5th graders and their parents. **EPHPP Appraisal:** Weak *Note: see Tanner, 2018*	**Program:** • After-school; 12, 2-hour sessions over 6 weeks: 2 nutrition education & 2 media literacy/health communication; 8 sessions for students to design & implement a parent targeted media campaign (exposure 2 weeks). Gift certificate incentive to participate in the study. • Two family nights: pre-post data collection, both groups; campaign skit/song presentation for intervention only. • Campaign components: 3 key messages, logo, slogan, table toppers, magnets, website, commercial, rap song. **Data Collection** • Two 24-hr diet recalls, led by RD, by phone, with parents • Pre- post-test questionnaires completed by parents • Pre- post-test questionnaires completed by students **Nutrition Outcomes Measured & Reported** • Children's FV intake – average servings/2 days; • Home nutrition environment changes - FV home availability/accessibility & parental social support • Children's self-efficacy, motivation, perceived support.	**Findings** • 31/42 students completed baseline measures; 5 dropped out due to transportation, school changes, mandatory tutoring. Significant differences between groups: more girls, lower SES & more single-parent households in intervention group. • **Children**: there was no significant changes in FV consumption between groups. Intervention group showed higher motivation levels. **Parents:** intervention group showed significant change in behaviour around FV availability & accessibility. **Strengths and Limitations** • Small sample size, short duration and high attrition rate, thus limited power to detect a statistical difference. • Demographic variables between groups may have impacted overall results. **Conclusions** • Student developed media campaign targeted at parents led to increased FV availability &accessibility (parent behaviour change); however, student involvement did not change FV consumption, even when higher motivation was reported. **Implications for Public Health Nutrition Practice** • Consider students as agents of change who may be in the best position to impact their own behaviour and influence that of their peers and their families. • Explore opportunities to support students in developing creative, relevant and simple multi-component media campaigns suited to their school, community or home environments.
Fabri, 2013 **Study Design:** cohort **Country:** UK **Population:** Universal **Participants:** 7 mothers (40-47 years) with children ages 5-11; recruited from 3 schools. **Purpose:** Investigate how nutritional eating behaviours can be improved with a cooking-based website. **EPHPP Appraisal:** Weak	**Program:** • Parents & children had 17-20 days to access a website featuring a mascot for information on nutrition & cooking related content, recipe blog, cook-a-long videos, featured meals, discussion forum & links to related websites. **Data collection** • Qualitative and quantitative data collected by pre- and post-study semi-structured interviews. • Food diary 1-week day/week: meals & FV portion intake **Outcomes Measured & Reported** • Initial eating habits • F/V consumption • Willingness of parents and children to eat FV • Stage of change (trans theoretical model of change - TTM) • Website content and usability (post intervention)	**Findings** • After using the website, all parents reported that children were more keen, willing to cook and try new foods. • Website was easy to use, navigate & child-friendly; mascot & photos of people were beneficial; Most would use in future to encourage children to cook. • Parents were willing to consume FV, but reports of actual healthy eating behaviours varied, with time-related to work patterns reported as a barrier. However, based on first/last food diary entries FV intake increased significantly for both parents and children. • Most families introduced new recipes; some changed their family diet; No change in family meal behaviours. • 2/7 parents progressed along TTM stages; one stayed the same; four moved backwards. **Strengths and Limitations** • Small sample, short duration • Findings not reported in detail; data reliability impacted due to collection gaps and flawed questionnaire. • Qualitative and quantitative data added value to the findings. **Conclusions** • Consider opportunities for further research around healthy eating attitudes and behaviours • Add nutrition content, quizzes, games, self-assessment questionnaire for personalized feedback, education to combat perceived time constraints; develop a mobile application to promote "always on" and always connected" as ideal easy technology further support behaviour change. **Implications for Public Health Nutrition Practice** • Parents can effectively support children's food skill development & role model health eating behaviours. • Websites & mobile applications may be effective tools to promote healthy eating attitudes & behaviours.

Study Details	Methods	Findings/Conclusions
Flood, 2008 **Study Design:** Evaluation (observational) **Country:** US **Population:** Universal **Participants:** 1112, K-Grade 2 children & parents, 48 classrooms in 17 schools **Purpose:** Evaluate use and child & parent learning about nutrition through a family bookbag program. **EPHPP Appraisal:** Weak	**Program** • *Eat Healthy. Pay Hard. Read More. Family Bookbag* was evaluated from 2003-2005. • Bookbag included: educator's guide, five children's books with positive health messages, a parent letter, a family tip sheet & recipe cards to promote healthy eating, being active and enjoy reading together; bags are sent home to families each week throughout the school year. **Data Collection** • Evaluation questionnaire included with bookbag. • Teacher survey – process evaluation **Nutrition-related Outcomes Measured & Reported** • Components used by parents • Parent & child learning about health behaviours • Reading time	**Findings** • 476 parent evaluations returned: 93% of the parents read the children's books; 85% looked at the recipes; 78% of parents indicated their children learned something new about nutrition or physical activity; • Parents indicated they learned about new/healthful recipes, ideas for after school snacks, & ways to encourage healthy eating. • 84% of teachers reported they would use the bookbag again; suggested two per classroom with different books in each & different books for each grade. **Strengths and Limitations** • Evaluation reported on use & reported learning. No further studies reported on long term behaviour change. **Conclusions** • Bookbags promote nutrition & physical activity messages using home reading programs. • Built-in parent involvement provides a mechanism to share additional nutrition information and at home methods to role model healthy eating behaviours in families. **Implications for Public Health Nutrition Practice** • Explore opportunities to promote book bags as a means of engaging parents in learning and practicing healthy eating behaviours with their families while developing reading literacy skills. Formal initiatives would require appropriate collaboration with partners and adequate funding.
Glasson 2013 **Study Design:** CBA **Country:** Australia **Population:** Universal **Participants** 1403 parents of K-6 school-aged children screened to identify those who had primary responsibility for food shopping and preparation. About 700 in each of control and intervention groups. **Purpose:** To determine if localized programs that are successful in engaging the community can add value to larger FV mass-media campaigns by evaluating the Eat It To Beat It Campaign. **EPHPP Appraisal:** weak	**Program** • *Eat It To Beat It Campaign:* a multi-strategy intervention to increase FV consumption using localized, community-based education and 'below the line' social marketing (school newsletters, cooking demonstrations, community event activities and competitions). Education provided by peer educators; volunteer-based to maximize resources. • Aim is to complement existing mass media campaigns including *NSW Go for 2&5* (TV, radio, print, bus, and supermarket ads, publications, web-based information, supermarket demonstrations) and *Good for Kids, Good for Life* (media about healthy lifestyle messages and organizational change in local councils, schools, child cares, community organizations, healthy services, sports clubs). • Control group (nearby communities) not subject to the *Eat It To Beat It Campaign*, but subject to the other two. **Data collection** • Pre- and post-test surveys **Nutrition-related Outcomes Measured & Reported** • Awareness of complimentary campaigns • Exposure to program strategies • Knowledge of recommended FV intake • Knowledge of recommended serving sizes • FV consumption (servings/day)	**Findings** • Experimental group reported significant increase in knowledge of recommended fruit intake & increased knowledge of recommended vegetable intake (not significant) compared to the control group. No significant changes reported in either group around knowledge of recommended FV serving sizes and actual FV consumption. • Comparing intervention parents who recalled the program after prompting to those who didn't recall the program, the mean number of FV servings among the latter group decreased significantly. **Strengths and Limitations:** • A large study that explored the impact of building upon other mass media campaigns through local promotional activities. Potential bias in the findings and limits to extrapolation of the results due to both groups having a higher education level. **Conclusions** • The program achieved improvements in knowledge of recommended servings (with modest reach) and knowledge of vegetable serving size, demonstrating the potential to positively influence factors that may in turn impact FV consumption. • Changes in actual consumption, although limited, can be achieved by the implementation of community-based strategies that build onto mass-media and social-marketing campaigns. **Implications for Public Health Nutrition Practice** • While overall FV consumption increases were modest, the population-wide impact should not be underestimated, especially as part of multi-level and multi-activity/component strategies. • Consider opportunities to coordinate mass media campaigns with community engagement strategies to impact knowledge and potential behaviour change in parents, using clear and targeted messages.

Study Details	Methods	Findings/Conclusions
Gribble, 2003 **Study Design:** NRCT **Country:** US **Population:** Universal **Participants:** 9 parent-child pairs; children ages 10-12 years. 17 parent-child pairs as controls. **Purpose:** Examine the effectiveness of a nutrition program to enhance children's knowledge, preference and whole fruit intake and to decrease parents' use of controlling feeding behaviours. **EPHPP Appraisal:** Weak	**Program** • 10-week, 2-hour (Saturday), classroom-based program; Led by trained research assistants with nutrition expertise • Child-focused interactive, skill-building & taste testing lessons; parent-focused lessons on child feeding practices to increase children's fruit intake (whole fruit & 100% juice) **Data Collection** • Pre-post-test questionnaires; 16 item knowledge questionnaire; Food preference questionnaire with 9 point preference scale on the 10 fruits offered during the study • Child-completed a 3-day food record (trained by an RD), using two-dimensional food models; manual count of each ½ serving plus 100% fruit juice intake. • 15 question child feeding questionnaire completed by parents **Nutrition-related Outcomes Measured & Reported** • Change in knowledge, preference & fruit intake in children • Change in control over child-feeding	**Findings** • Significant increase in children's knowledge scores & daily whole fruit intake between the two groups. No differences in fruit preference scores. • Significant decrease in parent use of controlling child-feeding strategies between the two groups. **Strengths and Limitations** • Parents were active participants in the program • Small sample size; difficult to draw conclusions **Conclusions** • Reported by the author, school-based dietary interventions that include parents and parent-focused child feeding protocols may effectively increase acceptance of healthy promoting foods by children. **Implications for Public Health Nutrition Practice** • Engaging parents through existing channels such as school and offering interactive components such as food preparation & taste testing provides role modelling, peer modelling opportunities. • Anticipated challenges include scheduling for maximum participation, cost to implement any program.
Hawthorne, 2018 **Study Design:** Observational analytic **Country:** Canada **Population:** Universal **Participants:** 321 Grade 3 & 4 student-parent dyads in 19 elementary schools. Self-selected to participate. **Purpose:** To compare parental reports of foods packed in children's lunches with what was actually packed (observation) as well as to identify barriers and facilitators to lunch packing behaviours. **EPHPP Appraisal:** Weak	**Data Collection** • Self-administered paper survey • Direct observation of packed lunch in classroom **Nutrition-related Outcomes Measured & Reported** • Portion #, amount/portion and types of foods typically packed in lunches (2007 food guide food groups, snacks, sweetened beverages, fruit, 100% juice, vegetables) • Importance of providing a healthy packed lunch • Barriers and facilitators to providing packed lunches • Actual lunch-packing behaviour – portion #, amount and types of foods (same categories as survey)	**Findings** • Significant differences reported: portions packed vs. observed portions packed in all food categories except grains; more servings of SSB, snacks; less servings of fruit/juice/vegetables, milk/alternatives, meat/alternatives. • Most parents reported that providing a healthy lunch was important/of utmost importance; almost all respondents rated their nutrition knowledge as adequate to very good. • Barriers reported: child's preferences, time, having enough money to buy food, school allergy policy& food safety (refrigeration/reheating equipment). Healthy food knowledge was not a reported barrier by most. • Facilitators included: resources (pamphlets/articles, online), seeing other children's lunches, child input & planning ahead. **Strengths and Limitations** • Parent misreporting may be due to poor serving size understanding & observers not seeing all items. • Participants who self-selected may generally pack a higher nutritional quality lunch. • Variations in barriers and facilitators were not identified by socio-economic position. **Conclusions** • While parents rate the importance of healthy lunches and their nutrition knowledge as high, disparities exist between reports and observations of packed lunches. Identified barriers and facilitators adds to the limited literature that would assist health professionals and school communities to collaboratively support parents in improving the healthfulness of packed lunches. **Implications for Public Health Nutrition Practice** • Explore opportunities to support parents with clear, actionable and relevant messages to promote healthfulness of packed lunches, considering multiple communication modes & methods. • Consider barriers around school food policies and equipment, while respecting school requirements to offer safe and healthy eating environments that meet all student needs.

Study Details	Methods	Findings/Conclusions
Horne 2009 **Study Design:** Cluster RCT **Country:** Ireland **Population:** Universal **Participants:** 228 children, ages 4 - 11 years in intervention school; 207 children in control school plus parents **Purpose:** Evaluate the effectiveness of the Food Dudes intervention and provided FV on children's fruit and vegetable intake in Irish schools where children bring lunch from home. **EPHPP Appraisal:** weak	**Program:** • 5-day baseline measure: FV provision in home lunches. 8-day baseline measure: FV provided to both schools; 16-day intervention: FV provided to intervention and control schools. Intervention group watched Food Dude video adventures and received small Food Dude rewards (pencils, erasers, etc.) for eating the provided FV. • Home pack with tips to promote and record FV intake. • 12-month maintenance for intervention group: Food Dude containers for parents to pack FV in lunches. Collectable stickers, certificates. Baseline and 12-month measures. **Data Collection** • Weight of provided FV • Pre-post researcher assessed lunches for FV consumption any FV, 100% juice, and fruit bars. **Nutrition-related Outcomes Measured & Reported** • Children's consumption of school provided FV • Parental provision of FV/juice/fruit bars in home lunches. • Children's FV/juice/fruit bar consumption from lunches.	**Findings** • No significant difference in FV consumption between groups at baseline. After the 16 day intervention, experimental group showed a significant increase in consumption of school provided FV, while control group showed a significant decline in consumption of school provided FV. In the 12-month maintenance phase, parents from the experimental group provided significantly more lunchbox FV/juice/fruit bars compared to both group baseline and control group measures. Children from the experimental group consumed significantly more FV/juice/fruit bars than the control group. **Strengths and Limitations:** • Both weight & observational measures of FV intake used. No discernment between juice/fruit bars. • Short intervention in school; 1-year follow-up of F/V provision in lunches from home. No SES assessment. • Heavy reliance on provision, rewards and providing containers to parents to influence FV intake. **Conclusions** • School-based interventions that involve peer-modelling & rewards can be effectively implemented in primary schools in Ireland and result in durable increases in parental provision & children's intake of FV. • Demonstrates effectiveness of peer-modelling & rewards to increase diet quality for both children & parents. **Implications for Public Health Nutrition Practice** • Engage parents via existing channels, include food preparation & taste testing to provide parent role modelling & peer modelling opportunities. Potential challenges include scheduling & program costs. • Promote a healthy relationship with food instead of extrinsic rewards for finishing full servings. • Consider potential unintended consequences on food-insecure households.
Knowlden, 2016 **Study Design:** RCT **Country:** US **Population:** Universal **Participants:** 57 mothers with a 4-6-year-old child; at 1 year, 44 participants: 22 intervention, 22 control **Purpose:** Evaluate the efficacy of the EMPOWER web-based intervention for sustained behaviour change 1-year post-intervention. **EPHPP Appraisal:** Moderate	**Program:** • EMPOWER intervention: web-based, 5 module program: FV intake, physical activity, sugar-free beverage intake, screen time, plus 1 all content booster session. Weeks 1,2,3,4 & 6. • Included, 10-15 minute presentation, worksheet & discussion board; encouraged child participation in meal planning, shopping and food preparation. • Active control group: Healthy lifestyles information for same target behaviours. **Data Collection** • Week 0 (baseline), Week 4 (post-intervention), Week 8 (1-month post-intervention follow-up), Week 60 (1-year post-intervention follow-up) • 24-hour recalls, self-reported measures using valid and reliable tools. **Nutrition-related Outcomes Measured & Reported** • **Child behaviour**: daily FV intake of 5 cups; increased sugar-free beverages; • **Maternal facilitated constructs**: environment; emotional coping; expectations; self-control; self-efficacy; maternal health behaviour data not collected.	**Findings** • **Child behaviours**: Significant increase in child FV consumption at all measurement points; 1-year follow-up – 1.847 cups increase. One month post-intervention follow up found significant main effects for child sugar-free beverage intake, although this was not significant in either group at 1 year. • **Maternal facilitated constructs**: the environment significantly changed child FV consumption; no significant change detected for sugar-free beverage intake; **Strengths and Limitations** • While the intervention was brief, however, increased FV intake remained 1- year post-intervention. • Mothers were assumed to be the sole agents of change; impact of other family members not known. • Self-reports may introduce measurement bias, while attrition may indicate self-selection bias (participants with healthier behaviours more likely to stay in the study for the duration). **Conclusions** • Maternal facilitated changes to the home environment may be effective at increasing child FV consumption. • Online modules with an interactive component may be an effective method to impact some health behaviour changes, especially FV consumption when compared to a knowledge only based program. **Implications for Public Health Nutrition Practice** • Further exploration around the effectiveness of web-based, interactive learning about health behaviours is warranted. Consideration must be given to family members most likely to be the agents of behaviour change in the home environment. Role modelling and food preparation with children.

Study Details	Methods	Findings/Conclusions
Prelip, 2011 **Study Design:** CBA **Country:** US **Population:** Targeted **Participants** 26 schools (15 intervention, 11 control); 328 intervention & 323 control parents recruited through schools; participation was by self-selection. **Purpose:** Test a comprehensive nutrition program with low-income parents of young school-aged children to determine changes in parents' knowledge, attitude, self-confidence & behaviours in parent and child FV intake. **EPHPP Appraisal:** weak	**Program** • Five weekly, 90-minute nutrition education classes for parents delivered by RD. To participate, parents committed to the 5 weeks. • Parents consulted around interests (pre-study focus groups) – general healthy eating, portion sizes, role of nutrients, reading food labels, healthy cooking & getting children to eat a healthy diet. • Used social cognitive theory (behavioural capability, outcome expectations, self-efficacy, observational learning). **Data Collection** • Self-administered questionnaires, adapted from previously developed questionnaires. • Mixed modelling techniques to measure outcomes. **Nutrition-related Outcomes Measured and Reported** • Parent nutrition/healthy eating knowledge, attitudes and behaviours – personal and in the home environment • Confidence in making healthier diet changes.	**Findings** • Significant positive changes in parent knowledge, food behaviours & home environment, especially for those attending at least 4/5 sessions. • No changes observed in parent attitude, although this measured high at baseline. • Statistically significant improvements in FV & whole grain consumption and using food labels when shopping. Significant decline in previous week availability of tortilla chips, soda, and candy. **Strengths and Limitations** • Parent targeted large sample size with program offered at multiple sites. • Short term outcomes measured, not long-term impacts. Participants self-selected to participate and self-reported data are possible sources of bias in results. **Conclusions** • Parent targeted programs offered in a school setting shows promise in creating positive outcomes around fruit and vegetable consumption in lower-income parents. **Implications for Public Health Nutrition Practice** • Consider multi-level, coordinated efforts in settings accessed by parents with focused messaging around FV intake, processed food, healthy drinks, food skills and role modelling healthy eating behaviours.
Schwinn, 2013 **Study Design:** RCT **Country:** US **Population:** Targeted **Participants:** 67 mother-daughter dyads (35 intervention; 31 control) from recruited from public housing settings in 27 US states. **Purpose:** Test a brief web-based, family involvement health promotion program aimed at drug use, physical activity and nutrition for adolescent girls aged 10-12 who reside in public housing. **EPHPP Appraisal:** weak	**Program** • 3-session, integrated online health promotion program focused on developing and maintaining girls' and mothers' healthy relationships, bodies and minds; knowledge of drugs, family rules, grocery shopping and food preparation skills, sources of stress and coping skills. **Data Collection** • Baseline, post-intervention and 5-month follow-up self-reported questionnaires completed online. • Questions adapted from previously developed tools. **Nutrition-related Outcomes Measured and Reported** • Mother-daughter FV intake, closeness, communication, parental monitoring, substance use, PA. • Daughter-only measures: perceived stress and drug refusal skills.	**Findings** • Post-test: girls reported better communication and parental monitoring. Mothers reported better communication, closeness, vegetable intake and physical activity. • 5-month follow-up – girls and mothers reported better parental monitoring. Girls reported better communication and closeness, reduced stress, better refusal skills and increased fruit intake. **Strengths and Limitations** • A brief intervention, short follow-up and small sample size. • Mothers had overall high education levels, potentially impacting readiness and participation. • Study tested online delivery which is accessible, lower cost and familiar to participants. **Conclusions** • A brief web-based health promotion program for mothers and girls living in public housing can affect positive and relatively sustained changes in health behaviour and salient risk and protective factors. • A program with a greater number of skills and enhanced levels of interactivity is warranted. More follow-up periods could assess long-term impact. **Implications for Public Health Nutrition Practice** • Consider opportunities to offer online education to families, incorporating interactivity, goal setting, targeted messaging and parents and children working together.

Study Details	Methods	Findings/Conclusions
Tanner 2008 **Study Design:** Quasi-experimental (observational) **Country:** US **Population:** Universal **Participants:** 39, Grade 4 & 5 students and parents; 2 schools: 1 intervention (18 students) &1 control (21 students). **Purpose:** Evaluate the effectiveness of an intervention where 4th and 5th graders in an after-school program developed a media campaign to increase FV intake. **EPHPP Appraisal:** weak *Note: See Evans, 2006*	**Program** • After-school; 12, 2-hour sessions over 6 weeks: 2 nutrition education & 2 media literacy/health communication sessions; 8 sessions for students to design & implement a parent targeted media campaign. Two Family Fun Nights. • Campaign components: 3 key messages, logo, slogan, table toppers, magnets, website, commercial, rap song. **Data Collection** • **Current study**: semi-structured focus group with children • **Overall study**: two 24-hr diet recalls, conducted by RD, by phone, with parents; pre- post-test, questionnaires, completed by parents; pre- post-test, questionnaires, completed by students (reliability tested tools). **Nutrition Outcomes Measured & Reported** • Children's FV intake – average servings/2 days; • Home nutrition environment changes - FV home availability/accessibility & parental social support	**Findings** • **Current Study** – focus group themes: knowledge-based outcomes (learned about importance of eating FV), behavioural outcomes (intervention inspired them to try new FV), & perceived parental support (positive influence from media campaign on some parents). Overall Study: Children were successful at creating media campaign to present to their parents; No significant changes in F/V consumption were noted between the control and intervention group; No significant differences on any measures between two groups for self-efficacy, motivation, or perceived parental support for increase FV consumption; Parents report greater availability of FV at home and more instrumental support for children to eat FV. **Strengths and Limitations:** • Use of a less-common approach for children to develop targeted media material and message for parents. • Small pilot study; high attrition rate (13 intervention and 18 control completed intervention questionnaires. • Difference in demographics of two groups (gender, number of single-parent family households, SES) **Conclusions** • Media can have a positive impact on parent behaviour change when developed by their children. It is not known if the same messages would resonate with parents if produced by someone else. **Implications for Public Health Nutrition Practice** • Consider opportunities to leverage the positive media messages through various methods. • Engage children & youth to create simple media campaigns targeted at their peers/families as an innovative/ creative way to influence knowledge, attitudes & behaviour change at home. • High attrition rate of study may be an indicator that intervention programs such as this one would see better results if it were embedded within school day activities.
Van Lippenvelde, 2012 **Study Design:** cluster RCT **Country:** Belgium **Population:** Universal **Participants:** 2232 students, aged 11-15 years; total 15 schools: 5 control, 10 intervention. **Purpose:** Investigate whether: 1) an intervention aimed at lowering overall fat intake, resulted in a lower fat intake from snacks; 2) the parental component resulted in changes in home-related determinants for eating less fat; 3) the mediating effects of the parental component in a school-based intervention on adolescent dietary fat intake from snacks. **EPHPP Appraisal:** weak	**Program:** • A school-based program to promote healthy food and physical activity. Two intervention group to identify the mediating effects: one with parent component (1006 students); one with no parent component (1226 students). **School environment component**: improve healthy food availability; decrease offerings of less healthy foods; **individual component**: computer-tailored, 1-hour classroom session to provide personal feedback about fat intake & attitudes and intention to reduce fat. • **Parent intervention**: free CD program to obtain individually tailored fat intake feedback for use at home; leaflet about their child's use of a similar program in school to discuss with their child; parent targeted, interactive nutrition education session at the school; regular newsletters. **Data Collection** • Pre-post self-administered questionnaires for students. **Nutrition Outcomes Measured & Reported** • Fat intake from sweet and savoury snack foods (days/week or month and portion). • Home availability of low-fat foods. • Parental encouragement and support to eat a low-fat diet.	**Findings** • Significant differences in baseline fat intake from snacks found between the two intervention groups. Fat intake from snacks were constant from baseline to follow-up for parenteral intervention group. • Parenteral intervention did not lead to significant changes in other home-related factors - availability of healthy foods availability, parent encouragement and support. **Strengths and Limitations:** • Large sample population; FFQ for fat intake valid and reliable; Study duration – over a year. • Possible implementation challenges: measures not sensitive enough to change, focus on overall fat intake was too general to influence specific snacking behaviour. **Conclusions** • There was no change in fat intake from snacks; however, authors noted a positive trend/trajectory for parental support for healthy choices for their adolescent. There was also limited or no change reported in adolescents' diet knowledge, attitude and behaviours. • School obesity prevention programs should focus on multi-faceted approaches to impact both school and home environments. Further research is warranted. **Implications for Public Health Nutrition Practice** • Consider whether a focus on eating patterns vs. specific nutrients may demonstrate better outcomes. Parent components within school-based programs ensure consistent messages to all audiences. • Explore opportunities to implement methods to engage parents through multiple avenues, recognizing the potential impact on behaviour change with both virtual and face-to-face opportunities.

Study Details	Methods	Findings/Conclusions
Vereecken 2013 **Study Design:** Observational analytic **Country:** Belgium **Population:** Universal **Participants** 46 parents from 1 pre-primary school & 1 primary school (392 invited to participate); Focus group with 17 parents. **Purpose:** Formative evaluation of the feedback component of the online tailoring instrument - Children's and Adolescents' Nutrition Assessment and Advice on the Web (CANAA-W). **EPHPP Appraisal:** weak	**Program:** • CANAA-W online tool previously provides tailored feedback to parents in response to a 3-day record of their child's dietary intake. • Three visuals for feedback: food triangle (Flemish Nutrition Guidelines), preference circles, and nutrient table • **Performance objectives**: to use the tool to improve dietary habits by helping parents promote healthy eating behaviour in children (E.g. encourage healthy eating, be a role model, increase availability of nutrient-dense foods, decrease energy-dense, low nutrient foods). • **Parent targeted determinants**: increase parents' awareness, nutritional knowledge, positive attitudes and skills. **Data collection** • Evaluation questionnaire, 4 point scale & comment option. **Nutrition Outcomes Measured & Reported** • Feedback message attractiveness, clarity, and usefulness.	**Findings** • 72% considered all components useful. Most found the advice comprehensible, logical, useful, well-formulated, personal, relevant, and attractive, with the right amount of information. • 17 focus group themes: 1) Parents were aware of the importance of role modelling & how the tool helped show them they were providing a healthy diet. The advice helped bring awareness & motivation for change. The printable food calendars allowed children to self-evaluate; 2) Parents reported a large amount of information in visuals and text. They may often skip the general information, but repetition was good for those who wanted it; 3) Traffic light colours, graphics & pictograms facilitated learning. Illustrated recipes were attractive & encouraging to children. Nutrient tables were less appreciated. **Strengths and Limitations:** • Use of integrated method design (qualitative and quantitative) used. The 3-day food record has limited representation of usual dietary intake for the children and may add to the burden of completion. • Overall low response rate; participants may not be representative of general population as only those that completed the 3-day food record were included in tool evaluation. **Conclusions** • CANAA-W well received by respondents, good feasibility based on feedback received. • Further evaluation needed with pre- and post-test method with control and intervention groups to investigate if this method is also effective in improving dietary habits of children. **Implications for Public Health Nutrition Practice** • Consider whether the detail and volume of information generated by the reports would be relevant to a broad population. In addition, computer access and familiarity is needed. • Further exploration around reaching families with appealing and relevant messages generated by simple online surveys or checklists is warranted.
Wilson, 2014 **Study Design:** quasi-experimental (observational) **Country:** US **Population:** Targeted **Participants:** 47 African-American parents with an adolescent child. **Purpose:** Test the feasibility of an individually tailored web-based intervention to increase fruit and vegetable intake in African American families. **EPHPP Appraisal:** weak	**Program:** • A one-time 45-60 minute session with feedback, web-based information and goal-setting/action phases. • Pre-test survey used to generate tailored feedback to parents based on their F/V consumption, their adolescent's F/V consumption, communication, social support, and autonomy for increasing F/V intake with the youth and custom feedback on what they were doing well and how they could improve. **Data collection** • Pre-test (pre-online education) post-test (1 week later) self-reported surveys **Nutrition Outcomes Measured & Reported** • Parents & adolescent FV consumption (avg. daily intake) • Parenting skills (autonomy, support, communication).	**Findings** • Significant increase in parent's self-reports of daily fruit intake from pretest to 1-week follow up time point • Parent and youth combined F&V intake also increased from pretest to 1 -week follow up time point • Parents reported the web-based online program was easy to navigate **Strengths and Limitations:** • Short duration study with a small sample size. **Conclusions** • Study provides preliminary evidence of the feasibility and acceptability of a tailored program on parenting skills to impact a parent's ability to increase FV intake in themselves and their children. **Implications for Public Health Nutrition Practice** • Explore the feasibility of an online tool for parents with and targeted, tailored and actionable messages.

Table C. Primary Research – Quantitative

Study Details	Methods	Findings/Conclusions
Fulkerson 2011 **Study Design:** Focus groups (observational) **Country:** US **Population:** Universal **Participants** 27 working parents with children ages 8-10 years in 3 schools and/or after school care serving racially and socioeconomically diverse families. **Purpose:** To conduct focus groups with working parents of school-aged children to learn more about barriers that families face around family meals and to gather ideas around development of interventions to improve the frequency, atmosphere, and quality of food at family meals. **CASP Appraisal:** 9/10	**Design** • Three focus groups, 9 parents/group; semi-structured questions • Survey prior to focus groups – demographics, family meal frequency and food items served. **Nutrition Outcomes Measured & Reported** • Questions to corroborate the authors previous research findings around typical family meals, benefits and possible areas for change. • Questions to expand on previous research to rate potential program ideas – interest and importance.	**Survey Results** • More than 1/2 of parents reported eating family dinner at least 3 times in the past week; about 25% reported never eating family breakfast in the past week; about 75% reported that a parent was present every evening when his/her child ate dinner; more than 75% reported that their child never ate meals in front of the TV in the past week or did so infrequently; many parents did not serve healthful food regularly. **Focus Group Results** • Dominant themes: 1) Time constraints - difficulty preparing meals & multi-tasking at meals; 2) Benefits of family mealtime - enjoyment of mealtime conversations, feelings of connectedness with their children; 3) Parent desired change - having children help during meal preparation, but avoiding it due to mess and time commitment; frustration with limited range of children's palates and how school and childcare food environments contribute to child's limited food repertoire. **Program Idea Results** • Parents were most enthusiastic about ideas for feeding tips & recipes to create healthful, quick meals, ideas to involve their children in food preparation & how to change the food offered at meals. **Strengths and Limitations** • Rich qualitative data from a diverse group of working parents regarding potential areas for intervention. • Parents' education and self-selection may have influenced their overall interest in nutrition and health. **Conclusions** • Health professionals can contribute to the health and wellbeing of families with school-aged children through nutrition education activities, recipes, tips for healthy eating, emphasis on the importance of family meals, eating with their children and role modelling, and food preparation skill building in children. **Implications for Public Health Nutrition Practice** • Consider opportunities to promote these concepts to parents through various methods – in person, virtual, social media using existing tools and resources. • Respect reported barriers parents face when developing relevant and achievable action messages to engage parents instead of alienating them with unachievable action or messages.

Study Details	Methods	Findings/Conclusions

Haerens, 2009
Study Design: Focus groups (observational)
Country: Europe
Population: Universal
Participants:
155, 6-8 year-olds (74 boys, 81 girls); 189 parents of 2-4 and 6-8-year-olds (28 men, 161 women) in 8 countries.
Purpose:
To describe important influencing factors for dietary behaviours in order to determine the best approaches for developing the dietary components of the standardized intervention.
CASP Appraisal: 8/10
	Design
	• 20 focus groups with children; 36 focus groups with parents from the 'identification and prevention of dietary- and lifestyle-induced health effects in children and infants' (IDEFICS).
	Nutrition Outcomes Measured & Reported
	• For Children
	  ○ Food preferences (at home and at school)
	  ○ Food type availability (at home and at school)
	  ○ Rules (at home and at school)
	  ○ Existing types of nutrition education at school
	• For Parents
	  ○ Channels for information
	• Barriers and facilitating factors for their child to eat healthy and unhealthy foods (at home and at school)
	• Food type availability (at home and at school)
	• Food rules (at home and at school)
	• Shopping behaviours
	• Motivators for behavioural change
	• Role of the school, teachers and parents
		Focus Group Results
		• Constructs include: social, physical, institutional, and personal/family related barriers.
		
		Themes
		1) **Rules regarding food consumption at home**: rules at home; not having any rules, children unaware of home rules
		2) **Rules about food consumption at school**: strict school rules; no clear rules or policies; most common rules: no gum, soft drinks or sweets
		3) **Barriers for healthy eating at home**: lack of time; grandparents/family members breaking the rules; husband's unhealthy preferences; lack of money to buy healthy foods; availability of unhealthy foods; difficulty understanding food labels
		4) **Facilitating factors for healthy eating at home**: parents as role models; positive rules; unhealthy foods not available; eating breakfast; offering healthy snacks in a child-friendly way; offering water as a first choice;
		5) **Food shopping factors**: price, promotions, seasonal changes, family food preferences (most influential with lower SES; medium and higher SES were more influenced by quality vs. price); advertising, habits, weekly menus, shopping lists, price vs. quality; not shopping with children (advertising/free gadgets leads to unhealthy food purchases
		6) **Motivators for behaviour change**: personal/child weight/health; media/ friends/relatives/parents/teachers;
		
		Strengths and Limitations
		• Large study that reinforces themes about barriers/influencers of parents' food choices for their children.
		
		Conclusion
		• Personal & environmental tailored education programming is needed for potential behaviour change.
		
		Implications for Public Health Nutrition Practice
		Consider multi-level, multi-activity, and multi-setting strategies for parents & children. Leverage coordinated messaging and acknowledge parent barriers/facilitators to healthy eating promotion.

Study Details	Methods	Findings/Conclusions
Pivonka 2011 **Study Design:** small group interviews/focus groups (observational) **Country:** US **Population:** Universal **Participants:** Stage 1: 27 people in 11 small groups; Stage 3: 48 mothers in 6 focus groups; Stage 4: 24 adults in 4 focus groups + online survey of 1033 people. **Purpose:** To understand the prevailing knowledge, attitudes and beliefs of mothers and their children regarding FV, as well as prevailing facilitators & barriers to consumption to design adaptable, sustainable and compelling messaging using existing message dissemination methods. **CASP Appraisal: 6/10**	**Design** • Small group interviews and focus groups at stages 1, 3 & 4 of the rebranding process for the '*Fruits & Veggies – More Matters'* social marketing campaign targeted at mothers. **Data collection** • **Stage 1**: 11 small group interviews; 6 families –single or married parents with at least one 4-14-year-old child; 3 mother dyads- two mothers each with at least one 4-14-year-old child; two "tween" trios, ages 8-12-year-olds, same-sex and age range. • **Stage 3**: 6 focus groups; 48 mothers (various cultural and socioeconomic position), ages 25-49 with at least one 4-14-year-old child. • **Stage 4**: 4 single-sex focus groups, split by income; 12 men, 12 women (various cultural and socioeconomic position); tested 4 graphics. Online survey of 1033 respondents, screened to represent age, sex, income, cultural and sole or shared grocery shopping responsibility. **Nutrition Outcomes Measured and Reported** • Attitudes and beliefs around diet, FV and barriers to healthy eating.	**Findings:** **Stage 1**: A compelling emotional benefit was needed to motivate consumers; National, state and local messaging consistency is needed; Hectic lifestyles and budget constraints substantially impacted people's food choices; Time is limited and highly valued; Cost vs. value is important; Parents reported that they lacked opportunities to influence family food choices due to limited shared meals and limited time spent cooking. Mothers perceive themselves as role models, primary menu planners, shoppers, cooks and gatekeepers. External influences on children challenges this role - peer pressure, unsupervised time, and widely available unhealthy food; Other challenges include complex health messages from various sources of unknown trustworthiness; Diet is viewed as foundational to health with FV being important; Fruit is viewed more positively than vegetables as it is easier to prepare, easier as snacks and preferred by children; Mothers did not know how to best cook vegetables; FV offer appropriate value for cost, especially frozen and canned varieties; Fresh FV perceived to taste best, followed by frozen; Low-income consumers found it difficult to buy fresh FV and could not afford time-saving, fresh-cut options; Six benefits identified for FV: 1) 'important that they be eaten regularly'; 2) 'help keep you at your best; 3) 'improve your health'; 4) 'come in many varieties; 5) 'make you feel better; 6) 'provide energy for your body. **Stage 3**: Mothers believed they were getting enough FV, although they also knew they could get more; 'It all adds up' was a more compelling message; A nurturing tone to the message was preferred to a preaching, frightening or bullying tone; The most effective approach was to be the mother's ally and encourage their caretaker role to keep their families healthy and happy and help build a foundation for a healthier future. Mothers were relieved that fresh, frozen, canned, dried and 100% juice all counted as FV choices; The 'appetite for life' concept was the most compelling but needed more emotional appeal. **Stage 4:** The branding platform "Fruits and Veggies – More Matters" was created and tested with focus groups. Online survey to rate the importance of the 6 identified benefits. About 80% of respondents considered all benefits important/very important. 41% perceived the slogan was a reminder of the benefits of an FV-rich diet, while 27% reported that specific FV or that 'people should eat more FV' came to mind. **Strengths and Limitations** • Solid formative research to inform universal social marketing programs/messages. **Conclusions** • Results of the formative research provided insight for food and nutrition practitioners to overcome consumers' perceived barriers to eating F/V. Appealing to the emotional benefit and a nurturing message tone are important to target mothers' perceived responsibility as caretakers. • Although awareness has increased because of the campaign, early findings are limited in demonstrating behaviour change. **Implications for Public Health Nutrition Practice** • Consider opportunities to coordinate messaging campaigns from all levels of government health and health system organizations. • Explore targeted, actionable messages framed with a nurturing tone and an emotional benefit to improve knowledge and awareness and effect behaviour change in FV consumption patterns.