

SUMMARY OF EVIDENCE:

How nutrition effects mental well-being in school-aged children and youth

Background

Childhood and adolescence is a period of rapid development, where establishing a foundation for good physical and mental health is critically important so this can be carried into adulthood. Children and youth's dietary and emotional health and well-being are affected by the complexity of social, physical and economic factors.^{1,2} [The Ministry of Education Foundations for a Healthy School](#) resource identifies well-being as one of the core goals for Ontario's vision for education. This goal emphasizes the need to focus not just on academic success but also on the whole child and student – their cognitive, emotional, social, and physical development. It acknowledges that healthy students are better prepared to learn, and education is a key determinant of health.³

Evidence suggests that there is an increasing number of Ontario children and youth that are concerned with their mental health and well-being.^{4,5,6} Mental health is not simply the absence of a mental health condition; it is "a state of well-being in which every individual realizes his or her own potential, can cope with the normal stresses of life, can work productively and fruitfully, and is able to make a contribution to her or his community".⁷ In 2017, Ontario Student Drug Use and Health Survey (OSDUHS) report⁴ showed that 29% of Ontario students believed that their mental health affects their school grades a "great deal" or "quite a lot". Just under half (46%) of students self-reported their mental health as excellent or very good, while more than one quarter (27%) rated it as fair or poor.⁶ Twenty-seven percent of Ontario students also reported visiting a mental health care professional for a mental health issue at least once in the past year - this is estimated to be 260,900 Ontario students.⁶

In Canada, dietary risk factors are one of the leading risk factors for chronic disease, including heart disease, stroke, diabetes and some types of cancer.⁸ In addition, other evidence suggests that a concerning number of Ontario children and youth are not meeting health-promoting recommendations, particularly when it comes to eating a healthy diet. Seventy-seven percent of youth (ages 12-19) reported inadequate vegetable and fruit consumption in Ontario, specifically consuming less than 5 times per day.⁹ The majority of Ontario grade 7-12 students eat too few healthy food choices like vegetables and fruit (85%) and many are indulging in less healthy choices on a daily basis, like sugary drinks and high-caffeine energy drinks.⁵ In 2015, Canadian children consumed up to 25% of total energy intake per day from total sugars with the top source of sugar from sugary beverages.¹⁰ In addition, over half (58%) of Ontario students in grades 7-12 don't eat breakfast before school every day.⁵

Nutritional risk factors for chronic diseases are considered modifiable, however many people are not able to make changes due to their food environment or life circumstances. Children's food choices can be affected by household income, parental employment status and parental health making them vulnerable to poor dietary intake.⁸ As many as 55,500 students in Ontario report going to bed or school hungry on a daily basis and this has significantly increased from 2015 to 2019.⁵ These dietary habits put children and youth at risk of not meeting nutrient needs that support healthy growth and development and of developing other health conditions such as dental cavities, diabetes and heart disease, some cancers and mental health concerns throughout their lifetime.^{11,12,13,14,15,16,17}

Children and youth spend a great deal of their lives at school. As such, it has been identified that schools play an important role in promoting healthy eating and positive mental health and well-being of children and youth.^{1,3} Ontario public health units are mandated to support schools in promoting and achieving optimal health and well-being of students, as an important factor in achieving academic success.



Purpose

An evidence review was conducted to inform public health practice and to understand the effects of nutrition and nutrition strategies on mental well-being in school-aged children and youth.

Research questions

The following four questions were developed to gain further knowledge and understanding of this topic:

1. What is the relationship between diet and mental well-being in children and youth aged 4-17?
2. What is the relationship between diet and behaviour-related outcomes in children and youth aged 4-17 in the school setting?
3. What is the relationship between diet and academic-related outcomes in children and youth aged 4-17 in the school setting?
4. How do nutrition strategies in the school setting impact mental well-being in children and youth aged 4-17?

Synthesis of Findings

Based on a review and critical appraisal of current literature the following are the findings. For more details related to the search process and research strategy, see the Appendix.

1. Relationship between diet and mental well-being in children and youth aged 4-17:

- An overall pattern of positive eating behaviours that emphasizes whole meals, vegetables and fruits, whole grain foods, and protein foods; includes health promoting behaviours and limits processed or prepared food that contributes excess sodium, free sugars, and/or saturated fat is associated with lower feelings of depression and/or better mental health in children and youth.^{14,16,17} Specifically:
- There may be a positive association between consumption of fruit and vegetables, fish, whole meal, and fat based on dietary guidelines and all indicators of well-being.¹⁷
- Fruit & vegetable consumption (400-500g per day) may be associated with mental well-being and fewer peer problems*.¹⁷
- Fish intake (2-3 times per week) may be associated with better self-esteem and no emotional or peer problems*.¹⁷
- Intake of a whole meal according to healthy dietary guidelines may be associated with no peer problems*.¹⁷
- There may be an association between diet quality and self-esteem in children. Those that follow nutrition guidelines tend to have better self-esteem, and those that have better self-esteem tend to follow nutrition guidelines.¹⁷
- An overall pattern of eating that emphasizes foods high in saturated fat, sugar and sodium through regular consumption of highly processed or prepared foods (fast/take-away food), confectionaries, sweetened beverages, and frequent snacking^{8,14} is associated with low mood** and/or feelings of anxiety in children and youth.^{14,15}

*Peer problems was assessed using a survey that asked about behaviours related to playing alone or with others, having friends, being liked by other children, being bullied or picked on and getting along with others.¹⁷

**Low mood includes symptoms such as feeling tired, trouble sleeping, feeling unhappy, sad, depressed, hopeless, nervous, tense, worrying too much about things, didn't feel like eating, stomach aches, scared, lonely, felt like crying.¹⁵

2. Relationship between diet and behaviour related outcomes in children and youth aged 4-17 in the school setting:

- Increased consumption of food and/or beverages that are high in saturated fat, added sugars, and sodium may be associated with adverse classroom behaviour***.¹⁶
- There may be an association between consumption of soft drinks and adverse classroom behaviour***.¹⁶

***Adverse classroom behaviour refers to measures of classroom behaviour including hyperactivity, inattention and classroom conduct, frequency of classroom disruption, inability to pay attention, restlessness, fidgeting, easily distracted, ability to concentrate, ability to think before acting.¹⁶

3. Relationship between diet and academic related outcomes in children and youth aged 4-17 in the school setting:

- Increased consumption of food and/or beverages that are high in saturated fat, added sugars, and sodium may be associated with poorer academic grades¹⁶
- Eating a diet that emphasizes vegetables and fruits, whole grain foods, and protein foods; includes health promoting behaviours and limits processed or prepared food that contributes excess sodium, free sugars, and/or saturated fat may be associated with better academic achievement.^{16,18} Specifically:
 - Fruit and vegetable intake daily may be associated with better academic performance.¹⁶
 - Regular breakfast consumption may be associated with better academic achievement.¹⁶
 - Consuming breakfast may be associated with a short term (within 4 hours) increase in attention and memory in children and adolescents, especially among those that are undernourished.¹⁹ Yet, no conclusions can be made regarding the type and amount of breakfast that will impact cognitive performance such as memory, attention and information processing.^{19,20,21}

4. Nutrition strategies in the school setting that impact mental well-being in children and youth aged 4-17:

- There was a lack of evidence regarding the impact of nutrition strategies and approaches and mental well-being in children and youth in school settings.

Limitations of evidence

- This literature review revealed relatively few studies that examined diet and mental health in children and youth. This was also identified by other researchers, especially when compared with the large number of studies with adult participants.¹⁴ In addition, few studies examined mental health from a well-being perspective. Studies tended to focus on diagnosed mental illness rather than studying the well individual and well-being; many of the studies measured depression only or other diagnosed mental illnesses.
- Associations between nutrition and mental health should be interpreted with caution due to possible confounding factors that may affect the relationship between the variables. Other factors (e.g. socioeconomic status, income, parents education, culture, age, etc.) that are highly correlated with diet and mental health in children and youth may play a role, since they were not measured consistently or controlled by some studies.^{14,17}
- There is a lack of evidence regarding nutrition strategies that would improve mental well-being in children and youth in schools.
- There are challenges with assessing the correlation between nutrition and mental health and well-being in children and youth. Many studies used measures that relied on child/adolescent self-report or parent/caregiver reports of child's diet, which may affect accuracy due to social desirability or lack of parents' knowledge of the child's actual intake.¹⁴
- There are challenges with studying mental health and well-being in children and youth in the school setting as it requires rigorous, ethical and administrative procedures and there is a lack of validated tools.

Implications for Practice

The following recommendations are for consideration for population health messaging in the school setting, based on the findings of this literature review, additional background information and Canada's Dietary Guidelines:

- **Raise awareness** with school communities about the probable association between nutrition and mental well-being including behaviour and academic outcomes for children and youth. Specifically:
 - A healthy diet and eating behaviours may be associated with better mental health, better self-esteem, and better academic achievement.
 - An unhealthy diet and eating behaviours may be associated with low mood, feelings of anxiety, adverse classroom behaviour and poorer academic outcomes.
 - Consuming breakfast may be associated with a short term (within 4 hours) increase in attention and memory in children and adolescents, especially among those that are undernourished.
- **Collaborate with and support** schools, school boards and education stakeholders to create healthy school nutrition environments that are supportive of mental health and well-being by:
 - Identifying opportunities and addressing barriers to healthy eating within policy, programs, and initiatives using the [Foundations for Healthy School Framework](#).
 - Encouraging access and availability to foods that are associated with positive mental health outcomes including vegetables and fruits, whole grain foods, protein foods, and water as the beverage of choice.
 - Encouraging access and availability to school food programs and initiatives that are associated with positive mental health outcomes such as Student Nutrition Programs (e.g. breakfast and snack) and food literacy initiatives.
 - Limiting access and availability to the types of food associated with poor mental health outcomes including those high in saturated fat, sugar and sodium such as processed or prepared foods (fast/take-away food), confectionaries, and sugar sweetened beverages.
 - Limiting practices that might encourage consumption of foods that are associated with poor mental health outcomes such as rewarding students with food, celebrating with unhealthy foods, and offering unhealthy foods at events.

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Conflict of Interest:

Team members received the support to participate in the research project from their Public health employers. No additional financial or other support was provided. There is no conflict of interest to declare.

Appendix: Evidence Review Process and Strategy

Search Process

A search strategy was developed with guidance from Public Health Ontario, EIDM experts within Ontario Public Health units, and tools from the National Collaborating Center for Methods and Tools (NCCMT). Three databases were searched for published literature in January 2019 (Medline, Psycinfo, CINAHL). Seventeen websites and search engines were searched for grey literature between January and November, 2019. A total of 2054 published literature abstracts and 75 grey literature documents were reviewed for alignment with PICO and search terms across all four research questions. Thirty-seven published articles and 8 grey literature sources were reviewed and critically appraised. A total of 8 articles (7 published and 1 grey literature) met inclusion criteria. Five articles were systematic reviews; one article was a scoping review; and one cohort study. All 8 articles were rated as moderate quality.

Research Questions

Question #1 PICO:

Population: children and youth ages 4-17 years

Intervention: diet and/or nutrition

Comparison: no comparison

Outcome: mental well-being

Question #2 PICO

Population: children and youth ages 4-17 years

Intervention: diet

Comparison: no comparison

Outcome: behaviour

Question #3 PICO

Population: children and youth ages 4-17 years

Intervention: diet

Comparison: no comparison

Outcome: academic performance

Question #4: PICO

Population: children and youth ages 4-17 years

Intervention: nutrition strategies

Comparison: no comparison

Outcome: mental well-being

Research Strategy

ODPH members at participating health units work collaboratively with their librarian to research one or more assigned priority nutrition issues affecting Ontario schools and create evidence-based recommendations for assigned priority nutrition issue(s).

Process:

1. Define research question(s) for assigned nutrition topic. Refer to the example in Appendix A to help guide you as you develop your research questions:

- Research teams of at least two members of the Evidence-informed SNWG task group will work with assigned librarians and use [PICO/PECO/PS search terms](#) tool to develop research questions. Document your research questions into Research Question Template.
- Final research questions to be sent out to the group by e-mail for review.
- Large group discuss and finalize by teleconference.

2. Librarians conduct literature search using Exclusion and Inclusion Criteria to guide the search:

- If the initial search does not meet the original search criteria, then the search will be re-run with expanded search criteria based on the findings.

3. Review titles and abstracts based using Exclusion and Inclusion Criteria:

- To pilot test this process, the entire group pilot tested the exclusion and inclusion criteria using the first 10-15 titles and abstracts for one selected nutrition topic.
- The entire group reviewed exclusion and inclusion criteria for consistency and edited as necessary.
- Revised exclusion and inclusion criteria were used by research teams to screen all titles/abstracts for their assigned research question(s). Each member of the team screened the abstracts separately, and then compared results of screening to come to an agreement about which abstracts to exclude or include. There were at least two reviewers screening abstracts in each team. In the case where it is unclear whether the abstract should be included, the EIDM specialist was consulted to resolve the dispute.
- Research teams obtain full text articles meeting inclusion criteria for assigned nutrition topic.

4. Research team read and critically appraise articles that meet inclusion criteria:

- Used the [PHO MetaQAT Guide and Framework](#) for guidance
- Used a [MetaQAT PDF](#) form to record your appraisal comments for each individual article.
- Specific companion appraisal tools were used to support critical appraisal of articles:
 - Systematic reviews, scoping reviews, etc. - [Amstar II](#) and [guidance document](#).
 - Grey literature [AACODS tool](#).
 - Cross-sectional Studies [EPHPP Quality Assessment Tool](#) and associated dictionary.
 - All other study designs as listed in [PHO recommended companion tools \(Table 1\)](#).

5. Document the Data Extraction step in the [PHO MetaQAT customizable data extraction spreadsheet](#).

Exclusion and Inclusion Criteria

Exclusion	Inclusion
<p>Published studies and grey literature sources published prior to 2013.</p>	<p>Published studies and grey literature sources between 2013-2018.</p> <p><i>Note: If initial search results in limited sources, a second search will be conducted for 2007-2012.</i></p>
<p>Non-English speaking articles or documents Developing/Underdeveloped Nations:</p> <ul style="list-style-type: none"> • Asia (including Japan) • Africa • Middle East • Russia • All others 	<p>Published literature: English speaking articles and documents from these nations including:</p> <ul style="list-style-type: none"> • Canada • USA • United Kingdom • Australia/New Zealand • South America • Europe (except those listed in excluded list) <p>Grey literature: bolded items should be searched for every research topic. Decision to search additional sites will depend on the topic, capacity, and amount of available published and grey literature. Research teams should determine final list in collaboration with librarian.</p> <p>Some sites will only be accessible by public health nutrition professionals. Librarians should create the search terms and nutrition professionals can use them to search grey literature sites</p> <p>Health Canada, Canadian best practices portal, Nutrition Resource Center Navigator, Apple schools Alberta, BC school health network, Pan Canadian Joint Consortium for Schools, Dietitians of Canada (PEN) (login required), ODPH (login required), The Academy of Nutrition and Dietetics, CDC Healthy Schools, National Association of School Nurses, Google, Google scholar (first 25), Public Health Ontario, Centre for Addiction and Mental Health (CAMH), Ontario Centre of Excellence for Child and Youth Mental Health, World Health Organization (WHO)</p>

<p>Study population</p> <ul style="list-style-type: none"> • Children less than 4 yrs of age • Adults 18 years and above or age range overlaps into adulthood over 18 years • Any sample that has diagnosed medical conditions or mental health diagnosis 	<p>Study Population</p> <p>Children ages 4-17 or 4-14 (If the assigned nutrition topic is only applicable to elementary)</p> <p>If the age range overlaps with adults (e.g. 15-24), include if the <18 results are presented separately</p>
<p>Types of Studies</p> <p>Published:</p> <p>Single studies that are included in systematic reviews and reviews.</p> <p>Narrative reviews</p> <p>Grey literature:</p> <p>Newspaper articles, website blogs, conference proceedings or posters, thesis, technical reports</p>	<p>Types of Studies</p> <p>Published:</p> <p>Systematic reviews, scoping reviews and rapid reviews</p> <p>If no reviews, single studies will be included including cohort, case-control, cross-sectional and mixed method, etc.</p> <p>Grey literature:</p> <p>Government reports; unpublished evaluations, practice guidelines</p>
<p>Outcomes of Study</p> <p>Outcomes related to non-school settings</p> <p>Non health or nutrition-related health outcomes</p> <p>Non-student related learning outcomes</p>	<p>Outcomes of Study</p> <p>Health risks or outcomes related to the research questions</p> <p>Student learning outcomes of the nutrition issue: calm, alert, focus, resilience, concentration, behaviour, thought, self-control, self-regulation, attention, mindful, knowledge, academic achievement, test scores, performance, attitude, growth mindset</p> <p>Effective/successful strategies or interventions in school settings related to the research questions</p>
<p>Quality of Study</p> <p>Exclude studies rated low quality</p>	<p>Quality of Study</p> <p>Include studies rated moderate or high quality</p>

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