Eating behaviours and their relationship with mental health indicators among Canadian youth

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Author Contributions

Under the supervision of Dr. Claire Tugault-Lafleur, MSc candidate Rita Al Kazzi is the principal investigator for this project. She was responsible for conceiving and designing the analysis, conducting statistical analyses, creating tables, interpreting the results, writing the thesis, communicating the findings, and submitting the final thesis. Rita Al Kazzi is the first author of the thesis, with Dr. Tugault-Lafleur as the senior author.

Abstract

Adhering to public health recommendations for physical activity, screen time, and sleep is linked to better mental health, but less is known about eating behaviours and how these relate to youth's mental health. This cross-sectional study used nationally representative data from the 2019 Canadian Health Survey on Children and Youth to explore associations between eating behaviours, level of adherence to eating recommendations and mental health indicators (self-rated health, anxiety and depressive symptoms) among Canadian youth aged 12-17 years. Regular breakfast consumption on school days and frequent family meals were positively associated with all three mental health indicators while avoiding screens during meals was only associated with low depressive symptoms. A dose-response gradient was observed, with meeting two or three recommendations being increasingly associated with mental health indicators (self-rated mental health and depressive symptoms) compared to meeting none of the eating recommendations. Meeting recommended eating practices is associated with better mental health among Canadian youth.

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1. INTRODUCTION

Mental health disorders are among the leading causes of disease burden in adolescents globally, with an estimated 14% of youth affected worldwide (World Health Organization, 2024). Adolescence represents a critical period for mental health development, as patterns established during this time tend to track into adulthood and significantly influence long-term psychological well-being (Daw et al., 2017). In Canada, recent trends reflect these concerns where between 2011 and 2018, the prevalence of poor perceived mental health, mood disorders, anxiety disorders, and mental health consultations among adolescents rose significantly (Wiens et al., 2020). These patterns are alarming, given that mental health issues not only impact quality of life but also have profound consequences for educational attainment, physical health outcomes, and substance abuse later in life (Patel et al., 2007).

Among the most prevalent and overwhelming conditions are anxiety and depressive symptoms. Between 2006 and 2017, mental health and addiction-related emergency visits among youth in Ontario increased by 89.1%, especially among those aged 14-21 years, driven largely by anxiety and mood disorders (Chiu et al., 2020). In Canada, rates of diagnosed anxiety disorders characterized by excessive fear, worry, and behavioural disturbances, among adolescents, more than doubled from 6% in 2011 to 13% in 2018 (Wiens et al., 2020), with young females experiencing the sharpest increases. Similarly, depressive symptoms, including persistent sadness, low energy, and feelings of worthlessness, have seen a marked rise among youth, particularly since the onset of the COVID-19 pandemic. In 2012, 11% of Canadians aged 15-24 years had experienced depression, with 7% reporting recent episodes (Findlay, 2017). By 2022, self-reported depression rose to 17%, with major depressive episodes increasing from 4.7% in 2012 to 7.6% in 2022, in individuals aged 15 to 24 years, especially among young women

(Canada NewsWire, 2022; Stephenson, 2023). A study in Alberta also found that 12.3% of fifth graders had been diagnosed with internalizing disorders like anxiety or depression (Wu et al., 2021).

In parallel with rising mental health challenges, lifestyle behaviours among youth have undergone substantial changes over recent decades. Among these behaviours, eating patterns have emerged as critical but often overlooked factors influencing mental health. While much attention has traditionally focused on nutrient intake, such as the consumption of fruits, vegetables, and ultra-processed foods, increasing research highlights that how individuals eat may be just as important as what they eat. Behaviours such as regular breakfast consumption, sharing meals with family members, and limiting screen use during meals represent important daily habits that would be important to see how they shape mental health trajectories.

Recognizing the importance of eating behaviours, the 2019 revision of Canada's Food Guide (CFG) introduced a more holistic view of dietary recommendations. For the first time, the guide not only addressed what Canadians should eat, but also contextual factors associated with eating behaviours (Health Canada, 2019). For example, the 2019 CFG encourages practices such as being mindful of eating habits, cooking more often, and eating meals with others. These behavioural recommendations are supported by new research that shows a connection between eating environments and better psychological outcomes such as overall well-being (Zhang et al., 2022).

Despite these advances, there remains a critical lack of research on the adoption of these behavioural guidelines among Canadian adolescents, particularly since the 2019 update. Much of the current research on adolescent nutrition has focused on dietary composition and the intake of ultra-processed foods (Mescoloto et al., 2024). While these are undoubtedly important,

focusing exclusively on food content neglects the social, environmental, and behavioural contexts in which eating occurs, factors that may be equally significant for mental health. For instance, breakfast consumption has been consistently linked to lower rates of depression and stress among adolescents (López-Gil et al., 2022; Zhu et al., 2019). Similarly, adolescents who engage in frequent family meals tend to report higher life satisfaction, lower rates of depressive symptoms, and reduced engagement in risky behaviours (Eisenberg et al., 2004; Elgar et al., 2013). Conversely, screen use during family meals has been linked to reduced family cohesion (Dallacker et al., 2019) and poorer dietary quality, including higher intake of discretionary foods (Dallacker et al., 2018; Litterbach et al., 2022), though no studies to date have identified a direct association with mental health outcomes.

Beyond isolated behaviours, research suggests that synergistic effects between lifestyle behaviours exist, meaning that the adoption of one behaviour may be associated with another, which highlights the importance of considering the health impact of combinations or patterns of eating behaviours. Studies examining the clustering of health-promoting behaviours, such as physical activity, sleep, and screen time, have found that adolescents who adhere to multiple 24-hour movement guidelines report significantly better mental health outcomes compared to their peers who meet few or none (Ahmad et al., 2023; Sampasa-Kanyinga et al., 2022). However, research specifically examining the cumulative effects of recommended eating behaviours on adolescent mental health remains scarce. Existing studies focusing on diet-movement clusters often omit eating behaviour variables or focus solely on food groups rather than eating behaviours themselves (Dabravolskaj et al., 2024; Wu et al., 2024).

Given the growing recognition that adolescent mental health is influenced by both lifestyle and environmental factors, understanding the role of eating behaviours presents an

important opportunity for early intervention. Eating behaviours are highly modifiable and occur multiple times daily, making them practical targets for public health strategies (Jastran et al., 2009). Moreover, they are shaped not only by individual choices but also by family, school, and community environments, highlighting the importance of shared responsibility among stakeholders (Marcone et al., 2020; Scaglioni et al., 2018). Yet, without clearer evidence linking specific eating behaviours to mental health outcomes, it remains difficult to design targeted, effective interventions.

Therefore, this study seeks to address gaps in the literature by exploring associations between three key eating behaviours, i.e., regular breakfast consumption, frequent family meals, and avoidance of screen use during meals, and mental health indicators among Canadian adolescents. Specifically, the objectives of this study are twofold: (1) to assess the relationships between each of these behaviours individually and three mental health outcomes (self-rated mental health, anxiety symptoms, and depressive symptoms); and (2) to examine whether adherence to a greater number of recommended eating behaviours is associated with better mental health outcomes, indicating a possible dose-response relationship. By examining these relationships within a nationally representative sample and using behaviours aligned with Canada's current food guide “how to eat” recommendations, this research aims to contribute emerging insights into how eating behaviours may help support adolescent psychological well-being.

This thesis is organised as follows. Chapter 2 presents a critical review of the literature on adolescent mental health status abroad and in Canada, eating behaviours among adolescents and finally, associations between eating behaviours and mental health. Chapter 3 presents the study objectives and hypotheses. Chapter 4 describes the methods, including data sources, how

variables are defined and assessed, and analytic strategies. Chapter 5 presents the study's findings, while Chapter 6 discusses the results in the context of previous research and public health implications. Finally, Chapter 7 summarizes the study's contributions to the field, outlines its limitations, and suggests directions for future research.

2. LITERATURE REVIEW

2.1 Mental health status among Canadian youth

Health encompasses not just the absence of illness or injury, but also physical, mental, and social well-being (World Health Organization, 2025). Among adolescents, mental health is a critical component of overall well-being, influencing academic performance, social relationships, and long-term health outcomes (World Health Organization, 2024). Given the complexity of mental health assessment, researchers often rely on subjective and objective indicators to capture the overall psychological well-being of youth (Public Health Ontario, 2024; UNICEF Canada, 2019; What Works Centre for Wellbeing., 2021). Various indicators have been used, such as self-rated mental health, symptoms of anxiety and depression being common indicators. Below, I discuss these three key indicators: self-rated mental health, anxiety symptoms, and depressive symptoms; in more detail, highlighting their significance, trends in recent data, and implications for understanding adolescent mental health in Canada.

Self-rated mental health

Self-rated health, often referred to as perceived health, is a widely used subjective measure of overall health status, referring to a person's general perception of their health. Self-rated health is often used in surveys to measure health-related quality of life. Indeed, the World Health Organization (WHO) recommends using self-rated health as a more appropriate measure of adolescent health than other morbidity and mortality measures (Currie et al., 2009). Focusing on health-related quality of life offers a subjective evaluation of health, which is essential to capture the overall well-being of adolescents beyond the scope of specific health problems (Krause and Jay, 1994).

The 2023 Canadian Health Survey on Children and Youth reveals significant shifts in youth mental health between 2019 and 2023. The proportion of youth aged 12 to 17 who rated their mental health as "fair" or "poor" more than doubled, from 12% in 2019 to 26% in 2023, when they were aged 16 to 21. This decline was especially pronounced among adolescent girls: in 2019, 16% of girls reported "fair" or "poor" mental health, rising to 33% in 2023. In contrast, the rate for boys increased from 7% to 19% over the same period. Notably, among youth who had rated their mental health as "good", "very good", or "excellent" in 2019, about one in five (21%) reported a decline to "fair" or "poor" by 2023. These findings underscore the ongoing mental health challenges faced by Canadian youth, particularly adolescent girls, following the COVID-19 pandemic (Statistics Canada, 2024).

Anxiety symptoms

Perceived symptoms of anxiety, which include feelings such as being anxious, nervous, or worried, are an indicator of mental health status that has been previously used in national surveys to assess mental health status. Anxiety symptoms have been measured using validated tools like the Generalized Anxiety Disorder-7 scale (GAD-7), which evaluates the frequency and severity of anxiety-related experiences over the past two weeks. The Washington Group/UNICEF Child Functioning Module has validated this indicator for cross-national use among youth populations (Cappa et al., 2018; Massey, 2018).

In Canada, provincial and national level surveys suggest that the prevalence of anxiety-related concerns among youth has risen over the past decade. For instance, researchers in a 2020 study analyzed linked health administrative datasets from 2006 to 2017, found that mental health or addiction-related emergency department visits among children and youth in Ontario increased by 89.1%. The most significant rises were observed among individuals aged 14-21 years, with

anxiety and mood disorders being the highest contributors (Chiu et al., 2020). Similarly, data from the Canadian Community Health Survey (2011-2018) show that the proportion of youth aged 12 to 24 years with a professionally diagnosed anxiety disorder rose from 6.0% in 2011 to 12.9% in 2018, with young females experiencing the most pronounced rise (Wiens et al., 2020). These findings suggest both a growing prevalence of anxiety symptoms and increased recognition and diagnosis of anxiety disorders in youth populations.

Depressive symptoms

Depression is another major mental health concern among adolescents, with symptoms including feelings of sadness, loss of interest in activities, and feelings of hopelessness. National surveys have previously used the Patient Health Questionnaire (PHQ-8 or PHQ-9) to assess depressive symptoms, offering insights into the prevalence and severity of depressive symptoms among youth populations. These indicators are also validated by the Washington Group/UNICEF Child Functioning Module for use among youth populations (Cappa et al., 2018; Eckersley, 2013; Massey, 2018).

Depressive symptoms levels have also seen a sharp increase among young people in Canada. Findings from the 2012 Canadian Community Health Survey-Mental Health showed that 11% of Canadians aged 15 to 24 had experienced depression in their lifetime, with 7% reporting depressive episodes in the past year (Findlay, 2017). More recently, a report from Mental Health Research Canada (2022) suggests that self-reported depression rates had reached 17%, surpassing the earlier stages of the COVID-19 pandemic (Canada NewsWire, 2022). The prevalence of major depressive episodes in individuals aged 15 to 24 years increased from 4.7% in 2012 to 7.6% in 2022, whereas young women have been particularly affected, with the prevalence of major depressive episodes doubling over the past decade (Stephenson, 2023). A

cross-sectional study analyzing data from 1,352 fifth-grade students in Alberta found that 12.3% had been diagnosed with internalizing disorders (such as anxiety or depression) (Wu et al., 2021). These findings highlight the high prevalence of depressive symptoms in Canadian youth.

2.2 Eating behaviours of Canadian youth

Eating behaviours have become a leading focus of youth health promotion policies due to their significant role in shaping long-term eating behaviours and overall well-being (Barnes et al., 2021; Chaudhary et al., 2020; De Medeiros et al., 2019). For example, the Ontario School Food and Beverage Policy mandates that all food sold in schools meet specific nutritional standards to encourage healthy eating habits among students (Ontario Ministry of Education, 2010). Eating behaviours are multifactorial and include dimensions such as food choices, meal patterns, eating practices, and eating-related psychological factors (Abang Brian et al., 2023; Dabravolskaj et al., 2024; Salmela et al., 2023).

In 2019, Canada's Food Guide provided updated dietary guidance and included new Healthy Eating Recommendations such as eating meals with others, cooking more often, enjoying your food and being mindful of eating habits – recognizing the importance of emphasizing healthy eating behaviours (Health Canada, 2019). The guide underscores that healthy eating is not just about the nutritional content of food but also about the behaviours and social context surrounding eating. Below, I provide evidence summaries of the prevalence of these eating behaviours within the Canadian population.

Breakfast consumption

Breakfast consumption is a key area of concern among Canadian youth, affecting a large proportion of Canadian youth. CFG 2019 addresses this by encouraging mindful eating and enjoying food to help promote regular, nutritious breakfasts that support overall health and well-

being (Health Canada, 2019). Cross-sectional studies suggest that missing breakfast is widespread among Canadian adolescents (Godin et al., 2018; Patte et al., 2024; Patte & Leatherdale, 2016). For instance, analyses drawing from year 2 (2013-2014) of the COMPASS cohort, which surveyed 44,861 secondary school students (grade 9-12) from Ontario and Alberta, revealed that on average 44% of girls and 37% of boys skipped breakfast at least three times a week. Even among those who participated in school breakfast programs, the prevalence of skipping breakfast remained high, reflecting a trend of breakfast skipping among nearly half of the girls students and over one-third of the boys students in the sample (Patte and Leatherdale, 2016). Another study further confirmed the high rates of breakfast skipping among Canadian youth, showing that approximately 40% of students in Canada reported eating breakfast fewer than three days per week (Godin et al., 2018). Finally, recent survey data from year 9 (2020-2021) of the COMPASS cohort spanning across four Canadian provinces (Alberta, British Columbia, Ontario, and Quebec) (n=52,138) highlighted that nearly half (48%) reported not having breakfast daily (Patte et al., 2024).

A study utilized prospective annual survey data collected both before (October 2019-March 2020) and after the onset of COVID-19 (November 2020-June 2021), with a sample of 8,128 students (mean age=14.2 years), representing 41 Canadian secondary schools (Duncan et al., 2024). In this study, about half of adolescents reported eating breakfast every day, with a lower proportion reporting daily breakfast consumption in the post-COVID-19 onset year than before the pandemic. Taken together, these findings indicate that breakfast skipping is a persistent and prevalent behaviour among Canadian adolescents. It not only persists despite public health efforts but also appears to have worsened in the wake of the COVID-19 pandemic.

Screen usage during meals

Few Canadian studies have examined the prevalence of screen use during meals among adolescents in Canada, with available evidence coming from regional samples and published over a decade ago. A cross-sectional analysis using data from the Longitudinal Study of Child Development in Quebec (1998-2002) found that nearly one-quarter of young children ate at least twice daily in front of a screen (Dubois et al., 2008). More than 21.7% of 4 to 5-year-old children ate breakfast while watching television, 7.3% did so while eating lunch, and 12.3% while eating dinner.

A cross-sectional observational study of Grade 5 students participating in a comprehensive population-based survey in the Canadian province of Nova Scotia (n = 4,966) found that eating supper in front of the television was common. Specifically, 43.9% of students reported doing so less than once per week, 33.0% reported doing so 1-2 times per week, 11.3% reported doing so 3-4 times per week, and 11.7% reported eating supper in front of the television five or more times per week.

The prevalence of screen use during meals among older students was further explored in the School Health Action, Planning, and Evaluation Surveys study. This study surveyed 20,923 students across four Canadian regions (Hamilton, Thunder Bay, Prince Edward Island, and Quebec) (Lillico et al., 2014). Findings showed that 70% of students in grades 5-8 and 76% of students in grades 9-12 reported eating meals in front of the television at least once a week. These findings highlight the need for mindful eating practices and enjoying your food recommended by Canada's Food Guide 2019, which advises minimizing screen use during meals to promote healthier eating habits among youth.

Eating meals with family members

Although the Canada Food Guide 2019 places a strong emphasis on the importance of shared meals, a significant proportion of adolescents in Canada do not engage in regular family meals. A study of 3,223 students (grades 6, 7, and 8) from Ontario and Nova Scotia found that the majority of adolescents reported frequent family dinners, with 70% eating with their family 6-7 days per week, 19% doing so 3-5 days per week, and 11% on 0-2 days per week (Woodruff & Hanning, 2009). Similarly, Lillico et al (2014) reported that just over half of students from grades 5-12 had family meals five days a week or more. More specifically, two-thirds of students in grades 5-8 ate meals with at least one adult family member five or more times a week, while only about 5% reported never eating with an adult. In contrast, among students in grades 9-12, just over half had family meals five or more times weekly, whereas approximately 8% reported they were not eating any meals with an adult during the week. In the literature, family meals are commonly operationalized as the number of times per week an adolescent eats a meal, typically dinner, with at least one adult family member or guardian. However, this construct varies across studies; some focus exclusively on dinners over a "usual week," while others include any meal (breakfast, lunch, or dinner) in the past 7 days. These methodological differences in defining and measuring family meals may lead to variability in reported prevalence data.

2.3 Associations between eating behaviours and mental health indicators

Understanding the relationship between mental health and eating behaviours is essential for raising awareness among policymakers. This awareness can inform more effective strategies to address mental health challenges, particularly as they may relate to eating behaviours, which may, in turn, subsequently affect long-term risk for chronic diseases. While individual eating behaviours have been linked to mental health outcomes among youth, as detailed in the section below, few studies have examined how combinations of eating behaviours together are

associated with mental health outcomes. Examining these associations can provide a more comprehensive picture of how daily routines and habits relate to youth mental health.

Breakfast consumption and mental health indicators

A large number of cross-sectional studies support a link between regular breakfast consumption and positive mental health outcomes among young people. In Korea, a study examined the relationship between dietary behaviours and self-rated health among 285 Korean college-age students. Participants were categorized into three groups - healthy (41.7%), normal (45.3%), or unhealthy (13.0%) - based on the answer to the self-rated health question (Kim et al., 2008). The study found that individuals who perceived themselves to be “healthy” had more regular mealtimes, reported eating in moderation, and consumed breakfast more frequently. This association has also been observed in other East Asian contexts. For instance, a more recent study conducted in Japan examined links between various lifestyle and eating behaviours with self-rated health among high school students (n=1296) (Osera et al., 2017). Students who reported consuming breakfast more often reported higher scores for self-rated health than those who didn’t. Consistent with these findings, a cross-sectional study involving 10,174 Chinese university students found that a higher frequency of breakfast consumption is associated with lower depressive symptoms, as measured by the Zung Self-Rating Depression Scale (Zhu et al., 2019). Logistic regression analysis showed significant associations ($p < 0.001$) across all Self-Rating Depression Scale groups.

Similarly, a cross-sectional study using data from the 2017 Spanish National Health Survey examined the associations between breakfast status, place, and habits with psychosocial behavioural problems in a nationally representative sample of 3,772 Spanish children and adolescents (ages 4-14) (López-Gil et al., 2022). Skipping breakfast was significantly associated

with greater odds of psychosocial behavioural problems (OR: 3.29, 95% CI: 1.47-7.35). These findings suggest that eating breakfast was associated with psychosocial well-being in children and adolescents. Another cross-sectional study involving 449 Turkish high school students examined the frequency of breakfast consumption and its associations with mental health and health-related quality of life. Breakfast consumption ≤1 time/week or 2-5 times/week correlated with higher rates of depression (25.2%), anxiety (26.9%), and stress (6.0%). Notably, breakfast skippers had lower health-related quality of life scores compared to regular consumers (Gürbüz et al., 2024).

More recently, a multi-country study examined the associations between eating habits and self-rated health and life satisfaction among adolescents across 42 countries, using data from the Health Behavior in School-Aged Children 2013-2014 survey (Chen et al., 2024). Adolescents who consumed breakfast more frequently on both weekdays and weekends reported higher levels of self-rated health and life satisfaction. For instance, those who ate breakfast on all five weekdays were 1.22 times more likely to report improved self-rated health compared to those who did not eat breakfast. Similarly, consuming breakfast on both weekend days was positively associated with greater life satisfaction.

In Canada, very limited research has been conducted on breakfast consumption and mental health among adolescents. Nevertheless, a cross-sectional study examined the relationship between breakfast skipping and psychosomatic symptoms, including feelings of low mood, irritability, sleep difficulties, nervousness, and dizziness, among 2,855 Canadian adolescents using data from the 2018 Health Behavior in School-aged Children survey. Logistic regression analyses indicated that adolescents who skipped breakfast were significantly more likely to report higher psychosomatic symptoms (including feelings of low mood and nervousness)

compared to those who ate breakfast (AOR: 2.55, 95% CI: 1.75-3.82) (Peprah et al., 2024). These findings align with international evidence and suggest that breakfast consumption is associated with positive mental health outcomes among adolescents.

Family meals and mental health indicators

A significant amount of research has examined the relationship between the frequency of family meals and the mental health of adolescents. The EHDLA study examined the relationship between family meals with depression, anxiety, and stress symptoms in a sample of 649 Spanish adolescents (ages 12-17) using the DASS-21 scale (Victoria-Montesinos et al., 2023). The frequency of family meals was assessed with the question: "During the past 7 days, how many times did all, or most, of your family living in your house eat a meal together?" This question was asked separately for breakfast, lunch, and dinner, with response options ranging from 0 to 7 days. Responses across all meals were summed to calculate the total number of weekly family meals. Unadjusted analyses suggested that more frequent family meals were correlated with fewer mental health symptoms. However, after adjusting for relevant covariates (age, sex, socioeconomic status, body mass index, physical activity, sedentary behaviour, sleep duration and energy intake), the associations with depression and stress symptoms were no longer statistically significant.

In New Zealand, a cross-sectional nationally representative survey among 8,500 students examined the link between family meal frequency and adolescent mental health. The study used standardized tools including the Reynolds Adolescent Depression Scale, the Strengths and Difficulties Questionnaire, and the WHO Well-being Index, to assess key mental health outcomes. Family meal frequency was measured by asking participants how many times in the past week all or most of their household family members ate a meal together. Response options

ranged from "never" to "7 times per week." For analysis purposes, the "never" and "1-2 times per week" responses were combined, resulting in four approximately equal-sized categories. Adolescents who reported eating family meals seven or more times per week experienced significantly better outcomes across multiple mental health indicators. Specifically, they had higher emotional well-being scores (mean = 16.8, 95% CI: 16.5-17.2) and lower levels of depressive symptoms (mean = 19.5, 95% CI: 19.3-19.8) and total emotional difficulties (mean = 11.4, 95% CI: 11.1-11.6) compared to those who had family meals two times per week or less. Notably, the association between family meals and depression was more pronounced in girls than in boys, suggesting potential gendered differences in how family mealtimes influence mental health (Utter et al., 2017).

Similarly, a cross-sectional observational study by Eisenberg et al. (2004) analyzed data from a school-based survey of 4,746 U.S. adolescents and examined links between family meal frequency and a broad range of well-being indicators. Family meal frequency was measured by asking participants: "During the past 7 days, how many times did all or most of your family living in your house eat a meal together?" Response options included: never, 1-2 times, 3-4 times, 5-6 times, 7 times, and more than 7 times. More frequent family meals was associated with a lower likelihood of reporting depressive symptoms among boys and girls (OR: 0.93, 95% CI: 0.86-1.00; OR: 0.92, 95% CI: 0.86-0.98) (Eisenberg et al., 2004).

In Canada, Elgar et al. examined the relationship between family dinner frequency and adolescent mental health in a large Canadian sample of youth aged 11-15 years (n=26,069) (Elgar et al., 2013). Family meal frequency was operationalised using the question: “On average, how many times per week does your family sit down at the table together for dinner/supper?” Responses ranged from 0 to 7 dinners per week. More frequent family dinners were associated

with more positive mental health outcomes, including lower internalizing (b = -0.17) and externalizing symptoms (b = -0.10), as well as higher emotional well-being (b = 0.21), prosocial behaviour (b = 0.11), and life satisfaction (b = 0.19). These associations were consistent across gender, grade level, and family affluence. While the study's cross-sectional design limits causal inferences, it suggests a dose-response association between the frequency of family dinners and positive and negative dimensions of adolescent mental health, highlighting the role of family mealtimes in promoting adolescent mental health.

Together, these studies highlight the potential importance of regular family mealtimes in supporting adolescent mental health, particularly with depressive symptoms.

Screen usage during meals and mental health indicators

While many studies have examined overall screen time with adolescent mental health, linking higher daily usage to increased symptoms of anxiety, depression, and low perceived mental health (Atifa Nazih Kamaleddine et al., 2022; Francisquini et al., 2025; Li et al., 2021; Mohd Saat et al., 2024; Mougharbel et al., 2023), very few have focused specifically on screen use during meals. The only identified study exploring this issue was conducted in a much younger population. A cross-sectional study in Lithuania examined preschool children (n=847) to see the relationship between screen use during mealtime and behavioural problems (Jusienė et al., 2019). The study found a significant association between children's emotional and behavioural issues and their exposure to screens during meals. Children with higher scores of emotional and behavioural problems were reported to have higher exposure to background TV, longer daily screen time, and were more likely to be fed in front of screens. The study used the Child Behaviour Checklist to measure emotional and behavioural problems in children, where parents reported how well each item described their child's behaviour over the previous two

months using a 3-point scale. The sum score of total problems (e.g., anxious/depressed, emotionally reactive, withdrawn, somatic complaints, attention problems, aggressive behaviour, sleep problems) was used in the analysis. These associations suggest that children with behavioural issues may be more likely to be exposed to screens during mealtimes.

Importantly, this study focused on screen use as a response to existing behavioural problems, suggesting that children with behavioural difficulties may be more frequently exposed to screens during meals, rather than screen use being the cause of these issues.

2.4 Combinations of lifestyle behaviours and mental health indicators

Although several studies have examined the associations between individual eating behaviours and mental health outcomes, fewer studies have focused on combinations or patterns of behaviours and their relationship with mental health indicators. It is important to examine not just individual eating behaviours, but also the broader patterns or clusters of these behaviours, as health behaviours may be interconnected and together influence mental health outcomes.

A cross-sectional study among Australian adolescents (aged 14-15 years) explored clusters of lifestyle behaviours related to 24-hour movement behaviours, drug use, diet and disordered eating with obesity, general health status, and health-related quality of life (Ahmad et al., 2023). Adolescents in clusters characterized by healthy lifestyles, including regular physical activity, never smoking, and a balanced diet rich in fruits, vegetables, whole grains, and minimal processed food, reported the highest percentage of “excellent” or “very good” self-rated health (60%). Conversely, female participants in clusters marked by multiple risk factors such as high sedentary behaviour, poor sleep quality, restrained diet, lower dietary awareness and more symptoms of eating disorders, had lower pediatric quality of life outcome scores compared to female participants in the healthy lifestyle cluster.

Another study with a similar approach in China investigated the association between eating habits and mental health problems in Chinese adolescents using latent class analysis. It involved 1,348 adolescents with an average age of 14.49 years (Li et al., 2022). Latent class analysis identified three distinct eating habit patterns: “Healthy Eating Behaviour/Eating at Home” (48.1%), “Healthy Eating Behaviour/Eating at School” (33.5%), and “Unhealthy Eating Behaviour/Random Place” (18.4%). Adolescents in the “Eating at Home” group were characterized by regular breakfast consumption, having most meals at home, and infrequent consumption of roadside stalls or late-night snacks. Similarly, those in the “Eating at School” group also maintained regular breakfast habits and primarily ate lunch and dinner at the school canteen; they rarely consumed night snacks, and nearly half expressed a dislike for food from roadside vendors. In contrast, adolescents in the “Unhealthy Eating Behaviour/Random Place” group exhibited irregular eating patterns, frequently skipped breakfast and school meals, preferred eating at roadside stalls, and had the highest rate of late-night snack consumption (34.1%) among the three groups. Binary logistic regression analysis, using the "Healthy Eating Behaviour/Eating at Home" group as a reference, showed that both "Healthy Eating Behavior/Eating at School" and "Unhealthy Eating Behavior/Random Place" classes were associated with increased mental health risks. After adjusting for covariates including age, gender, sleep duration, physical activity, sleep duration and passive smoking, the odds of mental health problems were higher in the “Healthy Eating Behaviour/Eating at School” group (OR = 1.73, 95% CI = 1.27-2.38) and even more so in the “Unhealthy Eating Behaviour/Random Place” group (OR = 2.23, 95% CI = 1.62-3.08). In conclusion, unhealthy eating habits were positively associated with mental health problems among adolescents, highlighting the potential protective effect of the “Healthy Eating Behaviors/Eating at Home” cluster.

In Luxembourg, a study explored the association between dietary habits and adolescent health, well-being, and behaviour outcomes among adolescents (n=7,529) (Geraets & Heinz, 2023). Cluster analysis was used to define dietary habits based on the consumption of fruits, vegetables, sweets, soft drinks, breakfast, and family meals. Logistic regression analyses assessed the associations of these clusters with self-reported health and well-being. Five distinct clusters of health behaviours were identified: healthy, less often family meal and breakfast skippers, sugar consumption, unbalanced diet, and unhealthy. The "healthy" cluster was linked to better health, positive mental health, and positive behaviour. Conversely, the less healthy clusters were associated with poorer health, mental health issues, and risk-taking behaviours. Compared to the healthy cluster, adolescents in other dietary clusters were less likely to report excellent health status, with family meal and breakfast skippers (OR = 0.61, CI: 0.53-0.70), sugar consumption cluster (OR = 0.79, CI: 0.68-0.92), unbalanced diet cluster (OR = 0.58, CI: 0.50-0.67), and unhealthy cluster (OR = 0.49, CI: 0.42-0.57). Adolescents in the family meal and breakfast skipping (OR = 1.43, CI: 1.24-1.65), sugar consumption (OR = 1.34, CI: 1.14-1.56), and unhealthy (OR = 1.90, CI: 1.63-2.22) clusters were more likely to report multiple health complaints. Furthermore, all non-healthy clusters reported lower odds of moderate to high life satisfaction: family meal and breakfast skippers (OR = 0.57, CI: 0.46-0.71), sugar consumption (OR = 0.74, CI: 0.58-0.95), unbalanced diet (OR = 0.71, CI: 0.56-0.89), and unhealthy cluster (OR = 0.44, CI: 0.35-0.55).

A recent Canadian study has examined links between combinations of 24-hour movement behaviours (physical activity, screen time and sleep) and diet (fruit and vegetable intake, grain products, milk and alternatives, meat and alternatives) with health-related quality of life among pre-adolescent children (10-11 years) in Alberta (n=2866) (Wu et al., 2024). Three

groups with distinct health behaviour patterns were derived using latent class analysis. Regression was used to test associations between each health behaviour class and health-related quality of life scores. The first grouping (55%) was characterised by healthy levels of sedentary behaviour, physical activity, and sleep, but a less healthy diet ("activity-focused" group). The second grouping (24%) was characterised by a relatively healthy diet but moderately healthy levels of sedentary behaviour, physical activity, and sleep ("diet-focused" group). The third group (21%) was characterised by mostly unhealthy behaviours ("not health-focused" group). A dose-response relationship was observed between health behaviour patterns and the likelihood of lower health-related quality of life, where children with unhealthy lifestyle behaviours ("not health-focused") were the most likely to report poor health-related quality of life, followed by those with moderately healthy habits ("diet-focused"). The highest health-related quality of life was found among children with the healthiest routines ("activity-focused").

2.5 Summary of research gaps and rationale

Studies from diverse contexts consistently show that regular breakfast consumption and family meals are linked to improved well-being, while excessive screen time is associated with poorer mental health. However, most research has examined these behaviours in isolation, overlooking how patterns or clusters of behaviours may interact to influence mental health and well-being.

Recent studies employing cluster or latent class analysis discussed above suggest that clusters of health behaviours (particularly those related to 24-hour movement behaviours) have a cumulative, health-promoting effect for youth's mental health and well-being, with fewer studies considering eating and dietary behaviours, especially in everyday contexts like mealtime screen

use. Notably, no Canadian study has examined how various eating behaviour indicators link with mental health outcomes among children and youth.

Several other gaps are also revealed in this literature. A complication in synthesizing findings across the literature is the inconsistent naming and operationalization of behavioural clusters. Studies that employ latent class or cluster analysis often use different terminology to describe similar patterns of eating behaviour (e.g., "healthy," "balanced," "family meal-focused"). This inconsistency makes it difficult to compare results or draw generalized conclusions across studies. Without a standardized classification, interpretation becomes more subjective, and findings are harder to translate into policy or practice. Similarly, another issue is the lack of consistency in how family meals are operationalized across studies. While some define family meals strictly as dinners with all household members, others include any shared meal, and the reference period often varies from “usual week” to “past 7 days.” This lack of standardization complicates cross-study comparisons and weakens the generalizability of findings.

Additionally, while numerous international studies link breakfast consumption with various mental health outcomes, there remains a surprising lack of Canadian research on this topic. No Canadian study has comprehensively examined how breakfast habits relate to validated indicators of adolescent mental health, such as anxiety or depressive symptoms. The reliance on international evidence limits our understanding of how cultural, dietary, and policy contexts specific to Canada may mediate these associations.

One last key limitation in this literature is the near absence of research exploring screen use during meals in relation to adolescent mental health, leaving a substantial gap in

understanding how this modern eating context may influence adolescent psychological outcomes.

Thus, the present study aims to address current knowledge gaps in the existing literature to help inform the development of intervention strategies improving overall dietary behaviours for better public health outcomes, with a specific focus on enhancing mental health among adolescents.

3. OBJECTIVES AND HYPOTHESIS

3.1 Objectives

The objectives of my MSc project are:

- To explore associations between eating behaviours and mental health indicators in a large sample of Canadian youth.
- To examine whether meeting more of the recommended eating behaviours would be associated with a higher likelihood of reporting better mental health outcomes (high self-rated mental health, low anxiety and low depressive symptoms).

3.2 Hypothesis

I hypothesized that there would be significant associations between individual eating behaviours and mental health indicators. Furthermore, based on research suggesting that positive lifestyle and 24-hour movement behaviours are linked to improved quality of life (Ahmad et al., 2023; Sampasa-Kanyinga et al., 2022), I hypothesized that youth who engaged in a greater number of recommended eating behaviours (i.e. eating breakfast regularly on school days, more frequent family meals, and eating meals not in front of screens) would report better mental health compared to those who did not engage in these recommended eating behaviours or engaged in few recommended eating behaviours.

4. METHODS

4.1 Study design and data source

This cross-sectional observational study used data from the 2019 Canadian Health Survey on Children and Youth (CHSCY), a nationally representative survey conducted by Statistics Canada (Statistics Canada, 2020). The CHSCY aimed to provide current and detailed health information on children and youth across Canada. Its main objective is to facilitate evidence-based policy and program development, assist in the evaluation of these initiatives, and contribute to research focused on children's health and overall well-being. Additionally, the survey plays a key role in supporting health surveillance efforts by consistently delivering timely and relevant data.

The content for the survey was developed through consultations with experts and federal and provincial stakeholders across Canada. Statistics Canada, in partnership with the Public Health Agency of Canada and Health Canada, created the survey questionnaire. Between 2014 and 2018, the Questionnaire Design Resource Centre refined the questionnaire through multiple stages of cognitive testing, including qualitative interviews and focus groups.

The sampling frame for CHSCY was based on the Canada Child Benefit files, which cover 98% of Canadian children and youth aged 1 to 17 as of January 31, 2019, in all 10 provinces and 96% in all territories. Children and youth living on First Nation reserves and other Aboriginal settlements in the provinces, those in foster homes and the institutionalized population were excluded from the survey. The sample was stratified by province, except the northern territories, which are grouped into a single stratum, and Ontario, where sub-regions of Local Health Integration Networks define the strata. Participants are further stratified into three

age groups: 1-4, 5-11, and 12-17 years old. The total sample size includes 92,170 raw units, and the survey response rate was 52%, which resulted in 47,871 complete cases.

The data collection process took place between February 11 and August 2, 2019, with electronic questionnaires and phone interviews for follow-up. Survey respondents were the "person most knowledgeable" about the child, typically a parent or guardian. Youth aged 12 to 17 years were also asked to self-report on select components.

4.2 Ethics and data access

The data were collected under the authority of the Statistics Act, Revised Statutes of Canada, 1985, Chapter S-19. All the information is kept strictly confidential. Informed consent was obtained from all participating youth and their parents or guardians (Statistics Canada, 2020).

Access to data for this analysis was granted through Statistics Canada's Research Data Centre. Because of the confidential nature of these microdata, they cannot be shared. All analyses were conducted in the Outaouais Research Data Centre (ORDC), located in the Morisset Library at the University of Ottawa.

4.3 Participants and sampling

For this study, we analyzed data from youth aged 12 to 17 years in 2019. The analytical sample included approximately 13,600 adolescents who provided complete information on their perceived mental health, as well as parental assessments of their adolescents' anxiety and depressive symptoms.

4.4 Measures

Dependent variables: Mental Health Indicators

Based on the available data from the CHSCY 2019, three indicators of youth mental health were used in this study: self-rated mental health, symptoms of anxiety, and depressive symptoms. Self-rated mental health was directly reported by the youth themselves, while the person most knowledgeable (e.g., parents, caregivers) reported on the frequency of their child's anxiety and depressive symptoms.

Self-rated mental health is a subjective indicator of an individual's overall mental well-being, encompassing emotional, psychological, and social aspects of health (Stanojevic Jerkovic et al., 2017). Among children and adolescents, self-rated mental health is believed to be influenced by health behaviours and environmental factors, potentially serving as a stable reflection of their perceived mental well-being (Boardman, 2006). The WHO recommends self-rated health, including mental health assessments, as a valuable tool for evaluating adolescent health, as it may offer insights that traditional morbidity and mortality measures do not capture (Currie et al., 2009). In the CHSCY, self-rated mental health was assessed by asking youth: "In general, how would you rate your mental health?" with a Likert scale response options ranging from 1 (excellent) to 5 (poor). To facilitate comparison with previous research (Jang et al., 2015; McAlpine et al., 2018) and because assumptions for ordinal regression were not met (see statistical analyses below), the self-rated mental health variable was dichotomized into either "high self-rated mental health" (combining those who reported their health as excellent, very good and good) vs. "low self-rated mental health" (combining those as reporting their health as fair and poor).

Anxiety and depressive symptoms were assessed using items from the Washington Group/UNICEF Child Functioning Module (Loeb et al., 2017). The Washington Group/UNICEF Child Functioning Module, a widely recognized tool for evaluating child well-being, has

demonstrated strong psychometric properties, including reliability and validity when used to assess these symptoms in this population (Cappa et al., 2018; Loeb et al., 2018). Anxiety was assessed by the question, "How often does [child's name] seem very anxious, nervous, or worried?" For depressive symptoms, the question was, "How often does [child's name] seem very sad or depressed?" The response options for both questions were "daily," "weekly," "monthly," "a few times a year," and "never." The responses were dichotomized into low (a few times a year/never) vs. high (daily/weekly/monthly) anxiety or depressive symptoms. (Loeb et al., 2017).

It is important to note that these items reflect parent-reported observations of external behaviours or emotional expressions, rather than self-reported internal experiences. As such, they capture how symptoms of anxiety and depression *appear* to parents, which may not fully reflect the child's subjective emotional state.

Independent variables: Eating behaviours

The following three eating behaviours were used in our analysis: frequency of breakfast consumption, frequency of family meals, and screen use during meals. These behaviours were selected based on their theoretical relevance to adolescent mental health and their availability within the 2019 CHSCY dataset. Collectively, these behaviours capture distinct dimensions of dietary practices, including the regularity of meals, the social context of eating, and environmental influences (e.g. screens) that may affect youth's mealtime experiences.

Breakfast consumption was assessed by asking respondents to report how many days they ate breakfast in the previous week. A second question asked them how many of these days were on school days, with response options ranging from 0 to 5. Respondents were categorized as either "regular breakfast eaters" (if they reported 0 breakfast missed on school days) or

"breakfast skippers" (if they missed breakfast on one day or more during the school days) (Pengpid & Peltzer, 2020; Sincovich et al., 2022).

The frequency of family meals was measured by asking respondents how many days during the previous week they ate the evening meal with their family at the dinner table (0-7 days). Consistent with previous literature (Lillico et al., 2014; Martins et al., 2019), responses were dichotomized into either having a family meal on or at least 5 days/week vs. fewer than 5 days/week.

Screen use during meals was assessed with the question, "Are you or other family members allowed to use electronic devices while eating the evening meal together?" Responses were dichotomized as yes (screen use permitted) or no (screen use not permitted). Although phrased in terms of permission, this item reflects parental rules or restrictions regarding screen use during meals and thus serves as a proxy for structured food parenting practices related to screen exposure.

Covariates

Covariates included in the analysis were selected based on their known associations with the outcome measures in the literature (Atifa Nazih Kamaleddine et al., 2022; Eisenberg et al., 2004; Moitra & Madan, 2022; Wang et al., 2025). These covariates included age (in years), racial background, weight status, and the highest level of parental education, which serves as a proxy for household socioeconomic status.

Age was included to account for developmental differences in eating behaviours and psychological well-being across adolescence (Neumark-Sztainer et al., 2011; Steinberg, 2005). Racial background was considered due to evidence of disparities in both mental health outcomes and eating behaviours across racial and ethnic groups (Assari et al., 2019). Weight status was

included given its strong associations with both eating behaviours and mental health indicators such as body dissatisfaction, self-esteem, and depressive symptoms (Choi & Hong, 2023; Goldfield et al., 2010). Lastly, the highest level of parental education was used as a proxy for socioeconomic status, which is a known determinant of both mental health and dietary behaviours through its influence on factors such as access to food and exposure to stress (Assari et al., 2019; Yang et al., 2025).

4.5 Statistical analyses

All analyses were conducted using STATA version 16.0, with a significance level set at $p<0.05$. Survey weights and 1000 sets of bootstrap weights were applied to compute nationally representative estimates and account for the complex sampling design of the CHSCY.

The sample's demographic, behavioural, and mental health characteristics were described in 2019 using univariate statistics, including proportions and frequencies. Chi-square tests were conducted for each independent and dependent variable with boys and girls to examine gender-based differences.

We further assessed interaction effects between both independent variables and gender with each dependent variable. These interactions were statistically significant (Wald test: $p < 0.001$), indicating that the associations differed by gender. Therefore, all subsequent analyses were stratified by gender. Gender-diverse individuals were included in the overall sample and main analyses. However, they were not shown in the gender-stratified analyses due to statistical and methodological limitations. Specifically, the small sample size (n=48) presented significant limitations when further divided across different groupings, reducing statistical power and the reliability of any conclusions drawn.

We initially considered ordinal logistic regression; however, the Brant test revealed that the proportional odds assumption was violated (Long & Freese, 2006). As a result, we used binary logistic regression, a more reliable and interpretable method when the ordinal model assumptions are not met.

Each eating behaviour (independent variables) was examined in a separate logistic regression model for its association with three dichotomized mental health outcomes (dependent variables): Self-rated mental health (excellent/very good/good vs. fair/poor), and anxiety and depressive symptoms (low vs. high). The models were adjusted for relevant covariates, including age, racial background, weight status, and parental education, based on theoretical relevance and prior evidence.

To assess whether the number of positive eating behaviours was cumulatively associated with mental health outcomes, a variable was created representing the number of behavioural recommendations that were met. Participants were categorized as follows: those who met none of the recommendations (reference group), those who met one, those who met two, and those who met all three eating recommendations (i.e. eating breakfast 5 days per week, having family meals at least 5 days per week and responded “no” when asked about screen use during meals). Logistic regression models were then used to estimate associations between the number of behaviours met and the three mental health outcomes. Due to significant gender interaction effects identified in earlier models (see Table A), analyses were stratified by gender. All results were reported as adjusted odds ratios with 95% confidence intervals.

5. RESULTS

5.1 Sociodemographic characteristics of the sample

The sample's descriptive characteristics are shown in Table 1. Close to a quarter of youth identified as non-white, with the largest racial/cultural group being Asian (which included South and East Asian youth) (18%), followed by Black (4%), Arab (2%) and Latin American & mixed racial groups (3%). Close to 30% of youth were overweight or were living with obesity. Seventy-nine percent of participants had parents with a college degree or higher.

5.2 Mental health and eating behaviours of the sample

Mental health indicators and eating behaviours are shown in Table 2. Across all indicators, girls reported significantly poorer mental health compared to boys. Poor or fair self-rated mental health was reported by 18% of girls, compared to 8% of boys. Anxiety and depressive symptoms followed a similar pattern, with a larger proportion of girls compared to boys reporting symptoms of anxiety and depression. Eating behaviours also varied by gender, with boys reporting more frequent breakfast consumption and more regular family meals compared to girls. A little over one out of five youth reported using screens during meals, and no difference was observed between boys and girls.

5.3 Associations between eating behaviours and mental health indicators

Associations between eating behaviours and mental health indicators for all youth, as well as among boys and girls, are shown in Table 3. In covariate-adjusted models, youth who reported regular breakfast consumption on school days were more likely to report high self-rated mental health (AOR: 2.06, 95% CI: 1.77 - 2.39) and less likely to report anxiety (AOR: 0.81, 95% CI: 0.73 - 0.89) and depressive symptoms (AOR: 0.71, 95% CI: 0.62 - 0.81) compared to youth who did not report regular breakfast consumption on school days. Frequent family meals

(≥5 times per week) were associated with better mental health outcomes, including higher odds of reporting high self-rated mental health (AOR: 2.10, 95% CI: 1.83 - 2.45) and lower odds of anxiety (AOR: 0.73, 95% CI: 0.65 - 0.81) and depressive symptoms (AOR: 0.58, 95% CI: 0.51 - 0.66). These associations were consistent across gender for both regular breakfast consumption and frequent family meals, with similar trends observed in boys and girls alike. Fewer associations were observed between screens being allowed to be used during meals and mental health indicators. However, youth reporting not using screens during meals had significantly lower odds of depressive symptoms (AOR: 0.80, 95% CI: 0.69 - 0.93). While this association was significant for boys (AOR: 0.71, 95% CI: 0.55 - 0.91), it was not significant for girls.

5.4 Associations between level of adherence to recommended eating behaviours and mental health indicators

Table 4 shows the association between meeting the number of recommended eating behaviours and the mental health indicators among boys and girls. A dose-response relationship was observed for self-rated mental health and depressive symptoms, but not for anxiety symptoms. Boys who met two (AOR: 1.67; 95% CI: 1.05-2.63) and three (AOR: 2.33; 95% CI: 1.44-3.76) of the recommended eating behaviours were more likely to report high self-rated mental health compared to boys who met none of the eating recommendations. There was no difference between boys who met none or only one of the recommended eating behaviours. Girls who met two (AOR: 1.90; 95% CI: 1.32-2.73) and three (AOR: 3.58; 95% CI: 2.39-5.37) of the recommended eating behaviours were more likely to report higher self-rated mental health compared to girls who met none of the eating recommendations. No significant associations were observed between meeting the recommended eating behaviours and symptoms of anxiety among boys. Girls who met all three recommended eating behaviours were more likely to report low

symptoms of anxiety (AOR = 0.68; 95% CI: 0.49-0.94) compared to meeting none of the eating recommendations. Among boys, meeting two (AOR: 0.57; 95% CI: 0.36-0.89) and three (AOR: 0.46; 95% CI: 0.29-0.73) of the recommended eating behaviours was associated with lower odds of having depressive symptoms compared to meeting none of the eating recommendations. Among girls, meeting two (AOR: 0.62; 95% CI: 0.43-0.89) and three (AOR: 0.47; 95% CI: 0.32-0.69) of the recommended eating behaviours was significantly associated with lower odds of depressive symptoms.

6. DISCUSSION

6.1 Summary of key findings

The objective of this study was to examine whether three eating behaviours (breakfast consumption, family meals, and screen use during meals) were associated with mental health indicators (self-rated mental health, anxiety, and depressive symptoms) in a nationally representative sample of Canadian adolescents. We also explored whether a dose-response gradient could be observed between level of adherence to recommended eating behaviours and youth's mental health. Our findings indicate that regular breakfast consumption and family meals are associated with all three mental health indicators (self-rated mental health, anxiety and depressive symptoms) while fewer associations were found between screen use during meals and mental health. A dose-response gradient was observed for self-rated mental health and depressive symptoms, with meeting two or three recommendations being associated with high self-rated mental health and lower odds of depressive symptoms compared to meeting none of the eating behaviour recommendations. These findings suggest that in both boys and girls, meeting a greater number of recommended eating behaviours is protective for youth's mental health.

6.2 Interpretation of associations between eating behaviours and mental health

Youth who regularly consumed breakfast and those who frequently ate meals with their families had notably better mental health indicators, including better self-rated mental health and lower levels of anxiety and depressive symptoms compared to youth who did not engage in these eating behaviours. Regular breakfast consumption has been consistently linked to better mental health outcomes and reduced symptoms of depression and anxiety in youth. These findings align with previous studies showing that adolescents who eat breakfast more frequently report better

psychological outcomes (e.g., lower levels of depression and less psychosocial behavioural problems) compared to those who skip breakfast (López-Gil et al., 2022; Zhu et al., 2019).

There are several ways in which regular breakfast consumption and family meals could be associated with better mental health and well-being among youth. The importance of both eating breakfast and family meals may lie in their ability to create daily routines and offer consistent social support, both of which have been shown to contribute to better mental health outcomes (Acoba, 2024; Arlinghaus & Johnston, 2019). Beyond these routines, a recent analysis from the HABITS youth cohort in British Columbia suggests that food parenting practices are associated with adolescent's mental health (De-Jongh González et al., 2025). High adolescent self-esteem was associated with parenting approaches such as providing healthy eating opportunities, maintaining structured meal routines, and minimizing the use of coercive control. Conversely, anxiety among youth was negatively associated with the use of rules and limits. These findings suggest that the benefits of structured mealtimes extend beyond nutritional intake, highlighting the importance of nurturing, autonomy-supportive food parenting practices as integral components of adolescent mental health promotion.

Regular breakfast consumption among children and youth has also been linked with higher dietary quality, which could in turn play a role in supporting mental health through the gut-brain connections. A Canadian cross-sectional study showed that the prevalence of nutrient inadequacy was highest among breakfast non-consumers, intermediate in those who ate non-cereal breakfasts, and lowest among those who consumed ready-to-eat cereal breakfasts (Barr et al., 2014). Specifically, non-consumers had higher inadequacy rates for vitamin D, calcium, iron, magnesium, vitamin A, phosphorus, and zinc. A nutrient-rich breakfast that includes cereals, dairy, and fruits provides essential nutrients such as complex carbohydrates, B-complex

vitamins, and minerals like magnesium and zinc, which is important for brain function and the synthesis of neurotransmitters involved in mood regulation (Huang et al., 2019; O'Sullivan et al., 2009). Given this established link between nutritional sufficiency and dietary quality with mental health, these findings suggest that breakfast consumption could serve as a protective factor against psychological distress in youth by supporting optimal nutrient intake. Mechanistically, breakfast consumption helps stabilize blood sugar and lowers cortisol levels after overnight fasting, both of which contribute to improved mood and reduced stress (Maki et al., 2016).

Studies have shown that shared mealtimes are associated with more positive mental health outcomes, as well as higher emotional well-being and life satisfaction (Eisenberg et al., 2004; Elgar et al., 2013). The association between family meals and mental health could be attributed to the supportive dynamics gained during family meals: regular gatherings around the table strengthen emotional bonds and family cohesion, provide routine and stability, and create a forum for open communication and parental monitoring (Chen et al., 2025; Harrison et al., 2012). Furthermore, shared mealtimes allow parents to model healthy behaviours such as maintaining a nutritious diet and practicing positive communication, which adolescents can adopt (Eisenberg et al., 2004). Consequently, adolescents who regularly dine with their families are less likely to engage in risky behaviours (such as substance use) and often report higher overall psychological well-being (Eisenberg et al., 2004; Harrison et al., 2012).

Screen use during meals showed less consistent associations. Although the absence of screen use during meals was associated with lower depressive symptoms in boys, it was not associated with these outcomes in girls, nor with self-rated mental health or anxiety symptoms. This may suggest that the context and impact of screen use during meals may be influenced by other moderating factors. This variable may not fully capture the complexity of screen-related

behaviours. For example, it does not distinguish between passive (e.g., watching TV) and interactive (e.g., texting, gaming) use, nor does it address the amount of screen time. Moreover, the finding that roughly one in five youth reported screen use during meals is both interesting and troubling. It reflects the increasing prevalence of digital devices in daily life is a shift that may have broader implications for public health. Unlike traditional mealtimes, which often facilitate face-to-face social interaction and family cohesion (Harrison et al., 2012; Lawrence & Plisco, 2017), meals involving screens may disrupt communication and emotional connection. As smartphones and tablets have only become widespread since the early 2010s (Pew Research Center, 2024), there is limited historical data to compare these trends over time, making it difficult to fully assess long-term consequences. Additionally, responses to this item may be influenced by social desirability, especially in youth who are aware that screen-free meals are often framed as healthier or more desirable in public discourse (Van de Mortel, 2008). As such, some participants may have underreported screen use, potentially weakening observed associations. This could explain why the expected relationship between screen use and mental health, often observed in studies on total screen time (Li et al., 2021; Mougharbel & Goldfield, 2020), was not strongly evident here. Lastly, the finding that screen use during meals was associated with higher odds of depressive symptoms among boys, but not among girls, may reflect gender-specific behavioural or emotional patterns that require further investigation.

Overall, these findings emphasize the importance of considering not only what adolescents eat but also how and in what context they eat, as suggested by the 2019 CFG (Health Canada, 2019). These findings suggest current health promotion efforts to address not only what youth eat but also the social context of meals as a path towards better social and mental well-being.

6.3 Associations between adherence to recommended eating behaviours and mental health

For our secondary objective, we explored whether adherence to a greater number of positive eating behaviours was associated with better mental health outcomes among Canadian adolescents. Specifically, we examined whether meeting none, one, two, or all three behaviour recommendations, regular breakfast consumption, frequent family meals, and avoiding screen use during meals, was associated with differences in self-rated mental health, anxiety symptoms, and depressive symptoms. Based on prior research suggesting that clustering multiple healthy behaviours can have additive benefits for mental health (Ahmad et al., 2023; Geraets & Heinz, 2023; Li et al., 2022; Wu et al., 2024), we hypothesized that adolescents meeting more eating behaviour recommendations would have better mental health profiles. Our findings confirmed a dose-response relationship: adolescents who met a greater number of positive eating behaviours reported progressively better mental health indicators across all outcomes measured.

Previous literature has suggested that adherence to multiple health-promoting behaviours related to physical activity are associated with improved mental health outcomes (Sampasa-Kanyinga et al., 2022). Previous research exploring how combinations of physical activity, sleep, and screen time behaviours are associated with mental health suggests that meeting a greater number of recommendations is associated with lower odds of depression and anxiety among youth (Ahmad et al., 2023; Wu et al., 2024). Similarly, other studies demonstrated that children who follow a comprehensive set of healthy lifestyle behaviours exhibit better mental health (Geraets & Heinz, 2023; Li et al., 2022). However, most existing studies have focused on lifestyle clusters primarily involving movement and sleep, while relatively few have addressed clusters of eating behaviours specifically. Our study adds to the literature by showing that

cumulative adherence to healthy eating behaviours is meaningfully associated with mental health outcomes in adolescents.

One theory that may explain our findings is that the cumulative impact of multiple healthy eating behaviours reflects broader underlying structures that promote emotional stability. Rather than acting separately, behaviours such as regular meal timing, family engagement during meals, and screen-free eating environments may interact together to promote emotional support and mindfulness. Together, these habits could foster more consistent biological cycles, greater social interaction, and less exposure to environmental stressors, all of which are important for maintaining psychological resilience (Acoba, 2024; Arlinghaus & Johnston, 2019). When these behaviours are practiced together, their benefits may accumulate, creating a stronger, more stable foundation for mental health than any single behaviour could provide.

Adolescence is a developmental period characterized by increasing autonomy and vulnerability to external stressors (Ruiz & Yabut, 2024; Sisk & Gee, 2022). Consistently practicing multiple healthy behaviours may reflect higher self-regulation skills and a more structured home environment, both of which are strongly associated with better psychological outcomes (Sousa et al., 2021). Adolescents who engage in multiple healthy eating behaviours may be benefiting from not only the direct effects of nutrition and social support but also from an overall environment that fosters positive health habits and resilience to stress.

While the observed dose-response relationship suggests a positive association between multiple healthy eating behaviours and better mental health outcomes, several limitations should be noted. Adolescents who engage in more healthy eating behaviours may differ in unmeasured ways, such as family support or health literacy, which could influence outcomes (Yang et al., 2025). Adopting multiple behaviour changes can also be difficult (Prochaska & Velicer, 1997)

and broader factors like food insecurity may impact the ability to follow positive eating practices (Cisneros-Vásquez et al., 2025; Dush, 2020).

Given that eating behaviours occur daily, these findings present a valuable opportunity for public health interventions. School breakfast programs, screen-free lunch initiatives, and family-focused education campaigns could be practical strategies to improve youth mental health outcomes at a population level. Taken together, these results suggest that encouraging healthy eating habits through contextual factors may offer a feasible and good strategy for improving adolescent mental health at the population level.

6.4 Gender differences in eating behaviours and mental health

Our gender-stratified analysis revealed some differences but overall similar patterns in how eating behaviours relate to mental health for boys and girls. Girls consistently reported worse mental health outcomes across all indicators, which aligns with prior research showing higher rates of internalizing disorders among adolescent girls (Stephenson, 2023; Wiens et al., 2020). In terms of eating behaviours, boys were more likely than girls to report regular breakfast consumption and more frequent family meals, aligning with previous studies indicating that adolescent girls are more likely to skip meals and exhibit irregular eating patterns (Savige et al., 2007; Sincovich et al., 2022). Despite these behavioural differences, both boys and girls who engaged in regular breakfast consumption and frequent family meals had better mental health outcomes, reinforcing the overall value of these behaviours.

Some gender-specific nuances were observed. For instance, in the overall sample, screen use during meals was only associated with lower levels of depressive symptoms. When stratified by gender, this association was significant only among boys, suggesting that the absence of screen use during meals may offer unique protective effects for boys' mental health, particularly

in reducing depressive symptoms. Among girls, no significant associations were found between screen use during meals and mental health, which may reflect differences in the context or emotional impact of screen use during eating.

Moreover, despite boys engaging more consistently in certain healthy eating behaviours, meeting all three recommended eating behaviours was significantly associated with lower odds of anxiety among girls but not among boys. This suggests that girls may be more sensitive to the mental health benefits derived from these behaviours, possibly due to higher baseline levels of emotional distress or greater psychological responsiveness to structured health routines.

Psychosocial and emotional processing differs across genders in adolescence, with girls generally exhibiting greater internalizing symptoms such as anxiety and depression, while boys may display more externalizing behaviours (Kuehner, 2017). As such, eating behaviours that provide emotional support or structure, like family meals, may have a stronger effect for girls, particularly against depressive-related symptoms (Utter et al., 2017). Moreover, adolescent girls are often more socially attuned and emotionally expressive and may be more receptive to the interpersonal benefits of shared meals, such as perceived support and connectedness, which can mitigate feelings of anxiety. These relational dynamics may not have the same emotional importance for boys, potentially explaining the lack of significant association between meeting the healthy eating recommendations and anxiety symptoms in adolescent boys.

Gender norms and expectations surrounding eating and health behaviours may also shape these observed differences. Research suggests that adolescent girls are more likely to engage in or be influenced by health-promoting behaviours, especially those framed around social or emotional well-being, such as mindful eating or family routines (Loth et al., 2014). Additionally, boys may display fewer observable signs of anxiety or parents may be less likely to recognize or

report these symptoms in boys due to stigma around emotional vulnerability, potentially attenuating associations in parent-reported data (Clark et al., 2018; Nabors et al., 2024).

This gender disparity also raises questions about how public health interventions should be tailored. While both boys and girls benefit from healthy eating behaviours, interventions may need to be gender-sensitive to address the specific challenges and drivers influencing behaviour and mental health in each group. For example, body image pressures and emotional eating patterns may affect girls differently than boys, potentially altering how eating behaviours intersect with mental well-being (Bearman & Stice, 2008).

Finally, it is important to recognize that gender is not binary, and our study's stratification by boys and girls may not fully capture the spectrum of adolescent gender identities.

7. CONCLUSION

7.1 Contributions to the field of nutrition

This thesis contributes meaningfully to the field of nutrition by highlighting how everyday eating behaviours, specifically breakfast consumption, family meals, and screen use during meals, are associated with mental health outcomes among Canadian adolescents. In an era where mental health challenges are a public health issue affecting youth, these findings reinforce the importance for public health nutrition intervention to address the social and behavioural context in which food is consumed. By using nationally representative data, this study offers new insights into how structured and mindful eating behaviours and practices may serve as protective factors for mental well-being, particularly among girls. These findings support CFG 2019 "how to eat recommendations", which emphasizes eating together and being mindful/present, alongside what we eat. The work also underscores the potential for nutrition-related public health interventions to play a role in mental health promotion. In doing so, this research invites future investigations into the psychosocial benefits of healthy eating routines and encourages an integrated approach to youth health that bridges nutritional, psychological, and social domains.

7.2 Strengths and limitations

To our knowledge, this study is among the first to examine associations between multiple eating behaviours, specifically breakfast consumption, family meals, and screen use during meals, and mental health outcomes in a nationally representative sample of Canadian adolescents, which enhances the generalizability of the findings to the broader population of Canadian youth.

However, several limitations should be noted. Given the cross-sectional nature of the study design, it is not possible to establish causality between behaviours and mental health

indicators. It is also possible that the relationship is bidirectional, and that adolescents with better mental health are more likely to engage in these behaviours through psychological determinants such as intrinsic motivation and greater intention (Polivy & Herman, 2005; Richards & Smith, 2016). Alternatively, those struggling with depression or anxiety might exhibit disrupted routines, irregular eating patterns, and less engagement with family activities (Harrison et al., 2012; Hussenoeder et al., 2021). Longitudinal studies would help in clarifying the temporal relationships between eating behaviours and mental health trajectories. It is also important to note that these analyses were conducted using data from the 2019 CHSCY, which predates the COVID-19 pandemic. As a result, the findings may not reflect current post-pandemic realities; therefore, updated analyses with more recent data are needed. In addition, the reliance on self-reported data introduces the potential for bias, including recall and social desirability bias, despite the general reliability of these measures in past research (Currie et al., 2009; Rutter et al., 2023; Sordo Vieira et al., 2022). Recalling bias may have occurred if participants had difficulty accurately remembering their past behaviours or experiences, such as how often they ate breakfast in the past week, potentially leading to misclassification. Social desirability bias may also have influenced responses, particularly if participants provided answers they perceived to be more socially acceptable rather than fully truthful. For example, adolescents may have underreported screen use during meals or overstated engagement in healthy behaviours like regular breakfast consumption. These potential biases highlight the limitations of relying solely on self-report data. Additionally, while depressive and anxiety symptoms were reported by parents, introducing the possibility of under- or overestimation based on observable behaviours, this limitation is partially offset by the inclusion of adolescent self-reported mental health data, which adds valuable perspective from the youth themselves and strengthens the

comprehensiveness of the findings. Future studies could incorporate objective measures of health behaviours and mental health, such as accelerometry or clinical diagnostic tools, to enhance data accuracy and strengthen the validity of findings. Another limitation of this study is that screen use during meals was assessed based on whether screen use was permitted, rather than on actual screen use behaviour. Therefore, the measure may not accurately reflect the frequency or duration of screen use during meals, as permission does not necessarily equate to usage. Furthermore, although the study controlled for several important covariates, residual confounding may still have influenced the results. For example, factors such as parental mental health, parenting style, physical activity, or sleep may have contributed to both eating behaviours and mental health outcomes. Lastly, while gender-diverse participants were included in the overall sample, the small subgroup size prevented meaningful analysis in gender-stratified models. Although this exclusion was necessary to maintain statistical validity, it limits the inclusivity and generalizability of our findings. Furthermore, the survey excluded youth living on First Nation reserves and other Aboriginal settlements, those in foster care, and institutionalized individuals. These groups are more likely to experience poor mental health in Canada (Chartier et al., 2024; Owais et al., 2022), so their exclusion limits the generalizability of the findings and may result in an underrepresentation of the mental health challenges faced by the broader youth population. Future research should address this gap by ensuring adequate representation of gender-diverse youth and examining how eating behaviours interact with gender identity, gender expression, and societal norms. It is also crucial to include populations currently excluded from the survey. Such work is essential to better understand mental health outcomes more inclusively and comprehensively.

7.3 Implications of research

Despite these limitations, this study contributes to the growing body of evidence supporting the role of eating behaviours towards overall health and well-being during adolescence. Our findings suggest that public health initiatives targeting the promotion of healthy eating behaviours, particularly regular breakfast consumption and family meals, may be beneficial in supporting adolescent mental health and reducing anxiety and depressive symptoms. However, further research is needed to explore the mechanisms underlying these associations and to determine what effective behaviour change techniques might help in promoting or changing eating behaviours.

Additionally, this research draws attention to gendered differences in mental health and behaviour, suggesting a need for tailored interventions that consider gender-specific patterns. Targeting clusters of healthy eating behaviours, rather than isolated actions, may be more challenging, but they might provide cumulative benefits for youth's mental health.

7.4 Future directions

Longitudinal research is needed to establish causal pathways between eating behaviours and mental health outcomes. Although this study drew from a nationally representative sample of Canadian youth, future investigations that are powered to understanding the relationship between eating behaviours and mental health among gender diverse youth are needed to ensure equity and inclusion in findings and interventions. More importantly, these analyses drew from the CHSCY 2019, which included key eating behaviours such as breakfast skipping, and it is unfortunate that the CHSCY 2023 iteration did not ask the same eating behaviours, precluding us from repeating the same analysis in a more recent sample. Nonetheless, this study lays the groundwork for future studies comparing some eating behaviours among youth pre- and post-pandemic. Given

the pandemic's far-reaching impact on family routines, dietary behaviours, and youth mental health, future research should explore how these patterns may have shifted over time. This would allow researchers to better understand the long-term public health implications of the pandemic.

Further work is also needed to explore the mechanisms underlying the observed associations, such as the role of social connectedness during meals, dietary quality, or emotional regulation. Additionally, future studies should assess the impact of screen use during meals on psychological well-being, as this behaviour remains underexplored in adolescent mental health research.

Finally, future research would benefit from greater standardization in defining and coding eating behaviours and lifestyle clusters to improve comparability across studies. The development of standardized, validated tools to assess meal quality, family dynamics, and health behaviour patterns would significantly strengthen the evidence base and support more targeted intervention strategies.

7.5 Overall conclusion

The study shows that adherence to healthy eating behaviours is associated with higher mental health and well-being among adolescents, and meeting two or three eating behaviour recommendations being associated with further benefits. The findings support the 2019 CFG guidelines, which state that following the recommended "how to eat" practices are linked to better mental health among Canadian youth. These findings highlight the importance of targeting contextual factors around food consumption to promote overall health and well-being among Canadian youth. It suggests that small changes in eating behaviours may positively impact youth mental health, and every additional change could have a cumulative impact. Promoting adolescents' mental health is a shared responsibility that requires the active involvement of

multiple stakeholders, including families, schools, and public health authorities, each playing a vital role in promoting healthier behaviours.

8. TABLES

Table 1. Sociodemographic characteristics of the sample of Canadian adolescents aged 12 to 17 years, Canadian Health Survey on Children and Youth 2019

	Unweighted %	n
Gender[1]		
Boys	49.8%	6,760
Girls	49.9%	6,780
Gender diverse	0.3%	45
Weight status[2]		
Normal weight	71.1%	8,905
Overweight or with obesity	28.9%	3,610
Cultural/Racial Background[3]		
White	74.3%	10,045
Asian	17.8%	2,410
Black	3.6%	490
Arab	1.8%	245
Latin American & mixed-racial groups	2.5%	340
Highest parental educational attainment[4]		
High school degree or less	20.9%	2,830
College degree or higher	79.1%	10,720
Total household income		
≤ $40,000	11.3%	1,540
$40,001 – $60,000	14.4%	1,965
$60,001 – $80,000	11.4%	1,550
.> $80,000	62.9%	8,550

[1] 20 missing (0.15%)

[2] 1085 missing (7.9%)

[3] 70 missing (0.5%)

[4] 50 missing (0.4%)

Table 2. Mental health indicators and eating behaviours of the sample of adolescents aged 12 to 17 years, Canadian Health Survey on Children and Youth 2019

	Boys		Girls		P-value
	%	n	%	n	
Self-rated mental health[1]					<0.001
Good/Very Good/Excellent	91.9%	6,185	81.7%	5,520	
Poor/Fair	8.1%	545	18.2%	1,230	
Anxiety symptoms[2]					<0.001
A few times a year/Never	75.5%	5,075	61.3%	4,140	
Daily/Weekly/Monthly	24.3%	1,635	38.7%	2,610	
Depressive symptoms[3]					<0.001
A few times a year/Never	88.1%	5,930	79.3%	5,360	
Daily/Weekly/Monthly	11.8%	795	20.7%	1,390	
Breakfast consumption on school days[4]					<0.001
5 days/week	56%	3,775	49.7%	3,310	
Fewer than 5 days/week	44%	2,875	50.3%	3,350	
Family meals[5]					<0.001
At least 5 days/week	68.6%	4,615	62.6%	4,225	
Fewer than 5 days/week	31.4%	2,115	37.4%	2,525	
Screen during meals[6]					0.333
Screen users	22.5%	1,425	21.8%	1,350	
Not screen users	77.5%	4,910	78.2%	4,855	

Unweighted percentages

[1] Boys (30 missing, 0.4%); Girls (25 missing, 0.37%)

[2] Boys (45 missing, 0.7%); Girls (30 missing, 0.4%)

[3] Boys (35 missing, 0%); Girls (25 missing, 0.4%)

[4] Boys (115 missing, 1.7%); Girls (120 missing, 1.8%)

[5] Boys (30 missing, 0.4%); Girls (30 missing, 0.4%)

[6] Boys (425 missing, 6.3%); Girls (575 missing, 8.5%)

P-value indicating the significance level of differences between boys and girls in mental health indicators and eating behaviours of Canadian adolescents aged 12 to 17 years, assessed using the chi-square test

Table 3. Logistic regression models examining associations between eating behaviours and mental health indicators among youth aged 12 to 17 years, Canadian Health Survey on Children and Youth, 2019

	High self-rated mental health		Low anxiety symptoms		Low depressive symptoms	
	Unadjusted OR (95% CI)	Adjusted OR (95% CI)	Unadjusted OR (95% CI)	Adjusted OR (95% CI)	Unadjusted OR (95% CI)	Adjusted OR (95% CI)
Regular breakfast consumption on school days (5 times/week)						
Total Sample	**2.35 (2.03 - 2.72)**	**2.06 (1.77 - 2.39)**	**0.76 (0.69 - 0.84)**	**0.81 (0.73 - 0.89)**	**0.67 (0.59 - 0.76)**	**0.71 (0.62 - 0.81)**
Boys	**2.15 (1.71 - 2.69)**	**1.90 (1.51 - 2.40)**	**0.81 (0.69 - 0.94)**	**0.80 (0.69 - 0.94)**	**0.77 (0.63 - 0.95)**	**0.77 (0.63 - 0.95)**
Girls	**2.32 (1.93 - 2.79)**	**2.10 (1.74 - 2.54)**	**0.78 (0.68 - 0.90)**	**0.82 (0.71 - 0.95)**	**0.65 (0.55 - 0.76)**	**0.68 (0.58 - 0.81)**
Frequent family meals (≥5 times/week)						
Total Sample	**2.55 (2.22 - 2.92)**	**2.10 (1.83 - 2.45)**	**0.69 (0.62 - 0.77)**	**0.73 (0.65 - 0.81)**	**0.55 (0.49 - 0.63)**	**0.58 (0.51 - 0.66)**
Boys	**1.96 (1.57 - 2.46)**	**1.69 (1.34 - 2.13)**	0.86 (0.76 - 1.01)	**0.83 (0.70 - 0.97)**	**0.68 (0.55 - 0.83)**	**0.66 (0.53 - 0.81)**
Girls	**2.78 (2.35 - 2.29)**	**2.35 (1.97 - 2.80)**	**0.62 (0.54 - 0.71)**	**0.67 (0.58 - 0.77)**	**0.50 (0.42 - 0.59)**	**0.54 (0.46 - 0.64)**
No screen use during meals						
Total Sample	**1.26 (1.07 - 1.48)**	1.16 (0.98 - 1.37)	0.96 (0.85 - 1.08)	0.91 (0.80 - 1.03)	**0.80 (0.69 - 0.92)**	**0.80 (0.69 - 0.93)**
Boys	1.15 (0.88 - 1.49)	1.06 (0.81 - 1.39)	1.01 (0.84 - 1.22)	0.92 (0.76 - 1.12)	**0.76 (0.60 - 0.97)**	**0.71 (0.55 - 0.91)**
Girls	**1.33 (1.07 - 1.65)**	1.21 (0.97 - 1.51)	0.92 (0.78 - 1.08)	0.89 (0.76 - 1.05)	0.83 (0.68 - 1.01)	0.87 (0.71 - 1.07)

Models are adjusted for age, racial background, weight status, and parental educational attainment.

The total analytical sample included boys, girls, and gender-diverse youth.

Statistically significant associations ($p<0.05$) are **bolded**.

Table 4. Logistic regression models examining associations between meeting recommended eating practices and mental health indicators among boys and girls aged 12 to 17 years, Canadian Health Survey on Children and Youth 2019

		High self-rated mental health		Low Anxiety symptoms		Low depressive symptoms	
		Unadjusted OR (95% CI)	Adjusted OR (95% CI)	Unadjusted OR (95% CI)	Adjusted OR (95% CI)	Unadjusted OR (95% CI)	Adjusted OR (95% CI)
Boys							
	None	1	1	1	1	1	1
	One	1.21 (0.76 - 1.94)	1.17 (0.72 - 1.89)	1.22 (0.83 - 1.78)	1.23 (0.84 - 1.80)	0.87 (0.54 - 1.38)	0.87 (0.54 - 1.38)
	Two	**1.86 (1.19 - 2.91)**	**1.67 (1.05 - 2.63)**	0.90 (0.61 - 1.30)	0.84 (0.58 - 1.23)	**0.60 (0.38 - 0.94)**	**0.57 (0.36 - 0.89)**
	Three	**2.94 (1.85 - 4.66)**	**2.33 (1.44 - 3.76)**	0.91 (0.63 - 1.32)	0.84 (0.58 - 1.21)	**0.50 (0.32 - 0.80)**	**0.46 (0.29 - 0.73)**
Girls							
	None	1	1	1	1	1	1
	One	1.16 (0.81 - 1.66)	1.11 (0.76 - 1.61)	1.14 (0.81 - 1.59)	1.07 (0.76 - 1.49)	0.97 (0.67 - 1.41)	0.95 (0.65 - 1.38)
	Two	**2.21 (1.55 - 3.15)**	**1.90 (1.32 - 2.73)**	0.80 (0.58 - 1.10)	0.79 (0.58 - 1.08)	**0.60 (0.42 - 0.86)**	**0.62 (0.43 - 0.89)**
	Three	**4.58 (3.10 - 6.78)**	**3.58 (2.39 - 5.37)**	**0.66 (0.48 - 0.91)**	**0.68 (0.49 - 0.94)**	**0.43 (0.29 - 0.62)**	**0.47 (0.32 - 0.69)**

Models are adjusted for age, racial background, weight status, and parental educational attainment.

Statistically significant associations ($p<0.05$) are **bolded**.

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Supplemental table:

Table A. Interaction between eating behaviours and gender on mental health indicators of Canadian adolescents aged 12 to 17 years, Canadian Health Survey on Children and Youth 2019

	Self-Rated Mental Health	Anxiety symptoms	Depressive symptoms
	P-value	P-value	P-value
Regular breakfast consumption # Gender	**< 0.001**	**< 0.001**	**< 0.001**
Regular family meals # Gender	**< 0.001**	**< 0.001**	**< 0.001**
No screens during meals # Gender	**< 0.001**	**< 0.001**	**< 0.001**

Statistically significant associations ($p<0.05$) are **bold**

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