

Demographic and Psychosocial Profiles of Adolescents who Undergo Metabolic Bariatric Surgery

Hector Luca Oliveira de Santana da Silva, B.Sc

A Thesis
in
The Department
of

Health, Kinesiology, and Applied Physiology

as a partial fulfillment of the requirements for the degree of

Master of Science (M. Sc) in Health & Exercise Science
at

Concordia University
Montreal, Quebec, Canada

March 2026

© Hector Silva, 2026

CONCORDIA UNIVERSITY

School of Graduate Studies

This is to certify that the thesis prepared

By: Hector Luca Oliveira de Santana da Silva

Entitled: Demographic and Psychosocial Profiles of Adolescents who Undergo Metabolic

Bariatric Surgery and submitted in partial fulfillment of the requirements for the degree of

Master of Science (Health, Kinesiology and Applied Physiology)

complies with the regulations of the University and meets the accepted standards with respect to
originality and quality.

Signed by the final Examining Committee:

Mr. Robert Panenic _____ Chair

Dr. Julius Erdstein _____ Examiner

Dr. Simon L. Bacon _____ Examiner

Dr. Angela Alberga _____ Supervisor

Approved by: _____

Dr. Angela Alberga , Graduate Program Director

April 21st , 2026 _____

Dr. Nancy St onge, Dean of Faculty

Abstract

Demographic and Psychosocial Profiles of Adolescents who Undergo Bariatric Surgery

Hector Silva

Background: Metabolic bariatric surgery is an effective treatment for adolescents with severe obesity, yet uptake remains limited. In a multidisciplinary setting where all adolescents are eligible and have access to surgery, it remains unclear which baseline characteristics are associated with undergoing surgery. This thesis examined baseline factors associated with surgical selection among adolescents with severe obesity.

Methods: A retrospective chart review was conducted among adolescents aged 12 to 18 years evaluated at a multidisciplinary pediatric obesity clinic between July 2017 and July 2024. All participants met criteria for severe obesity and completed a comprehensive baseline assessment. Adolescents were classified according to whether they eventually received surgery following an evaluation from a multidisciplinary team of healthcare professionals, creating a surgical and non-surgical group. Baseline cardiometabolic, familial, and psychosocial variables were assessed for analysis. Group differences were assessed using independent samples tests, and logistic regression models were used to examine baseline factors associated with undergoing surgery.

Results: The final sample included 138 adolescents, of whom 27 underwent surgery and 111 who did not. Adolescents who underwent surgery had a significantly higher baseline body mass index (BMI) than those who did not. In multivariable analyses, BMI was the only factor associated with undergoing surgery across multiple models. Sex, bloodwork parameters, and psychosocial measures, including weight-related quality of life, were not independently associated with surgical selection.

Conclusion: In a multidisciplinary clinic with uniform access to surgery, baseline BMI was the primary factor associated with adolescent surgical treatment. Psychosocial and cardiometabolic measures did not independently distinguish treatment trajectories, suggesting that surgical selection in this setting is largely driven by anthropometric severity.

Acknowledgments

I extend my sincere gratitude to my supervisor, Dr. Angela Alberga, for her steadfast guidance, intellectual rigor, and high standards throughout this project. Her commitment to scientific excellence and her thoughtful, detailed feedback challenged me to think more critically and strengthened this thesis in countless ways. I am equally grateful to my committee members, Dr. Julius Erdstein and Dr. Simon Bacon, whose expertise and constructive insights refined both the methodological and conceptual depth of this work.

I am especially indebted to Dr. Carla Farnesi for her mentorship. Her support during the extensive process of data extraction and clinical interpretation was invaluable. This project would not have been possible without the CEASO team's willingness to guide me through the practical realities of working within a multidisciplinary pediatric obesity program.

I would also like to thank the members of the Health for EveryBODY Lab for fostering an environment grounded in curiosity and collaboration. The discussions, shared problem-solving, and collective dedication to research deeply shaped my academic growth.

To my partner, Junainah, your patience, steadiness, and encouragement during the most demanding phases of this degree grounded me. Your support was constant, and I am endlessly grateful.

Finally, I owe my deepest gratitude to my family. Their unwavering support, belief in my goals, and sacrifices made this journey possible.

Author Contributions

Role of Co-authors:

Conception and Design:

Hector Silva, Carla Farnesi, Julius Erdstein, Simon Bacon and Angela S. Alberga

Data Collection:

Hector Silva and Carla Farnesi

Data Analysis and Interpretation:

Hector Silva, Angela S. Alberga, Laurence Watelle, and Simon Bacon.

Drafting of the Thesis:

Hector Silva

Critical Revision of the Thesis for Important Intellectual Content:

Hector Silva and Angela S. Alberga

Table of contents

Introduction	1
Demographics of adolescents in pediatric obesity management	3
Factors influencing the choice between standard care and MBS	4
Rationale	7
Objectives.....	8
Hypotheses	9
Methods.....	10
Study Design and Setting.....	10
Data Extraction	10
Participants	11
Baseline Measures	12
Family history measures and co-existing condition composite score	12
Psychosocial Assessments.....	13
Removed variables.....	15
Statistical Analysis.....	16
RESULTS.....	19
Abstract.....	20
Introduction.....	22
Methods	25
Results.....	31
Discussion.....	35
Conclusion	40
References.....	41
Tables.....	45
Additional exploratory results	47
Multiple imputation diagnostics	47
WBIS-M adjustment.....	49
General Discussion	50
Practical Applications	55
Future research directions	56
References	57
Appendix	63

Abbreviations

MBS; Metabolic and Bariatric Surgery

BMI; Body mass index

CEASO; The Centre of Excellence in Adolescent Severe Obesity

Introduction

Obesity is widely recognized as a complex and chronic health condition ¹. Pediatric obesity in particular has been on the rise in Canada since the 1970s ². In 2019, 27.5% of Canadian children and adolescents between the ages of 5 and 17 were reported to have overweight and obesity ³, with evidence to show that this number is reaching a plateau ². The Center for Disease Control and Prevention defines obesity in children and adolescents as having a body mass index (BMI) at or above the 95th percentile for their age and sex⁴. The recently published Canadian clinical practice guideline defined pediatric obesity as a chronic, stigmatized, progressive disease, characterized by the presence of excess body fat that may impair the health and well-being of children and their families, shifting the focus away from using weight alone as a diagnostic⁵. Nevertheless, diagnosing pediatric obesity is not a straightforward task due to the challenges and time required in directly measuring body fat, as such, BMI, calculated by dividing weight in kilograms by the square of height in meters, is most frequently utilized as a proxy for adiposity in children and adolescents ⁶. However, BMI may not always provide an accurate representation of body composition as it can overestimate adiposity in shorter individuals with a higher muscle mass and underestimate adiposity in those with low muscle mass ⁶. Additionally, BMI as a standalone test fails to identify over a quarter of children with excess body fat percentage ⁶. Despite these constraints, BMI is still regarded as a valuable tool for predicting cardiovascular risk factors in young patients, making it an important clinical indicator for pediatric obesity management ^{7,8}.

Due to long standing stigmatization, obesity is often thought to be a result of unhealthy choices on behalf of the patient ¹. In contrast, research suggests that obesity is a result of a

complex set of factors including genetics, environmental conditions, one's family and community, and an individual's hormonal, behavioral, psychosocial, and physiological characteristics^{1,9}. In addition to its direct effects on the individual, obesity also raises concerns of developing co-existing conditions such as type II diabetes mellitus, obstructive sleep apnea, polycystic ovary syndrome, amongst others⁹. These co-existing conditions tend to present in more severe or treatment-resistant forms in adolescents with obesity compared to their peers without obesity¹⁰. Furthermore, the psychological effects of obesity in adolescents, including low self-esteem, eating disorders, and depression, are believed to stem from experiences of weight stigma and discrimination¹¹. Given the complex origins of obesity and the way it presents itself in adolescents, there is a need to approach treatment options with a multidisciplinary team focusing on aspects such as behavioral interventions along with pharmacological and surgical treatments⁹. The focus on the multidisciplinary team setting has been reiterated by clinical practice guidelines such as the 2025 Canadian clinical practice guidelines on pediatric obesity management⁵ as well as the 2023 American Academy of Pediatrics Clinical Practice Guidelines for the Evaluation and Treatment of Children and Adolescents with Obesity⁴.

In the context of multidisciplinary care centers for pediatric obesity, adolescents may be considered for metabolic bariatric surgery (MBS). Although only 1% of all MBS procedures in the United States are performed on adolescents, its frequency has greatly increased in recent decades and is now considered standard treatment for adolescent with severe obesity and obesity related co-existing conditions^{9,12}. Randomized controlled trials in adult populations have consistently demonstrated MBS to induce sustained improvements in cardiometabolic health, including reduced incidence of cardiovascular disease and certain cancers, alongside weight reduction¹². Benefits of which were corroborated by the two randomized control trials done in

adolescents to date^{13,14}. The 2025 Canadian clinical practice guidelines recommend considering MBS, alongside behavioral and psychological interventions, for children aged 13 and older who are identified as eligible following a comprehensive health assessment by a specialized multidisciplinary team⁵. In Canada, there are currently two publicly funded multidisciplinary centers offering MBS to adolescents; the Center of Excellence for Adolescent Severe Obesity (CEASO) in Montreal, Quebec, and the Healthy Living clinic in Toronto, Ontario¹⁵.

Demographics of adolescents in pediatric obesity management

Adolescent obesity management clinics with large sample sizes in the United States report their patients to be an average age of 14.4 to 16.5 years when they are first seen at the clinic^{16,17}. In this same population, the average age of patients in pediatric MBS skewed towards the older range of adolescents at 17 years old¹⁸.

Moreover, it is well known that although socially disadvantaged and marginalized groups such as people with lower income, education and in ethnic equity-deserving groups are more likely to develop obesity, they are under-represented in obesity management programs¹⁹. A similar trend is observed in that white adolescents are more likely to undergo MBS compared to black and hispanic adolescents, despite the higher prevalence of severe obesity in those marginalized groups²⁰.

In adults, males are much less likely to seek out MBS, as seen by a large study looking at 61,708 patients in the United States which reports only 20% of the patients to be male²¹. It should be noted that in adolescent cohort studies, females are consistently overrepresented^{14,22–24}. This phenomenon can perhaps be explained by how in a study looking at sex differences, males were less likely to seek out treatment for obesity management²⁵. Furthermore, males and marginalized groups have been found to be less likely to be recommended surgery²⁶.

Research involving adolescents receiving behavioral interventions report a baseline BMI ranging from 31-35 kg/m² ^{27,28}. Patients undergoing MBS have a significantly higher baseline BMI, with a large meta-analysis of 1,928 adolescent patients showing an average preoperative BMI of 43.1 kg/m² ¹⁸. Large cohort studies comparing adolescents receiving MBS to those in standard care report the control group as having a lower mean BMI ^{22,29} which may reflect the prioritization of individuals with higher BMI for surgical intervention.

Adolescents referred to pediatric obesity management clinics present with more obesity-related co-existing conditions (*e.g.*, Hypertension, Type II Diabetes, Obstructive sleep apnea) than the general population ⁹. However, variability in how these conditions are reported across studies makes it difficult to draw consistent comparisons between surgical and non-surgical populations ^{22,24,30,31}.

Factors influencing the choice between standard care and MBS

Qualitative studies with adolescents identified health improvements such as co-existing conditions resolution, improvements in performing activities of daily living, and physical appearance as primary motivating factors for seeking MBS ³²⁻³⁴. It has been suggested that patients' feelings of "desperation" may play a role in the decision, with a significant portion of patients turning to surgery when they perceived no better alternatives available to manage their obesity³⁴. Large cohort studies comparing adolescents receiving MBS to those in standard care report the control group as having a lower mean BMI ^{22,29}, suggesting that adolescents may opt for MBS depending on the severity of their obesity. In the case of large cohort studies done on adolescents undergoing MBS and other articles looking at comparisons over a shorter term (up to 24 months), it is unclear whether the control group receiving non-surgical care were offered the

option of MBS ^{22,29}. To date, no study has reported the differences in the severity of obesity and risk factors for obesity related co-existing conditions between adolescents who received MBS compared to those in non-surgical care in a setting where all adolescents are eligible for and have access to MBS.

Family support has been reported as a facilitator for receiving MBS in adolescents, with fears about the procedure being a primary barrier^{33,35,36}. Consequently, adolescents reported that having a family member who also underwent MBS made them feel more supported and less fearful of the procedure³⁵, although no study to date has compared the family history of MBS between surgical and non-surgical groups.

Adolescents with obesity are more likely to develop depression, low self esteem, lower perceived health-related quality of life than the general population in this age range ³⁷. While there is limited research comparing the mental health concerns of patients undergoing MBS to those undergoing behavioral intervention, researchers have pointed out that particular attention must be paid to adolescents undergoing MBS given the increased prevalence of mental health concerns compared to the general population ³⁸⁻⁴⁰. Large cohort studies show a prevalence of 16% to 39% of depression amongst adolescents seeking MBS ⁴¹⁻⁴³. A large cohort study done in Sweden reported that 41% of their participants were undergoing psychiatric treatment for depression and/or anxiety, a much higher prevalence than the general population of the same age group (aged 13-18 years old) at 15% ⁴⁴. In regards to previously mentioned studies suggesting a feeling of “desperation” guiding an adolescent’s decision to undergo MBS³⁴, it would be prudent for a study looking at factors influencing that decision to take into account a patient’s mental health status.

It is important to note that not all patients fitting the BMI criteria for MBS are offered the surgery. Psychosocial assessments aim to determine if the patient is able to incorporate the significant behavioral changes required post-surgery and to ensure that there are no untreated eating disorders or severe psychological conditions that could impact postoperative success ^{45,46}. Furthermore, the discussion of choice in regards to adolescent bariatric surgery assumes that all have equal access to healthcare resources, including the availability of specialized multidisciplinary clinics and the economic factors associated with long-term follow-up care. In areas where access to specialized care is limited, MBS may not be an option ⁴⁷. Patient and physician bias may also influence the choice to refer to MBS ^{33,34,46,48–50}.

Together, these factors highlight the complexity of treatment decision-making in adolescent obesity care and underscore the need to better understand which factors are associated with MBS selection in settings where access is more uniform.

Rationale

Obesity management, often described as a "complex system", challenges traditional models of medical care⁵¹. Rather than applying a standardized treatment algorithm, clinicians must navigate an evolving landscape shaped by genetic, psychosocial, behavioral, and environmental factors⁹ that influence the etiology, progression and chronicity of obesity. In this context, the role of the healthcare provider shifts from that of an authoritative decision-maker to a collaborator and guide^{51,52}. This shift reflects a growing emphasis on shared decision-making,

where treatment choices are informed by both clinical judgment and patient values, goals, and lived experiences. This is reflected in the recommendations from the most recent 2025 Canadian clinical practice guidelines emphasizing the role of shared decision-making with patients and their families ⁵. While the present study does not directly assess decision-making processes, it aims to identify baseline factors associated with undergoing MBS within this broader clinical context.

Understanding patients' choices and the factors influencing those decisions is crucial for providing effective care in the complex, dynamic environment that is adolescent medicine; a field identified as critical in addressing health concerns early, before they become lifelong chronic issues ⁵³. MBS has emerged as a safe and effective treatment option for adolescents with severe obesity, yet its uptake remains inconsistent despite guideline support^{48,49}. Understanding the factors that influence whether adolescents pursue MBS or remain in non-surgical care is essential for delivering ethically-sound and patient-centered treatment. Clarifying these influences can help healthcare teams tailor their communication, identify potential barriers to care, and support adolescents and families in making informed, values-aligned decisions. This thesis seeks to contribute to that understanding by exploring factors associated with surgical selection in a context where all patients were eligible for and had access to multidisciplinary obesity management, including access to MBS.

Objectives

The primary aim of this thesis was to bridge the aforementioned knowledge gap by addressing the following specific objectives:

1. Characterize the baseline profiles of adolescents opting for MBS versus those choosing non-surgical management by comparing previously measured variables including demographic,

anthropometric, cardiometabolic and psychosocial variables. Furthermore, family health history will be compared including obesity related co-existing conditions and previous family history of MBS.

2. Identify key factors associated with undergoing MBS. This involves examining whether adolescents who opt for MBS exhibit more advanced baseline characteristics compared to those who choose non-surgical management in terms of the severity of obesity and obesity-related covariates (BMI, blood pressure, HbA1c, dyslipidemia, blood C-Reactive Protein).

Hypotheses

1. Adolescents who undergo MBS are hypothesized to differ from those selecting non-surgical management across baseline demographic, anthropometric, cardiometabolic, psychosocial, and family-level characteristics.
2. Adolescents who undergo MBS are hypothesized to have higher baseline BMI and to be more likely to be female compared to those selecting non-surgical management.
3. Adolescents who undergo MBS are expected to demonstrate greater baseline cardiometabolic risk, including higher values for blood parameters (HbA1c, triglycerides, LDL-cholesterol, total cholesterol, and C-reactive protein levels) and blood pressure.

4. Adolescents who undergo MBS are expected to differ in baseline psychosocial profiles, including self-esteem, weight bias internalization, and mental health measures.
5. Adolescents opting for MBS are more likely to have a family history of obesity-related co-existing conditions and a family history of undergoing MBS.

Methods

Study Design and Setting

This retrospective cohort study utilized data from the Centre of Excellence in Adolescent Severe Obesity (CEASO) at the Montreal Children's Hospital, a tertiary care center offering specialized multidisciplinary treatment for adolescents with obesity. Ethical approval was obtained from the research ethics boards of both the Montreal Children's Hospital (2025-11437) and Concordia University (30021914). Data were extracted from medical records of adolescents assessed at CEASO in a five-year period between July 2017 and July 2024. All records were de-identified and assigned coded identifiers prior to analysis to ensure patient confidentiality.

Data Extraction

The primary author was responsible for all stages of data extraction for this study. Data were extracted in person at the Montreal Children's Hospital from medical records of

adolescents assessed at the CEASO clinic between July 2017 and July 2024. Extraction was conducted under the supervision of Dr. Carla Farnesi, research coordinator at CEASO, in accordance with institutional data access and confidentiality requirements. Electronic clinical data were retrieved directly from the hospital's OASIS electronic medical record system. Where information was not available electronically, such as historical laboratory results documented in scanned or paper-based records, data was manually reviewed and entered. In such cases, data was entered into REDCap in order to complete CEASO's electronic record.

For each eligible patient, the author systematically reviewed clinical notes, laboratory reports, and assessment forms to extract demographic, anthropometric, metabolic, psychosocial, and family-level variables. Extracted data was entered into a standardized data extraction spreadsheet developed specifically for this project to ensure consistency across records. Each participant was assigned a unique study identifier, and all identifying information was removed prior to analysis.

Participants

Adolescents referred to CEASO were required to meet diagnostic criteria for severe obesity, defined as a body mass index (BMI) of 40 kg/m² or higher, or a BMI of at least 35 kg/m² in the presence of one or more obesity-related co-existing conditions, as determined by CEASO physicians⁵⁴. Referrals were made by healthcare providers, and all patients completed a comprehensive baseline assessment that included medical, metabolic, psychological, and social evaluations.

Regardless of treatment pathway, all adolescents received continued intensive psychological interventions, including behavioral counseling and exercise prescriptions. The

multidisciplinary team, which includes pediatricians, dieticians, social workers, art therapists, kinesiologists, and nurses, meet with patients 4 times per year. For the purpose of this study, participants were classified into two groups based on the treatment plan established through multidisciplinary consultation: those who underwent metabolic and bariatric surgery (MBS group) and those who continued with non-surgical management (NS group). The only exclusion criterion was the absence of data required for analysis, defined as not having at least 50% observed (non-missing) data.

Baseline Measures

Baseline clinical data were collected at the initial CEASO intake appointment. All information was taken by the nursing staff save for the laboratory blood tests, which were collected and analyzed by laboratories external to CEASO. This included:

- Demographics: age (years), sex (male or female).
- Physical exam: The physical examination included a measurement of height (m) and weight (kg) using the Health O Meter scale (Continental Scale Corp., Bridgeview, ILL). BMI was then calculated by dividing weight in kilograms by the square of height in meters.
- Vital signs: Systolic and diastolic blood pressure (mm Hg) taken with a sphygmomanometer with patients in a seated position.

- Laboratory blood tests: Hemoglobin A1c (HbA1c; %), total cholesterol (mmol/L), high-density lipoprotein cholesterol (HDL-C; mmol/L), low-density lipoprotein cholesterol (LDL-C; mmol/L), and triglycerides (mmol/L), obtained through blood samples processed by a certified hospital laboratory.

Family history measures and co-existing condition composite score

Self-reported data on parental obesity, history of MBS, and other cardiometabolic diseases were collected via a questionnaire (See Appendix). Family history was consolidated into two variables; An adjusted composite score showing the average number of reported co-existing conditions (e.g., Obesity, Type II Diabetes, Obstructive sleep apnea) per family member included in the self-report, and a categorical variable of whether there was a family history of MBS (yes/no). The composite score was calculated as a proxy for co-existing condition burden on the patient. This approach aimed to capture the broader health context in which the adolescent is embedded, under the assumption that a higher familial burden of disease may shape perceptions of risk and treatment urgency, and potentially influence the decision to pursue MBS over standard care.

Psychosocial Assessments

The psychosocial assessments were completed by patients at home prior to their first visit at CEASO:

- The Beck Depression Inventory-II (BDI-II) measured depressive symptoms over the past 2 weeks. Scores range from 0 to 63, with higher scores indicating greater severity⁵⁵. It

shows a high internal consistency (Cronbach's $\alpha = 0.89$) and test-retest reliability (0.75) in Canadian adolescents with and without obesity⁵⁶.

- The Screen for Child Anxiety Related Emotional Disorders – Revised (SCARED-R) evaluated symptoms of anxiety, including generalized anxiety and social phobia. It consists of 66 items rated on a 3-point Likert scale (0 = not true or hardly ever true, 1 = somewhat true or sometimes true, 2 = very true or often true). Total scores range from 0 to 132, with higher scores indicating greater anxiety severity⁵⁷. It was found to have adequate validity and reliability (exact values not reported) in a sample of European children and adolescents⁵⁷.
- The Impact of Weight on Quality of Life – Kids (IWQOL-Kids) measures weight-related quality of life in children and adolescents. It consists of 27 items rated on a 5-point Likert scale (1 = always true to 5 = never true). Total scores range from 0 to 100, with higher scores indicating better weight-related quality of life⁵⁸. It shows a high internal consistency (Cronbach's $\alpha = 0.96$) and test-retest reliability (0.75-0.88) in a sample of North American adolescents⁵⁸.
- The Modified Weight Bias Internalization Scale (WBIS-M) evaluated the degree to which individuals internalize negative weight-based stereotypes. It is an 11-item rated using a 7-point Likert scale (1=strongly disagree, 7=strongly agree), with higher scores indicating higher weight bias internalization. It was shown to be reliable with a high internal consistency (Cronbach's $\alpha = 0.90$) in a sample of North American adults with overweight and obesity⁵⁹. There is evidence to suggest that the WBIS-M questionnaire holds better psychometric value after the removal of item 1⁶⁰. As such, a

follow up analysis of between group differences was assessed for this questionnaire (see Additional exploratory results).

- The Adolescent Binge Eating Disorder Questionnaire (ADO-BED) screens for symptoms of binge eating disorder in adolescents. It consists of 10 items rated on a 3-point Likert scale (0 = never, 1 = sometimes, 2 = often). Total scores range from 0 to 20, with higher scores indicating greater severity of binge eating symptoms⁶¹. Although exact values were not reported, it was found to be a valid and sensitive measure of binge eating disorder in adolescents with obesity⁶¹.
- The Pediatric Quality of Life Inventory (PedsQL) measures health-related quality of life in children and adolescents. It consists of 23 items rated on a 5-point Likert scale (0 = never to 4 = almost always). Items are reverse-scored and linearly transformed to a 0–100 scale; higher scores indicate better quality of life⁶². It was found to be reliable and with a high internal consistency (Cronbach's alpha = 0.88) in a sample of North American youths⁶². Notably, this was the only questionnaire completed by the adolescent's parents, not the adolescent.

Removed variables

Multiple variables, although available in the patient medical record, were not included in this analysis for reasons including:

- The variable had excessive missing data, defined as having at least 50% observed (non-missing) data, across the full cohort, rendering it unsuitable for statistical analysis or imputation.

- Parental BMI, parental age, previous weight loss attempts by the adolescent.
Waist circumference.
- The variable was deemed not directly relevant to the study objectives. As in, they did not have a clear theoretical or empirical link to treatment decision-making in obesity management.
 - Bloodwork variables include blood minerals (zinc, iron), hormones (Ex: testosterone, thyroid stimulating hormone), vitamins, fasting glucose, liver enzymes (ex: Alanine Aminotransferase), c-reactive protein, urine microalbumin/creatinine.
 - Vital signs such as heartbeat respiration rates.
 - Neck circumference.
- Some variables were excluded from analysis due to concerns regarding the conceptual clarity, theoretical robustness, or psychometric validity of the measures used. These tools, while occasionally utilized in clinical or research contexts, may not reliably capture constructs relevant to treatment decision-making or may introduce ambiguity in interpretation.
 - Causes of Obesity Questionnaire, Physical Activity Enjoyment Scale.
 - Food Frequency and Eating Habits questionnaire, sleep questionnaire, motivation questionnaire. (All CEASO developed questionnaires)

- Adolescent Sedentary Activities Questionnaire. (Not CEASO developed but modified for CEASO purposes)

Statistical Analysis

All statistical analyses were performed using IBM SPSS Statistics for Windows, version 29 (IBM Corp).

Multiple imputation

Missing data were addressed using multiple imputation by the fully conditional specification (FCS) setting built into SPSS, with 20 iterations conducted to generate a complete dataset. The imputation model included all study variables that met the minimum threshold for inclusion, defined as having at least 50% observed (non-missing) data. Variables that did not meet this threshold were excluded from imputation and subsequent analysis due to concerns about the reliability and stability of imputed estimates.

Descriptive Statistics

Descriptive statistics were computed using the first imputed dataset (Imputation 1) and reported for each group, as well as the full sample. Continuous variables were summarized using means and standard deviations, while categorical variables were reported as frequencies and percentages. To assess baseline differences between the MBS and NS groups, independent samples t-tests were used for continuous variables, and Chi-squared (χ^2) tests were used for categorical variables. Rather than relying solely on p-values, univariate effect sizes were calculated to inform variable selection for

multivariable modeling. Variables were retained if they demonstrated at least a small-to-moderate association with the outcome ($|\text{Cohen's } d| \geq 0.30$)⁶³. For binary variables, equivalent thresholds were derived using the established conversion between standardized mean differences and log odds ratios⁶⁴, yielding approximate cutoffs of OR ≥ 1.7 or ≤ 0.6 .

Collinearity

Collinearity among variables was assessed using variance inflation factors (VIF) obtained from linear regression models. Each variable was regressed on all other variables in the dataset to evaluate the extent to which it was linearly related to the others. A VIF value greater than 5 was used as the threshold to indicate problematic multicollinearity, as values above this level suggest a high degree of redundancy that may distort coefficient estimates and reduce model interpretability. Variables exceeding this threshold were excluded from multivariable logistic regression models to ensure model stability and reduce the risk of inflated standard errors.

Logistic Regression

Variables that passed univariate screening, met collinearity criteria, and had strong theoretical justification were included in logistic regression models to assess their association with MBS status (yes/no). A hierarchical logistic regression strategy was prespecified to evaluate baseline factors associated with undergoing MBS while maintaining model stability and interpretability. Variables were entered sequentially to reflect increasing levels of clinical and psychosocial complexity, with the number of

variables per model restricted to a maximum of four given the limited number of surgical cases and the need to reduce overfitting. Accordingly, variable inclusion was guided primarily by theoretical relevance and clinical plausibility for influencing MBS decision-making rather than by univariate associations alone. Three models were constructed to reflect progressive levels of adjustment: Model A included BMI and sex as core demographic and anthropometric covariates; Models B and C each introduced one additional variable, selected based on univariate analyses and theoretical relevance. Where possible, these variables were chosen to represent distinct domains, including cardiometabolic and psychosocial factors. Logistic regression analyses were performed on the pooled imputed dataset (N = 138). Model fit was assessed using the Hosmer–Lemeshow goodness-of-fit test and Nagelkerke R².

All statistical tests were two-tailed with a significance threshold set at $p < .05$.

RESULTS

Original Manuscript formatted for submission to the academic peer-reviewed journal *Pediatric Obesity* aimed to be submitted for publication in Winter 2026.

Demographic and Psychosocial Profiles of Adolescents who Undergo Bariatric Surgery

Authors: Hector Luca Oliveira de Santana da Silva¹ (0009-0002-0181-2417), Carla B. Farnesi², Laurence Watelle¹, Julius Erdstein^{2,3,4}, and Angela S. Alberga (0000-0003-3858-9482)^{1,3,4*}

Affiliations:

¹ Department of Health, Kinesiology, And Applied Physiology, Concordia University, Montreal, Quebec, Canada.

² Centre of Excellence in Adolescent Severe Obesity, Adolescent Medicine, Montreal Children's Hospital, Montreal, Quebec, Canada

³ Department of Pediatrics, Faculty of Medicine, McGill University, Montreal, Quebec, Canada.

⁴ Research Institute of the McGill University Health Research Center, Montreal, Quebec, Canada.

***Corresponding author:**

Angela Alberga, PhD

Concordia University

7141 Sherbrooke Street West

Montreal, Quebec, H4B1R6 Canada

Email: angela.alberga@concordia.ca;

Phone: (514) 848-2424 ext. 3371

Acknowledgements:

The authors would like to thank the Center of Excellence in Adolescent Severe Obesity (CEASO) team at the Montreal Children's Hospital for their support and collaboration. We are grateful to the clinical and administrative staff for their assistance with data access and for their ongoing commitment to the care of adolescents with severe obesity.

Abstract

Background: Metabolic and bariatric surgery is an effective treatment option for adolescents with severe obesity, yet uptake remains limited despite guideline recommendations. In publicly funded multidisciplinary settings where all adolescents meet eligibility criteria and have access to surgery, it remains unclear which baseline characteristics are associated with undergoing surgery. The purpose of this study was to compare baseline cardiometabolic, familial, and psychosocial profiles of adolescents who underwent surgery versus those who continued with non-surgical management and examined baseline factors independently associated with surgical selection among all adolescents referred to the program.

Methods: A retrospective chart review was conducted among adolescents aged 12 to 18 years evaluated at a tertiary multidisciplinary pediatric obesity clinic between July 2017 and July 2024. All participants met criteria for severe obesity (BMI > 40 or BMI > 35 with an obesity related co-existing condition) and completed a comprehensive baseline assessment. Adolescents were classified according to whether they eventually received surgery following an evaluation from a multidisciplinary team of healthcare professionals, creating a surgical and non-surgical group. Group differences were examined using independent samples tests, and hierarchical logistic regression models were used to evaluate baseline factors associated with undergoing surgery with sequential adjustment for anthropometric, cardiometabolic, and psychosocial variables.

Results: A total of 138 adolescents were included, of whom 27 underwent surgery and 111 who did not. Adolescents who underwent surgery had significantly higher baseline body mass index than those in non-surgical care. In multivariable analyses, body mass index was the only factor associated with undergoing surgery across multiple models. Sex, bloodwork parameters, and psychosocial measures, including weight-related quality of life, were not independently associated with surgical selection after adjustment.

Conclusion: Among adolescents with severe obesity evaluated in a multidisciplinary clinic with uniform access to surgery, higher baseline body mass index was the primary factor associated with undergoing surgical treatment. Psychosocial measures, cardiometabolic indicators, and sex did not independently differentiate adolescents who underwent surgery from those who did not, suggesting that surgical selection in this setting is largely driven by anthropometric severity rather than broader psychosocial variables or familial context.

Keywords:

Adolescent severe obesity, Metabolic and bariatric surgery, Treatment selection, Psychosocial factors, Body mass index

Abbreviations:

MBS; Metabolic and Bariatric Surgery

BMI; Body mass index

CEASO; The Centre of Excellence in Adolescent Severe Obesity

Introduction

Pediatric obesity in particular has been on the rise in Canada since the 1970s¹. In 2013, 13.4% of Canadian children and adolescents between the ages of 5 and 17 were reported to have obesity². Although recent trends suggest a plateau in these rates¹, the long-term consequences of adolescent obesity, including elevated risks for cardiovascular disease, type II diabetes mellitus, obstructive sleep apnea, and psychological disorders, highlight the need for timely, effective interventions³. Given the early onset of these complications and their tendency to persist into adulthood, adolescence represents a critical window for treatment^{4,5}.

Once attributed to only a lack of engagement in health behaviors, obesity is now understood as the product of complex interactions between genetic, hormonal, behavioral, environmental, and psychosocial factors^{3,6}. This multifactorial nature demands an equally comprehensive treatment approach. Clinical guidelines in both Canada and the United States now recommend management within a multidisciplinary framework that combines behavioral, psychological, pharmacological, and surgical intervention options^{7,8}. Notably, the 2025 Canadian clinical practice guidelines emphasize the importance of a shared decision-making process between adolescents with severe obesity, their families, and the multidisciplinary team with broadened access to advanced treatment options⁸.

Adolescents have been classified as having severe obesity if they either have a BMI greater than or equal to 120% of the 95th percentile for their age and sex, or a BMI at or above 35 kg/m^{2,3}. Metabolic and bariatric surgery (MBS) has emerged as a safe and effective intervention for adolescents with severe obesity, producing significant and sustained reductions over up to 10 years in body mass index (BMI) and obesity-related co-existing conditions (e.g., diabetes remission, hypertension, obstructive sleep apnea) across large, multi-site cohort studies in the United States and Europe^{9–11}. Research also suggests improvements in quality of life, disordered eating, and cardiometabolic health in the years following MBS performed in adolescence^{10,12,13}. However, uptake of intensive treatments, particularly MBS, remains inconsistent even in the context of clear guideline recommendations. Many adolescents continue to receive only conservative behavioral counseling on health behaviours in primary care^{14,15} despite guidelines such as the American Academy of Pediatrics supporting not only an earlier referral to a multidisciplinary clinic but also earlier use of pharmacotherapy and the consideration of MBS for adolescents aged 13 and older with severe obesity⁷.

Evidence shows mixed results in the effectiveness of behavioral interventions in managing adolescent obesity in relation to BMI and co-existing condition resolution¹⁶. For these reasons, understanding the factors influencing an adolescent's decision to undergo MBS is crucial as it could shed light on the intricate interactions between physiological, psychological, and environmental elements that impact this choice. Demographic characteristics such as age and sex may also shape access to care, treatment expectations, and health-seeking behaviors^{17,18}. Examining these domains together may help clarify how clinical and contextual factors interact to shape treatment pathways.

Previous research has identified the desire to improve one's physical and mental health, along with family support, as motivators for undergoing MBS in adolescents¹⁹⁻²². The desire to improve one's quality of life has also been demonstrated as a motivator for seeking MBS in this population^{19,21}. Alternatively, fear of surgical complications and mortality have been identified as barriers for MBS selection in adolescents, with many seeking MBS as a "last resort" when they feel they cannot lose weight without it¹⁹⁻²². Large cohort studies comparing adolescents receiving MBS to those in standard care report the control group as having a lower mean BMI and lower rates of co-existing conditions^{12,23}, suggesting that adolescents may opt for MBS depending on the severity of their obesity. However, it is not clear in these studies if all adolescents had access to MBS. To date, no study has attempted to quantitatively identify a diverse range of factors associated with MBS selection in an adolescent population in a setting where all adolescents are eligible for and have access to multidisciplinary adolescent obesity management, including access to MBS.

Our primary objective is to characterize and compare the baseline profiles of adolescents who undergo MBS with those who pursue non-surgical interventions at a multidisciplinary care

center specialized in adolescent severe obesity, focusing on variables such as BMI, psychosocial factors, and family history. A second objective is to identify key factors among the previously compared variables that are associated with the decision to undergo MBS. Finally, we explore the potential influence of family health history, including obesity-related co-existing conditions and prior family history of MBS.

We hypothesize that adolescents opting for MBS will present with higher baseline BMI and more pronounced psychosocial concerns, including higher internalized weight bias and lower quality of life. We further anticipate that family history of obesity related co-existing conditions and MBS will be more prevalent among those who pursue surgical treatment.

Methods

Study Design and Setting

This retrospective cohort study was conducted using data collected from CEASO at the Montreal Children's Hospital, a tertiary care center that provides specialized multidisciplinary care for adolescents with obesity. The study was approved by the institutional research ethics boards of the Montreal Children's Hospital (2025-11437) and Concordia University (30021914). Data was extracted from patient medical records for adolescents evaluated at CEASO between July 2017 and July 2024. All data was de-identified and coded prior to analysis.

Data Extraction

Data was extracted in person at the Montreal Children's Hospital from medical records of adolescents assessed at the CEASO clinic between July 2017 and July 2024. Electronic clinical data were retrieved directly from the hospital's OASIS electronic medical record system under the supervision of a research coordinator at CEASO, in accordance with institutional data access and confidentiality requirements. Where information was not available electronically, such as historical laboratory results documented in scanned or paper-based records, data was manually reviewed and entered.

For each eligible patient, the author systematically reviewed clinical notes, laboratory reports, and assessment forms to extract demographic, anthropometric, metabolic, psychosocial, and family-level variables. Extracted data was entered into a standardized data extraction spreadsheet developed specifically for this project to ensure consistency across records. Each participant was assigned a unique study identifier, and all identifying information was removed prior to analysis.

Participants

In order to be referred to CEASO, adolescents must have met diagnostic criteria for severe obesity, defined as a body mass index (BMI) of 40 kg/m² or greater, or a BMI of 35 kg/m² or greater in the presence of at least 1 obesity-related co-existing conditions as defined by the physicians at CEASO²⁴. All patients were referred to CEASO by a healthcare provider and underwent a comprehensive baseline assessment that included medical, metabolic, psychological, and social assessments.

All patients seen at CEASO undergo continued intensive behavioral/psychological intervention regardless of whether they undergo MBS. The multidisciplinary team, which includes pediatricians, dietitians, social workers, art therapists, kinesiologists, and nurses, meet

with patients 4 times per year. Participants were categorized into two groups based on the treatment trajectory determined after multidisciplinary consultation: those who underwent metabolic and bariatric surgery (MBS group), and those who stayed with non-surgical treatment (NS group). There were no exclusion criteria beyond the absence of data required for analysis.

Baseline Measures

Baseline clinical data were collected at the initial CEASO intake appointment. All information was taken by the nursing staff save for the laboratory blood tests, which were collected and analyzed by laboratories external to CEASO. This included:

- Demographics: age (years), sex (male or female).
- Physical exam: The physical examination included a measurement of height (m) and weight (kg) using the Health O Meter scale (Continental Scale Corp., Bridgeview, ILL). BMI was then calculated by dividing weight in kilograms by the square of height in meters.
- Vital signs: Systolic and diastolic blood pressure (mm Hg) taken with a sphygmomanometer with patients in a seated position.
- Laboratory blood tests: Hemoglobin A1c (HbA1c; %), total cholesterol (mmol/L), high-density lipoprotein cholesterol (HDL-C; mmol/L), low-density lipoprotein cholesterol (LDL-C; mmol/L), and triglycerides (mmol/L), obtained through blood samples processed by a certified hospital laboratory.
- Family history: Self-reported data on parental obesity, history of bariatric surgery, and other cardiometabolic diseases. Family history was consolidated into two variables; An adjusted composite score showing the average number of reported co-existing

conditions (e.g., Obesity, Type II Diabetes, Obstructive sleep apnea) per family member included in the self-report, and a categorical variable of whether there was a family history of MBS (yes/no).

Psychosocial Assessments

The psychosocial assessments were completed by patients at home prior to their first visit at CEASO:

- The Beck Depression Inventory-II (BDI-II) measured depressive symptoms over the past 2 weeks. Scores range from 0 to 63, with higher scores indicating greater severity²⁵. It shows a high internal consistency (Cronbach's alpha = 0.89) and test-retest reliability (0.75) in Canadian adolescents with and without obesity²⁶.
- The Screen for Child Anxiety Related Emotional Disorders – Revised (SCARED-R) evaluated symptoms of anxiety, including generalized anxiety and social phobia. It consists of 66 items rated on a 3-point Likert scale (0 = not true or hardly ever true, 1 = somewhat true or sometimes true, 2 = very true or often true). Total scores range from 0 to 132, with higher scores indicating greater anxiety severity²⁷. It was found to have adequate validity and reliability (exact values not reported) in a sample of European children and adolescents²⁷.
- The Impact of Weight on Quality of Life – Kids (IWQOL-Kids) measures weight-related quality of life in children and adolescents. It consists of 27 items rated on a 5-point Likert scale (1 = always true to 5 = never true). Total scores range from 0 to 100, with higher scores indicating better weight-related quality of life²⁸. It shows a high

internal consistency (Cronbach's $\alpha = 0.96$) and test-retest reliability (0.75-0.88) in a sample of North American adolescents²⁸.

- The Modified Weight Bias Internalization Scale (WBIS-M) evaluated the degree to which individuals internalize negative weight-based stereotypes. It is an 11-item rated using a 7-point Likert scale (1=strongly disagree, 7=strongly agree), with higher scores indicating higher weight bias internalization. It was shown to be reliable with a high internal consistency (Cronbach's $\alpha = 0.90$) in a sample of North American adults with overweight and obesity²⁹.
- The Adolescent Binge Eating Disorder Questionnaire (ADO-BED) screens for symptoms of binge eating disorder in adolescents. It consists of 10 items rated on a 3-point Likert scale (0 = never, 1 = sometimes, 2 = often). Total scores range from 0 to 20, with higher scores indicating greater severity of binge eating symptoms³⁰. Although exact values were not reported, it was found to be a valid and sensitive measure of binge eating disorder in adolescents with obesity³⁰.
- The Pediatric Quality of Life Inventory (PedsQL) measures health-related quality of life in children and adolescents. It consists of 23 items rated on a 5-point Likert scale (0 = never to 4 = almost always). Items are reverse-scored and linearly transformed to a 0–100 scale; higher scores indicate better quality of life³¹. It was found to be reliable and with a high internal consistency (Cronbach's $\alpha = 0.88$) in a sample of North American youths³¹. Notably, this was the only questionnaire completed by the adolescent's parents, not the adolescent.

Statistical Analysis

All statistical analyses were performed using IBM SPSS Statistics for Windows, version 29 (IBM Corp). Missing data were addressed through multiple imputation using fully conditional specification (FCS) with 20 iterations. The imputation model included all study variables, and diagnostics were used to ensure convergence and proper handling of missingness.

Descriptive statistics were computed using the first imputed dataset (Imputation 1) and reported for each group, as well as the full sample. Continuous variables were summarized using means and standard deviations, while categorical variables were reported as frequencies and percentages. To assess baseline differences between the MBS and NS groups, independent samples t-tests were used for continuous variables, and Chi-squared (χ^2) tests were used for categorical variables. Rather than relying solely on p-values, univariate effect sizes were calculated to inform variable selection for multivariable modeling. Variables were retained if they demonstrated at least a small-to-moderate association with the outcome ($|\text{Cohen's } d| \geq 0.30$)³². For binary variables, equivalent thresholds were derived using the established conversion between standardized mean differences and log odds ratios³³, yielding approximate cutoffs of $\text{OR} \geq 1.7$ or ≤ 0.6 . Collinearity was assessed via linear regression using variance inflation factors (VIF), with $\text{VIF} > 5$ indicating problematic multicollinearity.

Variables that passed univariate screening, met collinearity criteria, and had strong theoretical justification were included in logistic regression models to assess their association with MBS status (yes/no). A hierarchical logistic regression strategy was prespecified to evaluate baseline factors associated with undergoing MBS while maintaining model stability and interpretability. Variables were entered sequentially to reflect increasing levels of clinical and psychosocial complexity, with the number of variables per model restricted to a maximum of four given the limited number of surgical cases and the need to reduce overfitting. Accordingly,

variable inclusion was guided primarily by theoretical relevance and clinical plausibility for influencing MBS decision-making rather than by univariate associations alone. Three models were constructed to reflect progressive levels of adjustment: Model A included BMI and sex as core demographic and anthropometric covariates; Models B and C each introduced one additional variable, selected based on univariate analyses and theoretical relevance. Where possible, these variables were chosen to represent distinct domains, including cardiometabolic and psychosocial factors. Logistic regression analyses were performed on the pooled imputed dataset ($N = 138$). Model fit was assessed using the Hosmer–Lemeshow goodness-of-fit test and Nagelkerke R^2 .

All statistical tests were two-tailed with a significance threshold set at $p < .05$.

Results

Out of 146 patients who had been registered with CEASO between July 2017 and July 2024, 27 were in the MBS group and 119 were in the non-surgical group. From the non-surgical group ($n=119$), patients were excluded because of missing data ($n=8$), defined as having had $\geq 50\%$ of variables missing. The $\geq 50\%$ cutoff was chosen based on the minimum data required for stable imputation³⁴. A total of 138 adolescents were included in the final analysis after filtering for completeness, comprising 27 participants in the MBS group and 111 in the non-surgical management group. Table 1 shows a full list of each variable's mean value and standard deviation.

Of the 138 participants, 27 (19.6%) underwent MBS, while 111 (80.4%) did not. The total sample included 64 females (46.4%) and 74 males (53.6%). A total of 33 participants (23.9%) had a family history of MBS, while 105 (76.1%) did not.

Univariate screening

Univariate screening was conducted using pooled effect sizes (Cohen's d) from multiple imputation datasets. Continuous variables with an absolute effect size greater than 0.3 were considered to be retained for model building. The following variables met this threshold: BMI ($d = -0.66$), diastolic blood pressure ($d = -0.48$), family co-existing condition score ($d = -0.46$), the Impact of Weight on Quality of Life in Kids questionnaire ($d = 0.36$) and blood hemoglobin A1c ($d = -0.66$).

The two categorical variables met the odds ratio threshold for inclusion in the logistic regression model ($OR > 1.7$ or $OR < 0.6$). Male sex was associated with lower odds of MBS selection ($OR = 0.432$; 95% CI, 0.182–1.028). Similarly, adolescents with a family history of MBS had higher odds of undergoing surgery ($OR = 2.78$; 95% CI, 0.146–0.883).

Collinearity diagnostics

Collinearity diagnostics were conducted via linear regression using the first imputed dataset, as variance inflation factors (VIF) cannot be pooled across imputations. The only variables showing significant collinearity included total cholesterol ($VIF = 38.76$), triglycerides ($VIF = 6.98$), HDL ($VIF = 7.4$), and LDL ($VIF = 28.61$). However, these variables had already been excluded via univariate screening.

Logistic Regression:

Logistic regression results are presented using a hierarchical modeling approach to examine whether associations observed in simpler models persisted after adjustment for additional domains. To preserve model stability, only a limited number of theoretically justified variables were retained in each model, and variables with less direct relevance to MBS selection (e.g., diastolic blood pressure and family history measures) were excluded from multivariable analyses despite associations in univariate testing. Table 2 presents the results of the logistic regression models.

Model A: Base model

Model A included BMI and sex as variables in relation to MBS selection. In this model, BMI was significantly associated with MBS selection (OR = 1.07; 95% CI = 1.019-1.119; P = .006), indicating that for each additional unit increase in BMI, the odds of undergoing MBS increased by approximately 7%. Sex was not significantly associated with surgical selection (OR = 0.43; 95% CI = 0.173-1.044; P = .062), although it approached statistical significance. The model demonstrated acceptable goodness-of-fit, with Hosmer-Lemeshow test values ranging from P = .464 to .883 across imputations. The model explained between 11.7% and 13.2% of the variance in treatment choice (Nagelkerke R² range = 0.117 - 0.132).

Model B: Cardiometabolic

Model B included BMI, sex, and blood HbA1c levels in relation to MBS selection. In this model, BMI remained significantly associated with MBS selection (OR = 1.062; 95% CI = 1.011-1.116; $P = .016$), indicating that each one-unit increase in BMI was associated with a 6.2% increase in the odds of undergoing surgery. Although HbA1c had a relatively large effect size (OR = 1.55), it did not reach statistical significance ($P = .090$), and sex was also not significantly associated with treatment selection ($P = .085$). The model showed acceptable goodness-of-fit based on the Hosmer–Lemeshow test (range: .185–.833) and accounted for approximately 16.6% to 19.1% of the variance in surgical selection (Nagelkerke R^2 range = 0.166 – 0.191).

Model C: Psychosocial

Model C included BMI, sex, HbA1c, and weight-related quality of life (IWQOL-Kids total score) in relation to MBS selection. In this model, BMI remained significantly associated with undergoing surgery (OR = 1.057; 95% CI = 1.004-1.113; $P = .035$), with each unit increase in BMI associated with a 5.7% increase in the odds of MBS selection. HbA1c ($P = .074$), sex ($P = .135$) and IWQOL-Kids scores ($P = .458$) were not significantly associated with the outcome in this model. The Hosmer–Lemeshow goodness-of-fit test indicated adequate model fit across most imputations ($p > 0.05$ for 18 of 20 imputations). A small number of imputations ($n = 2$) yielded $p < 0.05$, suggesting some variability in model fit across imputed datasets, but no consistent evidence of systematic misfit. The model explained approximately 16.2% to 19.8% of the variance in surgical selection (Nagelkerke R^2 range = 0.162–0.198).

Discussion

In this retrospective chart review study, we analyzed factors associated with undergoing MBS among adolescents referred to a specialized multidisciplinary pediatric obesity clinic. Our findings revealed that BMI was the most consistent factor associated with undergoing MBS, reaching significance across all three logistic regression models. Notably, sex, HbA1c, and the self-perceived impact of weight on quality of life were not significantly associated with MBS selection in the multivariable models.

The association between BMI and MBS selection is unsurprising, given that BMI is both a diagnostic and eligibility criterion for surgery in adolescent obesity guidelines^{7,8,35}. In our models, each unit increase in BMI was associated with a 5.7–7% increase in the odds of undergoing surgery; a result consistent with previous research comparing adolescents undergoing

MBS with those receiving behavioral interventions for severe obesity which found the MBS group to consistently have higher baseline BMI values^{12,23,36}. However, unlike those studies which compared participants across different treatment settings and institutions, our study draws on a unique sample of adolescents who were all evaluated within the same publicly funded clinic for adolescents with severe obesity, making them a sample of adolescents who were all eligible for and had access to multidisciplinary obesity management, including access to MBS.

Although elevated BMI is a strong clinical risk factor for developing obesity-related co-existing conditions, it is not a measure of health status or disease severity^{3,37}. People with lower BMIs may still present with significant co-existing conditions (e.g., hypertension, diabetes) or quality of life impairments³⁷. In adults, BMI was shown to be a poor predictor of a patient's readiness and outcomes of MBS³⁸. In our statistical models, however, BMI emerged as the only consistent factor associated with undergoing MBS, suggesting that it may play an important role in guiding treatment decisions within the current clinical framework for adolescents. However, our models accounted for a maximum of 19.8% of the variance in MBS selection, indicating that additional unmeasured factors likely contribute to surgical decision-making. This finding suggests that BMI may play a central role in shaping both clinical recommendations and patient perceptions of disease severity, potentially acting as a key trigger for considering surgical intervention despite its known limitations as a measure of health risk. Future studies should aim to better understand how BMI is interpreted and used by both healthcare providers and families in the decision-making process, and whether additional individual-level psychosocial, cardiometabolic, or higher-level institutional factors contribute meaningfully to surgical decision-making beyond BMI.

Although HbA1c did not reach statistical significance in our models, this is most likely explained by limited sample size and low statistical power. Despite a relatively large effect size, the small number of adolescents with abnormal glycemic markers in our cohort likely reduced the ability to detect a significant association with MBS selection. Regardless, the result is still somewhat surprising given the well-established effect of MBS in inducing type II diabetes remission in adolescents³⁹ and its importance in perioperative care management⁴⁰. One possible explanation is a much larger sample would be needed to answer this question given the low absolute prevalence of adolescents with obesity having type II diabetes³. Type II diabetes was not included as a variable due to its anticipated low prevalence in this cohort, as indicated during data scoping discussions. Given the constraints of sample size and the need to prioritize variables with sufficient variability, extracting this information was not pursued. As a result, HbA1c was used as a proxy measure of glycemic status. This limitation may have obscured the clinical relevance of HbA1c, particularly if there were fewer teens in our sample who had impaired glucose tolerance, insulin resistance, metabolic syndrome or type 2 diabetes mellitus which reduced the perceived urgency for surgery among some adolescents.

Despite prior qualitative research suggesting that poor mental health and quality of life are key motivators for pursuing MBS in adolescents¹⁹⁻²², the IWQOL-Kids score was not independently associated with MBS selection in our models. This may reflect limited variability or insufficient severity of quality of life impairment within our sample, such that differences were not large enough to influence treatment choice. This may suggest that, even when psychosocial challenges are present, it is not a primary factor in determining treatment selection within the discussions between patients and the multidisciplinary teams. In our study, quality of life was measured at the baseline assessment, but there may be meaningful variability between

an adolescent's initial presentation at the clinic and the time at which a surgical decision is made, potentially weakening its association. Despite this, understanding the role of psychosocial factors remains important for future research studies, as studies that track changes in quality of life over time or incorporate longitudinal mental health assessments may better capture how these factors influence treatment decision-making in future studies.

Although we found a significant difference in the sex distribution between both groups, this significance disappeared when adjusting for BMI. Sex was expected to hold a more significant role in MBS selection in our sample given previous research in adults suggesting that females are more likely to seek and go through MBS, even when adjusting for BMI and co-existing condition severity⁴¹. Several explanations may underlie this pattern. First, sociocultural norms around body image may influence female adolescents to be more receptive to surgical options. Second, clinician biases may play a role in the selection-making process^{21,42}. Clinicians may be more likely to interpret the psychological impact of obesity as more significant in female patients whereby one study showed that clinicians were more likely to refer females with obesity for psychotherapy than males⁴³, which may translate to more referrals for MBS for females. Similarly, families may be more supportive of surgery for daughters than sons due to societal expectations and pressure about health, appearance, or future relationship or career prospects for females²¹. These patterns, while difficult to quantify, may contribute to the observed sex differences in MBS selection among adolescents living with severe obesity. Future research should aim to disentangle the relative influence of sociocultural, familial, and clinician factors on MBS decision-making by incorporating qualitative interviews and longitudinal analyses to better understand how sex and gender expectations and biases shape treatment pathways over time.

There may be other limitations related to our study design and sample that help explain why sex was not significantly associated with MBS selection in the multivariable models. This may be due in part to the limited sample size of the MBS group, which reduced the statistical power to detect moderate effects, particularly for categorical variables. It is possible that sex interacts with other unmeasured variables, such as parental attitudes⁴⁴ or provider recommendations⁴³, which may play a role in MBS selection but were not captured in our dataset. As such, the influence of sex and gender may operate through complex psychosocial pathways rather than as a direct, independent driver of surgical selection. This underscores the need for future research to explore intersectional factors associated with MBS selection, including sex and gender-related experiences of living with a higher body weight, as well as decision-making dynamics within the family and clinical context.

Limitations should be considered when interpreting our findings. First, the cross-sectional nature of the data limited our ability to assess how decisions evolved over time. All data were drawn from baseline assessments, which may not reflect the adolescent's or family's perspective at the time a decision about surgery was actually made. Additionally, the retrospective design limited our ability to assess causal relationships. For example, psychosocial distress or motivation for surgery may fluctuate during the preoperative process but were only captured once at intake. Additionally, the dataset did not include potentially influential factors such as prior weight loss attempts, parental attitudes toward surgery, adolescent understanding of the procedure, or whether MBS was first proposed by the family or the clinical team. We were also unable to distinguish between adolescents with untreated versus medically managed co-existing conditions, such as hyperglycemia, which may have influenced the perceived need for surgery and the clinical urgency of the decision. Despite these limitations, the study benefits from a well-

defined and unique sample in which all adolescents had equal access to multidisciplinary obesity management, including access to MBS. This design reduced variability related to insurance coverage, external referrals, or regional access to care, allowing for a more focused analysis of anthropometric, cardiometabolic, and demographic factors associated with treatment selection.

Future research should build on these findings by using mixed-methods designs that combine prospective clinical data with qualitative interviews. Exploring how adolescents and their families understand the risks and benefits of MBS, and how they experience the decision-making process, could help identify factors that are not captured by structured questionnaires. Longitudinal studies would also be valuable for examining how treatment readiness, family dynamics, or psychosocial challenges change over time and influence the path toward surgery. These approaches may help improve clinical guidance and ensure that recommendations are responsive to the evolving needs and contexts of adolescents with severe obesity.

Conclusion

This retrospective chart review examined baseline cardiometabolic, familial, and psychosocial characteristics associated with undergoing metabolic and bariatric surgery among adolescents with severe obesity evaluated in a publicly-funded multidisciplinary clinic in Canada. Higher baseline BMI consistently distinguished adolescents who underwent surgery from those who continued non-surgical management, remaining the only variable significantly associated with MBS selection in the multivariable models. These findings suggest that, within a multidisciplinary clinical framework, weight continues to play a dominant role in guiding surgical treatment decisions for adolescents with severe obesity.

Conflicts of interest statement:

No conflicts of interest to declare.

Acknowledgments & Author contributions:

Hector Silva conceived the study, led the study design, conducted data extraction and data analysis, and drafted the manuscript. Carla Farnesi and Julius Erdstein contributed to study design and were instrumental in data collection and clinical context. Angela Alberga contributed to study design, data analysis, and data interpretation, and provided critical revisions to the manuscript. Laurence Watelle and Simon Bacon contributed to data analysis and provided methodological guidance. All authors contributed to manuscript revision and approved the final version for publication.

Acknowledgements

Silva gratefully acknowledges the Concordia University Merit Award Scholarship and a MSc bursary the Health for everyBODY Research Lab under the stewardship of Dr. Angela Alberga. Alberga gratefully acknowledges support from her past New Investigator Salary Award from Les Fonds de Recherche du Québec Santé (Chercheur Boursier Junior 2) during earlier stages of this work and currently her Implementation Science Chair in Youth Health from the Canadian Institutes of Health Research (CIHR) and her Tier 2 Concordia University Research Chair.

References

1. Rodd C, Sharma AK. Recent trends in the prevalence of overweight and obesity among Canadian children. *CMAJ Can Med Assoc J J Assoc Medicale Can*. 2016;188(13):E313-E320. doi:10.1503/cmaj.150854
2. Government of Canada SC. Overweight and obesity based on measured body mass index, by age group and sex. March 25, 2021. Accessed February 21, 2024. <https://www150.statcan.gc.ca/t1/tbl1/en/tv.action?pid=1310037301>
3. Kumar S, Kelly AS. Review of Childhood Obesity: From Epidemiology, Etiology, and Comorbidities to Clinical Assessment and Treatment. *Mayo Clin Proc*. 2017;92(2):251-265. doi:10.1016/j.mayocp.2016.09.017
4. Patton GC, Sanci LA, Sawyer SM. Adolescent medicine. *Med J Aust*. 2002;176(1):3-3. doi:10.5694/j.1326-5377.2002.tb04236.x
5. Alberga AS, Sigal RJ, Goldfield G, Prud'Homme D, Kenny GP. Overweight and obese teenagers: why is adolescence a critical period? *Pediatr Obes*. 2012;7(4):261-273. doi:10.1111/j.2047-6310.2011.00046.x
6. Cardel MI, Atkinson MA, Taveras EM, Holm JC, Kelly AS. Obesity Treatment Among Adolescents: A Review of Current Evidence and Future Directions. *JAMA Pediatr*. 2020;174(6):609-617. doi:10.1001/jamapediatrics.2020.0085
7. Hampl SE, Hassink SG, Skinner AC, et al. Clinical Practice Guideline for the Evaluation and Treatment of Children and Adolescents With Obesity. *Pediatrics*. 2023;151(2):e2022060640. doi:10.1542/peds.2022-060640
8. Ball GDC, Merdad R, Birken CS, et al. Managing obesity in children: a clinical practice guideline. *Can Med Assoc J*. 2025;197(14):E372. doi:10.1503/cmaj.241456
9. Järholm K, Janson A, Peltonen M, et al. Metabolic and bariatric surgery versus intensive non-surgical treatment for adolescents with severe obesity (AMOS2): a multicentre, randomised, controlled trial in Sweden. *Lancet Child Adolesc Health*. 2023;7(4):249-260. doi:10.1016/S2352-4642(22)00373-X
10. De La Cruz-Muñoz N, Xie L, Quiroz HJ, et al. Long-Term Outcomes after Adolescent Bariatric Surgery. *J Am Coll Surg*. 2022;235(4):592-602. doi:10.1097/XCS.0000000000000325

11. Inge TH, Courcoulas AP, Jenkins TM, et al. Five-Year Outcomes of Gastric Bypass in Adolescents as Compared with Adults. *N Engl J Med*. 2019;380(22):2136-2145. doi:10.1056/NEJMoa1813909
12. Olbers T, Beamish AJ, Gronowitz E, et al. Laparoscopic Roux-en-Y gastric bypass in adolescents with severe obesity (AMOS): a prospective, 5-year, Swedish nationwide study. *Lancet Diabetes Endocrinol*. 2017;5(3):174-183. doi:10.1016/S2213-8587(16)30424-7
13. Järholm K, Bruze G, Peltonen M, et al. 5-year mental health and eating pattern outcomes following bariatric surgery in adolescents: a prospective cohort study. *Lancet Child Adolesc Health*. 2020;4(3):210-219. doi:10.1016/S2352-4642(20)30024-9
14. Roebroek YGM, Talib A, Muris JWM, van Dielen FMH, Bouvy ND, van Heurn LWE. Hurdles to Take for Adequate Treatment of Morbidly Obese Children and Adolescents: Attitudes of General Practitioners Towards Conservative and Surgical Treatment of Paediatric Morbid Obesity. *World J Surg*. 2019;43(4):1173-1181. doi:10.1007/s00268-018-4874-5
15. Vanguri P, Lanning D, Wickham EP, Anbazhagan A, Bean MK. Pediatric health care provider perceptions of weight loss surgery in adolescents. *Clin Pediatr (Phila)*. 2014;53(1):60-65. doi:10.1177/0009922813500848
16. Whitlock EP, O'Connor EA, Williams SB, Beil TL, Lutz KW. Effectiveness of Weight Management Interventions in Children: A Targeted Systematic Review for the USPSTF. *Pediatrics*. 2010;125(2):e396-e418. doi:10.1542/peds.2009-1955
17. Kochkodan J, Telem DA, Ghaferi AA. Physiologic and psychological gender differences in bariatric surgery. *Surg Endosc*. 2018;32(3):1382-1388. doi:10.1007/s00464-017-5819-z
18. Robertson C, Archibald D, Avenell A, et al. Systematic reviews of and integrated report on the quantitative, qualitative and economic evidence base for the management of obesity in men. *Health Technol Assess Winch Engl*. 2014;18(35):v-vi, xxiii-xxix, 1-424. doi:10.3310/hta18350
19. Li MK, Regina A, Strom M, Kim MS, Philipp-Muller N, Hamilton JK. "It's a tool, not a cure": the preoperative teen perspective on bariatric surgery. *Surg Obes Relat Dis*. 2021;17(6):1190-1197. doi:10.1016/j.soard.2021.02.004
20. Doyle J, Colville S, Brown P, Christie D. How adolescents decide on bariatric surgery: an interpretative phenomenological analysis. *Clin Obes*. 2018;8(2):114-121. doi:10.1111/cob.12236
21. Allicock MA, Francis JM, Braxton R, et al. Motivators and Barriers to Seeking Metabolic and Bariatric Surgery Among Adolescents: A Qualitative Study. *Obes Sci Pract*. 2025;11(1):e70040. doi:10.1002/osp4.70040

22. Garcia MG, Watt JL, Six-Means A. An Adolescent's Motivation to Pursue Bariatric Surgery: A Meta-Aggregation Review. *J Pediatr Surg Nurs*. 2023;12(2):58-64. doi:10.1097/JPS.0000000000000364
23. Lawson ML, Kirk S, Mitchell T, et al. One-year outcomes of Roux-en-Y gastric bypass for morbidly obese adolescents: a multicenter study from the Pediatric Bariatric Study Group. *J Pediatr Surg*. 2006;41(1):137-143; discussion 137-143. doi:10.1016/j.jpedsurg.2005.10.017
24. MUHC. CEASO referral form. Accessed May 10, 2024. https://www.thechildren.com/sites/default/files/ceaso-_referral-e-2022-05-11.pdf
25. Beck, A.T., Steer, R.A., & Brown, G.K. Manual for the Beck Depression Inventory-II. Published online 1996.
26. Mellick W, Hatkevich C, Venta A, et al. Measurement invariance of depression symptom ratings across African American, Hispanic/Latino, and Caucasian adolescent psychiatric inpatients. *Psychol Assess*. 2019;31(6):833-838. doi:10.1037/pas0000708
27. Muris P, Steerneman P. The Revised version of the Screen for Child Anxiety Related Emotional Disorders (SCARED-R): First evidence for its reliability and validity in a clinical sample. *Br J Clin Psychol*. 2001;40(1):35-44. doi:10.1348/014466501163463
28. Modi AC, Zeller MH. The IWQOL-Kids®: Establishing minimal clinically important difference scores and test-retest reliability. *Int J Pediatr Obes*. 2011;6(2-2):e94-e96. doi:10.3109/17477166.2010.500391
29. Durso LE, Latner JD. Understanding self-directed stigma: development of the weight bias internalization scale. *Obes Silver Spring Md*. 2008;16 Suppl 2:S80-86. doi:10.1038/oby.2008.448
30. Chamay-Weber C, Combescure C, Lanza L, Carrard I, Haller DM. Screening Obese Adolescents for Binge Eating Disorder in Primary Care: The Adolescent Binge Eating Scale. *J Pediatr*. 2017;185:68-72.e1. doi:10.1016/j.jpeds.2017.02.038
31. Varni JW, Seid M, Kurtin PS. PedsQL™ 4.0: Reliability and Validity of the Pediatric Quality of Life Inventory™ Version 4.0 Generic Core Scales in Healthy and Patient Populations. *Med Care*. 2001;39(8):800-812. doi:10.1097/00005650-200108000-00006
32. Cohen J. *Statistical Power Analysis for the Behavioral Sciences*. 2. ed., reprint. Psychology Press; 2009.
33. Polanin JR, Snijlsteit B. Converting between effect sizes. *Campbell Syst Rev*. 2016;12(1):1-13. doi:10.4073/cmpn.2016.3
34. Hardt J, Herke M, Brian T, Laubach W. Multiple Imputation of Missing Data: A Simulation Study on a Binary Response. *Open J Stat*. 2013;03(05):370-378. doi:10.4236/ojs.2013.35043

35. Pratt JSA, Browne A, Browne NT, et al. ASMBS pediatric metabolic and bariatric surgery guidelines, 2018. *Surg Obes Relat Dis Off J Am Soc Bariatr Surg*. 2018;14(7):882-901. doi:10.1016/j.soard.2018.03.019
36. Call CC, Devlin MJ, Fennoy I, Zitsman JL, Walsh BT, Sysko R. Who seeks bariatric surgery? Psychosocial functioning among adolescent candidates, other treatment-seeking adolescents with obesity and healthy controls. *Clin Obes*. 2017;7(6):384-392. doi:10.1111/cob.12211
37. Wu Y, Li D, Vermund SH. Advantages and Limitations of the Body Mass Index (BMI) to Assess Adult Obesity. *Int J Environ Res Public Health*. 2024;21(6):757. doi:10.3390/ijerph21060757
38. Karpińska IA, Kulawik J, Pisarska-Adamczyk M, Wysocki M, Pędziwiatr M, Major P. Is It Possible to Predict Weight Loss After Bariatric Surgery?—External Validation of Predictive Models. *Obes Surg*. 2021;31(7):2994-3004. doi:10.1007/s11695-021-05341-w
39. Beamish AJ, Ryan Harper E, Järnholm K, Janson A, Olbers T. Long-term Outcomes Following Adolescent Metabolic and Bariatric Surgery. *J Clin Endocrinol Metab*. 2023;108(9):2184-2192. doi:10.1210/clinem/dgad155
40. Hamid SA, Graetz E, Zolfaghari EJ, Schultz KS, Schneider EB, Gibbs KE. Characterization of trends in preoperative hemoglobin A1c testing prior to metabolic and bariatric surgery: a retrospective, observational study. *Perioper Med*. 2025;14(1):3. doi:10.1186/s13741-024-00483-8
41. Grobman B, He L, Lan Z, Nimeri A, Apovian C, Turchin A. Race and Sex Disparities in Metabolic/Bariatric Surgery over 20 Years: A Cohort Study. *Ann Surg Open*. 2025;6(1):e540. doi:10.1097/AS9.0000000000000540
42. Baluyot TC. *Canadian Health Care Providers' Attitudes and Practices Towards Pharmacotherapy and Bariatric Surgery in Youth*. Concordia University; 2023. Accessed March 19, 2024. <https://spectrum.library.concordia.ca/id/eprint/992101/>
43. Melchionda N, Marchesini G, Apolone G, et al. The QUOVADIS Study: features of obese Italian patients seeking treatment at specialist centers. *Diabetes Nutr Metab*. 2003;16(2):115-124.
44. Puhl RM, Lessard LM, Foster GD, Cardel MI. A Comprehensive Examination of the Nature, Frequency, and Context of Parental Weight Communication: Perspectives of Parents and Adolescents. *Nutrients*. 2022;14(8):1562. doi:10.3390/nu14081562

Tables

Table 1. Participant characteristics

	NS	MBS	Total Sample	
	N = 11	N = 27	N = 138	
Variable	Mean (SD)	Mean (SD)	Mean (SD)	Range
Age (years)	15.77 (1.59)	15.41 (1.39)	15.48 (1.43)	12-18
Sex	M= 64	M= 10	M= 74	

	F= 47	F= 17	F= 64	
BMI (Kg/m²)	50.45 (10.16)	45.11 (8.09)	46.15 (8.76)	30.25-79.05
Systolic Blood Pressure (mmHg)	122.30 (9.41)	119.86 (11.23)	120.34 (10.91)	80-151
Diastolic Blood Pressure (mmHg)	78.04 (7.29)	74.31 (8.45)	75.04 (8.34)	45-94
Family co-existing condition composite score	3.39 (1.62)	2.55 (1.72)	2.71 (1.73)	0.20-12.67
PedsQL	52.06 (14.91)	57.82 (20.15)	56.69 (19.32)	10.23-105
ADO-BED	4.44 (2.34)	3.46 (2.70)	3.65 (2.65)	0-8
IWQOL-Kids	57.54 (19.85)	67.04 (19.17)	65.18 (19.60)	14.82-100
BDI-II	19.26 (13.08)	16.61 (11.36)	17.13 (11.72)	0-50
SCARED-R	51.33 (24.49)	42.88 (25.80)	44.54 (25.68)	1-111
WBIS-M	4.64 (0.81)	4.23 (1.13)	4.31 (1.09)	2.00-6.18
HbA1c (%)	6.27 (2.17)	5.54 (0.42)	5.69 (1.06)	4.50-14.20
Total Cholesterol (mmol/L)	4.15 (0.55)	4.17 (1.00)	4.17 (0.92)	2.15-8.91
Triglycerides (mmol/L)	1.70 (0.75)	1.50 (0.84)	1.54 (0.83)	0.43-5.27
HDL-C (mmol/L)	1.04 (0.20)	1.10 (0.26)	1.09 (0.25)	0.68-2.46
LDL-C (mmol/L)	2.33 (0.52)	2.41 (0.83)	2.39 (0.78)	0.86-6.91

Table 2. Cohen's d values for all continuous variables collected

Variable	Cohen's d
Age (years)	-0.249
BMI (Kg/m²)	-0.65795 *
Systolic Blood Pressure (mmHg)	-0.2152
Diastolic Blood Pressure (mmHg)	-0.486 *
Family co-existing condition composite score	-0.44065 *
PedsQL	0.2386
ADO-BED	-0.1824
IWQOL-Kids	0.36125 *
BDI-II	-0.1545
SCARED-R	-0.2438
WBIS-M	-0.24025
HbA1c (%)	-0.67565 *
Total Cholesterol (mmol/L)	0.01145
Triglycerides (mmol/L)	-0.2893
HDL-C (mmol/L)	0.21645
LDL-C (mmol/L)	0.1006

*Note: * denotes a variable that met the Odds Ratio criteria to be considered for the logistic regression models. (Cohen's $d > |0.3|$)*

Table 3. Logistic regression results

Model	Variable	OR	95% CI	p-value
A	BMI	1.07	1.019-1.119	0.006*
	Sex	0.43	0.173-1.044	0.062
B	BMI	1.06	1.011-1.116	0.016*
	Sex	0.45	0.179-1.119	0.085
	HbA1c	1.55	0.935-2.555	0.09
C	BMI	1.06	1.004-1.113	0.035*
	Sex	0.49	0.189-1.251	0.135
	HbA1c	1.55	0.958-2.502	0.074
	IWQOL-Kids	0.99	0.965-1.016	0.458

*Note: * denotes statistical significance as defined by $p < 0.05$*

Additional exploratory results

Multiple imputation diagnostics

In order to be eligible for multiple imputation, a variable must not be missing more than 50% of its values in each respective group, as well as the total sample. As such, prior to multiple imputation, variables had to be assessed for completeness. Variables including Age, Sex, weight and whether the adolescent eventually underwent MBS were 100% complete. The rest are laid out in the table below for reference. Note that the variable “Previous weight loss attempts by the adolescent” is missing due to a choice to not extract it from the patient record given its extensive incompleteness (<10 cases total). Variables deemed not suitable for the study’s objectives were not extracted and not analyzed for completeness.

Table 3. Variable completeness by group

Variable	Completeness in MBS Group (N = 27)	Completeness in NS Group (N = 119)	Completeness in Total Sample (N = 146)
BMI (Kg/m²)	100%	99%	99%
Systolic Blood Pressure (mmHg)	100%	93%	94%
Diastolic Blood Pressure (mmHg)	100%	91%	93%
Parental BMI (Mother)	55%	43%*	45%*
Parental BMI (Father)	59%	36%*	40%*
Family co-existing condition composite score	100%	77%	81%

PedsQL	85%	70%	73%
ADO-BED	74%	67%	68%
IWQOL-Kids	92%	70%	74%
BDI-II	70%	59%	61%
SCARED-R	88%	70%	73%
WBIS-M	59%	51%	52%
HbA1c (%)	85%	90%	89%
Total Cholesterol (mmol/L)	100%	90%	92%
Triglycerides (mmol/L)	100%	89%	91%
HDL-C (mmol/L)	100%	91%	93%
LDL-C (mmol/L)	100%	89%	91%

Note: * Denotes a variable selected for removal due to being lower than the 50% cutoff

WBIS-M adjustment

There is evidence to suggest that the WBIS-M questionnaire holds better psychometric value after the removal of item 1⁶⁰. In this study, Hilbert et al improved the internal consistency of the WBIS-M questionnaire by removing an item that showed a low item-total correlation, meaning that patients who scored high on the questionnaire tended to score low on the item; implying it was not meaningfully contributing to the construct of the questionnaire. The item asked patients to assess their agreement with a statement (“As an overweight person, I feel that I am just as competent as anyone”) on a 7 point likert scale (reverse scored).

As such, a follow up analysis was done in the current thesis project whereas the WBIS-M was rescored to remove item 1. As this variable had more than 50% completeness in the sample,

it was eligible for multiple imputation. Table 4 reports values for the results pooled across all iterations of the multiple imputation.

Table 4. Group statistics for WBIS-M follow up analysis

Variable	MBS Group (N = 27)	NS Group (N = 119)	Total Sample (N = 146)
	Mean (SD)		
WBIS-M	4.64 (0.81)	4.23 (1.13)	4.31 (1.09)
WBIS-M with item 1 removed	4.56 (1.36)	4.21 (1.29)	4.37 (1.33)

Despite the removal of item 1, the WBIS-M questionnaire still did not meet the threshold to be considered for inclusion in the logistic regression (Cohen's $d = -0.27$). It was also found to not be significantly different between the MBS and NS ($P = 0.28$).

General Discussion

In this retrospective chart review, we examined how cardiometabolic, familial, and psychosocial factors were associated with the decision to pursue MBS among adolescents referred to a specialized multidisciplinary adolescent obesity clinic. In this study, BMI emerged as the strongest and most consistent predictor of surgical selection across all analytic models. In contrast, factors such as sex, blood parameters (e.g., HbA1c), and self-perceived quality of life did not independently predict surgical selection after accounting for BMI and other covariates. This pattern highlights the continued centrality of BMI in guiding treatment pathways within adolescent obesity care, despite growing recognition of the complex psychosocial and developmental factors that shape readiness, motivation and decision-making for surgery.

In our models, each unit increase in BMI was associated with a 5.7–7% increase in the odds of undergoing surgery; a result consistent with previous research comparing adolescents undergoing MBS with those receiving behavioral interventions for severe obesity which found the MBS group to consistently have higher baseline BMI values^{22,29,65}. However, because it is unclear whether all adolescents in these prior studies had comparable access to MBS like our adolescent medicine clinic, it remains difficult to determine whether these differences reflect true clinical or motivational factors influencing surgical selection, or simply disparities in access and eligibility across study samples. Thus, this gives strength to the present study which draws on a unique sample of adolescents who were all evaluated within the same publicly funded clinic for adolescents with severe obesity, making them a sample of adolescents who were all eligible for and had access to multidisciplinary obesity management, including access to MBS.

While HbA1c did not reach statistical significance in the present models, the relatively large effect size raises questions about why it was not more strongly associated with MBS selection. Given the well-documented impact of MBS on type II diabetes remission in adolescents and its centrality in perioperative management¹², this finding was surprising. It is possible that the limited number of adolescents presenting with clinically elevated HbA1c levels in this sample constrained the ability to detect significant effects. However, it is also important to consider developmental factors that may shape how adolescents evaluate the risks and benefits of surgery. Unlike adults, adolescents may place less emphasis on the long-term consequences of chronic diseases like diabetes, which can seem abstract or distant in time⁶⁶. Instead, they may prioritize more immediate concerns such as physical appearance, peer acceptance, or the ability

to participate in social and physical activities^{33,35}. This difference in values and temporal orientation may weaken the role of clinical indicators like HbA1c in shaping treatment decisions during adolescence. As a result, even when a cardiometabolic risk factor is clinically significant, it may not carry the same motivational weight in adolescent decision-making processes, particularly if it does not align with their current goals or perceived quality of life.

Although an initial difference in sex distribution was observed between adolescents who underwent MBS and those who did not, this association was no longer significant after adjusting for BMI. This attenuation contrasts with findings from adult populations, where females consistently demonstrate higher rates of MBS uptake, even after accounting for BMI and co-existing condition⁶⁷. The lack of an independent sex effect in the present study suggests that, within this adolescent cohort, BMI may exert a stronger influence on treatment selection than sex-related factors, or that the mechanisms driving sex differences in adults may not yet be fully established during adolescence. It is important to take into account the family influence in these discussions, as it has been shown to be particularly important in driving adolescent MBS selection in qualitative studies^{33,35}. In many societies, there is greater social pressure on girls and women to conform to thinness ideals, which may lead to heightened distress and societal pressure about weight and appearance⁶⁸. Female adolescents have also been found to receive more comments from their family and peers about their body shape⁶⁹. This in turn could make female adolescents more likely to view surgery as a necessary or desirable intervention, particularly if they have experienced weight-based teasing or social exclusion³⁵. Taken together, these findings suggest that while overt sex differences in surgical selection may be attenuated after accounting for BMI, underlying sociocultural and familial dynamics likely continue to shape adolescents' attitudes toward and engagement in the surgical decision-making process.

Aside from the context of sex and gender, the family context may still play a meaningful role in the decision to pursue MBS. Adolescents with greater self-perceived self-efficacy have been shown to have a greater reduction in BMI after participating in obesity management programs⁷⁰. As such, it was initially assumed that adolescents from more engaged and supportive families might be less likely to opt for surgery, as these families could foster greater self-efficacy and adherence to intensive lifestyle interventions typically offered in standard care settings. However, this assumption reflects a somewhat simplified view of treatment adherence, as it implicitly suggests that engagement in non-surgical interventions is primarily driven by individual motivation or family support. In contrast, research studies with adolescents with obesity do not support this assumption as familial support was associated with greater adherence to MBS^{35,71}. Furthermore, given the relatively low prevalence of clinically diagnosed co-existing conditions in adolescents with obesity, particularly at early stages of care, capturing the full impact of disease at the individual level remains challenging⁹.

To better understand the potential influence of family factors on treatment selection, two family-level proxy indicators were incorporated: the presence of a family history of MBS, reflecting both genetic predisposition and openness to surgical intervention, and a composite co-existing condition score representing the average number of obesity-related conditions among immediate family members. The composite score was made to take into account adolescents who may come from a larger family where the same co-existing condition could be present in multiple people. However, this does not take into account how a family with multiple instances of a co-existing condition could change the risk perception of obesity in an adolescent compared to only having one family member with the given condition. Furthermore, it does not take into account the nature of the co-existing condition. Whereas, for example, a family member having a

history of myocardial infarctions may impact the adolescent more than a family member with dyslipidemia, although they are counted as the same for the composite score. Lastly, although there was a statistically significant difference between the MBS and non-surgical groups showing a greater occurrence of family members having undergone the surgery in the MBS group, this finding does not take into account the outcomes of that family member's surgery. A family member who had complications or weight loss below their desired expectations following the surgery may negatively impact an adolescent's motivation for MBS. Future research should explore how family experiences and dynamics, including perceptions of relatives' surgical outcomes, influence adolescents' attitudes and decision-making regarding MBS.

Ultimately, by focusing on a setting in which all adolescents met eligibility criteria and had uniform access to surgery, this study offers a unique opportunity to examine factors associated with undergoing surgery while minimizing structural barriers such as insurance coverage or referral access. However, in real-world contexts, access to MBS remains far from equitable. In areas with limited access to healthcare, MBS may not be an option⁴⁷. Given the existence of only two publicly funded pediatric clinics offering MBS to adolescents in Canada¹⁵, both of which lay in the eastern half of Canada (SickKids Hospital in Ontario & Montreal Children's Hospital in Quebec), this may leave many Canadian adolescents without the option for surgery. Furthermore, many adolescents with severe obesity and their families are not aware that MBS is a potential treatment option. A 2019 study from the United States showed that only a minority of families become aware of MBS as an option unless it is explicitly discussed by their provider⁷². Further research shows that many healthcare providers are not aware of MBS as an option for adolescent severe obesity⁴⁸. Physician bias may also play a role, with many physicians in the United States and Canada opting for low intensity behavioral intervention over MBS^{48,50}.

In addition, limited awareness of specialized programs such as CEASO and insufficient understanding of the complex nature of obesity further contribute to under-referral. Addressing these informational and systemic barriers is essential to ensure that adolescents who meet eligibility criteria are informed about, referred to, and able to consider MBS as a safe and effective treatment option as part of a shared decision-making process with their families and providers.

Practical Applications

These findings have practical implications for clinicians counseling adolescents and families about metabolic bariatric surgery. In our study, BMI emerged as the only consistent baseline predictor of surgical selection, while HbA1c, sex, and weight-related quality of life did not demonstrate independent associations with treatment choice. For clinicians, this suggests that adolescents with higher BMI may be more likely to pursue surgery when access is equitable, whereas psychosocial distress or mild cardiometabolic abnormalities alone may not strongly drive the decision. This insight can inform how providers structure early conversations. For example, clinicians may wish to explore how adolescents perceive their weight severity relative to clinical thresholds, and whether their motivations are centered on immediate functional concerns, appearance, long-term health risks, or other goals.

Beyond individual counseling, these results can assist program planners and multidisciplinary teams in identifying which patients may require more structured decision-support tools. Policymakers and administrators may also use these findings to better understand patterns of surgical uptake in publicly funded settings, which can inform resource allocation and service planning. By clarifying how treatment decisions unfold when access barriers are

minimized, this work contributes to the development of more transparent, equitable, and patient-centered care pathways in adolescent obesity management.

Future research directions

Future research should extend these findings through mixed-methods approaches that integrate prospective clinical data with qualitative inquiry. Examining how adolescents and their families interpret the risks and benefits of metabolic and bariatric surgery, as well as how they navigate the decision-making process, may reveal influences that are not readily captured through quantitative measures such as using validated questionnaires. Longitudinal designs would further allow for the assessment of how treatment readiness, family dynamics, and psychosocial challenges evolve over time and shape trajectories toward surgical care. Together, these approaches could inform more nuanced clinical guidance and support decision-making that is aligned with the changing needs and lived experiences of adolescents with severe obesity.

These findings also highlight the potential need for improved clinical tools to assess readiness and decision-making for bariatric surgery in adolescents. The development and validation of structured assessment measures and decision aids tailored to adolescents, families, and healthcare providers may support more transparent, consistent, and developmentally appropriate shared decision-making in the context of severe obesity.

References

1. Cardel MI, Atkinson MA, Taveras EM, Holm JC, Kelly AS. Obesity Treatment Among Adolescents: A Review of Current Evidence and Future Directions. *JAMA Pediatr.* 2020;174(6):609-617. doi:10.1001/jamapediatrics.2020.0085
2. Rodd C, Sharma AK. Recent trends in the prevalence of overweight and obesity among Canadian children. *CMAJ Can Med Assoc J J Assoc Medicale Can.* 2016;188(13):E313-E320. doi:10.1503/cmaj.150854
3. Government of Canada SC. Overweight and obesity based on measured body mass index, by age group and sex. March 25, 2021. Accessed February 21, 2024. <https://www150.statcan.gc.ca/t1/tbl1/en/tv.action?pid=1310037301>
4. Hampl SE, Hassink SG, Skinner AC, et al. Clinical Practice Guideline for the Evaluation and Treatment of Children and Adolescents With Obesity. *Pediatrics.* 2023;151(2):e2022060640. doi:10.1542/peds.2022-060640
5. Ball GDC, Merdad R, Birken CS, et al. Managing obesity in children: a clinical practice guideline. *Can Med Assoc J.* 2025;197(14):E372. doi:10.1503/cmaj.241456
6. Javed A, Jumeau M, Murad MH, et al. Diagnostic performance of body mass index to identify obesity as defined by body adiposity in children and adolescents: a systematic review and meta-analysis. *Pediatr Obes.* 2015;10(3):234-244. doi:10.1111/ijpo.242
7. Camhi SM, Katzmarzyk PT. Prevalence of cardiometabolic risk factor clustering and body mass index in adolescents. *J Pediatr.* 2011;159(2):303-307. doi:10.1016/j.jpeds.2011.01.059
8. Freedman DS, Mei Z, Srinivasan SR, Berenson GS, Dietz WH. Cardiovascular risk factors and excess adiposity among overweight children and adolescents: the Bogalusa Heart Study. *J Pediatr.* 2007;150(1):12-17.e2. doi:10.1016/j.jpeds.2006.08.042
9. Kumar S, Kelly AS. Review of Childhood Obesity: From Epidemiology, Etiology, and Comorbidities to Clinical Assessment and Treatment. *Mayo Clin Proc.* 2017;92(2):251-265. doi:10.1016/j.mayocp.2016.09.017
10. Skinner AC, Perrin EM, Moss LA, Skelton JA. Cardiometabolic Risks and Severity of Obesity in Children and Young Adults. *N Engl J Med.* 2015;373(14):1307-1317. doi:10.1056/NEJMoa1502821
11. Marcus C, Danielsson P, Hagman E. Pediatric obesity-Long-term consequences and effect of weight loss. *J Intern Med.* 2022;292(6):870-891. doi:10.1111/joim.13547

12. Beamish AJ, Ryan Harper E, Järholm K, Janson A, Olbers T. Long-term Outcomes Following Adolescent Metabolic and Bariatric Surgery. *J Clin Endocrinol Metab*. 2023;108(9):2184-2192. doi:10.1210/clinem/dgad155
13. O'Brien PE, Sawyer SM, Laurie C, et al. Laparoscopic adjustable gastric banding in severely obese adolescents: a randomized trial. *JAMA*. 2010;303(6):519-526. doi:10.1001/jama.2010.81
14. Järholm K, Janson A, Peltonen M, et al. Metabolic and bariatric surgery versus intensive non-surgical treatment for adolescents with severe obesity (AMOS2): a multicentre, randomised, controlled trial in Sweden. *Lancet Child Adolesc Health*. 2023;7(4):249-260. doi:10.1016/S2352-4642(22)00373-X
15. Farnesi BC, Kaffash K, Cohen TR, Alberga AS. A qualitative exploration on the needs of health care providers working with adolescents who are undergoing bariatric surgery. *Obes Pillars*. 2023;6:100067. doi:10.1016/j.obpill.2023.100067
16. Lefèvre H, Bertrand JB, Vachey B, Moro MR. Qui sont les adolescents consultant pour demande de prise en charge d'une obésité dans une Maison des adolescents ? Phénotypes d'une cohorte de 200 patients. *Arch Pédiatrie*. 2011;18(11):1162-1169. doi:10.1016/j.arcped.2011.08.007
17. Inge TH, Garcia V, Daniels S, et al. A multidisciplinary approach to the adolescent bariatric surgical patient. *J Pediatr Surg*. 2004;39(3):442-447; discussion 446-447. doi:10.1016/j.jpedsurg.2003.11.025
18. Pedroso FE, Angriman F, Endo A, et al. Weight loss after bariatric surgery in obese adolescents: a systematic review and meta-analysis. *Surg Obes Relat Dis Off J Am Soc Bariatr Surg*. 2018;14(3):413-422. doi:10.1016/j.soard.2017.10.003
19. Robertson C, Aceves-Martins M, Cruickshank M, Imamura M, Avenell A. Does weight management research for adults with severe obesity represent them? Analysis of systematic review data. *BMJ Open*. 2022;12(5):e054459. doi:10.1136/bmjopen-2021-054459
20. Nunez Lopez O, Jupiter DC, Bohanon FJ, Radhakrishnan RS, Bowen-Jallow KA. Health Disparities in Adolescent Bariatric Surgery: Nationwide Outcomes and Utilization. *J Adolesc Health*. 2017;61(5):649-656. doi:10.1016/j.jadohealth.2017.05.028
21. Kochkodan J, Telem DA, Ghaferi AA. Physiologic and psychological gender differences in bariatric surgery. *Surg Endosc*. 2018;32(3):1382-1388. doi:10.1007/s00464-017-5819-z
22. Olbers T, Beamish AJ, Gronowitz E, et al. Laparoscopic Roux-en-Y gastric bypass in adolescents with severe obesity (AMOS): a prospective, 5-year, Swedish nationwide study. *Lancet Diabetes Endocrinol*. 2017;5(3):174-183. doi:10.1016/S2213-8587(16)30424-7
23. Inge TH, Jenkins TM, Xanthakos SA, et al. Long-term outcomes of bariatric surgery in adolescents with severe obesity (FABS-5+): a prospective follow-up analysis. *Lancet Diabetes Endocrinol*. 2017;5(3):165-173. doi:10.1016/S2213-8587(16)30315-1
24. De La Cruz-Muñoz N, Xie L, Quiroz HJ, et al. Long-Term Outcomes after Adolescent Bariatric Surgery. *J Am Coll Surg*. 2022;235(4):592-602.

doi:10.1097/XCS.0000000000000325

25. Robertson C, Archibald D, Avenell A, et al. Systematic reviews of and integrated report on the quantitative, qualitative and economic evidence base for the management of obesity in men. *Health Technol Assess Winch Engl*. 2014;18(35):v-vi, xxiii-xxix, 1-424. doi:10.3310/hta18350
26. Wee CC, Huskey KW, Bolcic-Jankovic D, Colten ME, Davis RB, Hamel M. Sex, Race, and Consideration of Bariatric Surgery Among Primary Care Patients with Moderate to Severe Obesity. *J Gen Intern Med*. 2014;29(1):68-75. doi:10.1007/s11606-013-2603-1
27. Whitlock EP, O'Connor EA, Williams SB, Beil TL, Lutz KW. Effectiveness of Weight Management Interventions in Children: A Targeted Systematic Review for the USPSTF. *Pediatrics*. 2010;125(2):e396-e418. doi:10.1542/peds.2009-1955
28. Birch L, Perry R, Hunt LP, et al. What change in body mass index is associated with improvement in percentage body fat in childhood obesity? A meta-regression. *BMJ Open*. 2019;9(8):e028231. doi:10.1136/bmjopen-2018-028231
29. Lawson ML, Kirk S, Mitchell T, et al. One-year outcomes of Roux-en-Y gastric bypass for morbidly obese adolescents: a multicenter study from the Pediatric Bariatric Study Group. *J Pediatr Surg*. 2006;41(1):137-143; discussion 137-143. doi:10.1016/j.jpedsurg.2005.10.017
30. Inge TH, Courcoulas AP, Jenkins TM, et al. Five-Year Outcomes of Gastric Bypass in Adolescents as Compared with Adults. *N Engl J Med*. 2019;380(22):2136-2145. doi:10.1056/NEJMoa1813909
31. Alqahtani AR, Elahmedi M, Abdurabu HY, Alqahtani S. Ten-Year Outcomes of Children and Adolescents Who Underwent Sleeve Gastrectomy: Weight Loss, Comorbidity Resolution, Adverse Events, and Growth Velocity. *J Am Coll Surg*. 2021;233(6):657-664. doi:10.1016/j.jamcollsurg.2021.08.678
32. Farnesi BC. *Exploring the Perceptions of Bariatric Surgery for Adolescents Living with Severe Obesity*. PhD Thesis. Concordia University; 2020.
33. Li MK, Regina A, Strom M, Kim MS, Philipp-Muller N, Hamilton JK. "It's a tool, not a cure": the preoperative teen perspective on bariatric surgery. *Surg Obes Relat Dis*. 2021;17(6):1190-1197. doi:10.1016/j.soard.2021.02.004
34. Doyle J, Colville S, Brown P, Christie D. How adolescents decide on bariatric surgery: an interpretative phenomenological analysis. *Clin Obes*. 2018;8(2):114-121. doi:10.1111/cob.12236
35. Allicock MA, Francis JM, Braxton R, et al. Motivators and Barriers to Seeking Metabolic and Bariatric Surgery Among Adolescents: A Qualitative Study. *Obes Sci Pract*. 2025;11(1):e70040. doi:10.1002/osp4.70040
36. Garcia MG, Watt JL, Six-Means A. An Adolescent's Motivation to Pursue Bariatric Surgery: A Meta-Aggregation Review. *J Pediatr Surg Nurs*. 2023;12(2):58-64. doi:10.1097/JPS.0000000000000364

37. Rankin J, Matthews L, Cobley S, et al. Psychological consequences of childhood obesity: psychiatric comorbidity and prevention. *Adolesc Health Med Ther*. 2016;7:125-146. doi:10.2147/AHMT.S101631
38. Järholm K, Karlsson J, Olbers T, et al. Two-year trends in psychological outcomes after gastric bypass in adolescents with severe obesity. *Obesity*. 2015;23(10):1966-1972. doi:10.1002/oby.21188
39. Hunsaker SL, Garland BH, Rofey D, et al. A Multisite 2-Year Follow Up of Psychopathology Prevalence, Predictors, and Correlates Among Adolescents Who Did or Did Not Undergo Weight Loss Surgery. *J Adolesc Health Off Publ Soc Adolesc Med*. 2018;63(2):142-150. doi:10.1016/j.jadohealth.2017.12.021
40. Herget S, Rudolph A, Hilbert A, Blüher S. Psychosocial Status and Mental Health in Adolescents before and after Bariatric Surgery: A Systematic Literature Review. *Obes Facts*. 2014;7(4):233-245. doi:10.1159/000365793
41. Järholm K, Olbers T, Marcus C, et al. Short-term psychological outcomes in severely obese adolescents after bariatric surgery. *Obes Silver Spring Md*. 2012;20(2):318-323. doi:10.1038/oby.2011.310
42. Zeller MH, Roehrig HR, Modi AC, Daniels SR, Inge TH. Health-related quality of life and depressive symptoms in adolescents with extreme obesity presenting for bariatric surgery. *Pediatrics*. 2006;117(4):1155-1161. doi:10.1542/peds.2005-1141
43. Kim RJ, Langer JM, Baker AW, Filter DE, Williams NN, Sarwer DB. Psychosocial status in adolescents undergoing bariatric surgery. *Obes Surg*. 2008;18(1):27-33. doi:10.1007/s11695-007-9285-x
44. Olbers T, Gronowitz E, Werling M, et al. Two-year outcome of laparoscopic Roux-en-Y gastric bypass in adolescents with severe obesity: results from a Swedish Nationwide Study (AMOS). *Int J Obes 2005*. 2012;36(11):1388-1395. doi:10.1038/ijo.2012.160
45. Pratt JSA, Browne A, Browne NT, et al. ASMBS pediatric metabolic and bariatric surgery guidelines, 2018. *Surg Obes Relat Dis Off J Am Soc Bariatr Surg*. 2018;14(7):882-901. doi:10.1016/j.soard.2018.03.019
46. Beamish AJ, Reinehr T. Should bariatric surgery be performed in adolescents? *Eur J Endocrinol*. 2017;176(4):D1-D15. doi:10.1530/EJE-16-0906
47. Bergmann KL, Cox SJ, Tabone LE. Influence of a rural environment on patient access and outcomes for bariatric surgery. *Surg Obes Relat Dis*. 2017;13(4):632-636. doi:10.1016/j.soard.2016.11.009
48. Roebroek YGM, Talib A, Muris JWM, van Dielen FMH, Bouvy ND, van Heurn LWE. Hurdles to Take for Adequate Treatment of Morbidly Obese Children and Adolescents: Attitudes of General Practitioners Towards Conservative and Surgical Treatment of Paediatric Morbid Obesity. *World J Surg*. 2019;43(4):1173-1181. doi:10.1007/s00268-018-4874-5
49. Vanguri P, Lanning D, Wickham EP, Anbazhagan A, Bean MK. Pediatric health care

- provider perceptions of weight loss surgery in adolescents. *Clin Pediatr (Phila)*. 2014;53(1):60-65. doi:10.1177/0009922813500848
50. Baluyot TC. *Canadian Health Care Providers' Attitudes and Practices Towards Pharmacotherapy and Bariatric Surgery in Youth*. Concordia University; 2023. Accessed March 19, 2024. <https://spectrum.library.concordia.ca/id/eprint/992101/>
 51. Plsek PE, Greenhalgh T. Complexity science: The challenge of complexity in health care. *BMJ*. 2001;323(7313):625-628. doi:10.1136/bmj.323.7313.625
 52. Pearce N. It's complicated! Systems science and obesity. Obesity Canada. October 17, 2018. Accessed May 14, 2024. <https://obesitycanada.ca/snp/its-complicated-systems-science-and-obesity/>
 53. Patton GC, Sanci LA, Sawyer SM. Adolescent medicine. *Med J Aust*. 2002;176(1):3-3. doi:10.5694/j.1326-5377.2002.tb04236.x
 54. MUHC. CEASO referral form. Accessed May 10, 2024. https://www.thechildren.com/sites/default/files/ceaso-_referral-e-2022-05-11.pdf
 55. Beck, A.T., Steer, R.A., & Brown, G.K. Manual for the Beck Depression Inventory-II. Published online 1996.
 56. Mellick W, Hatkevich C, Venta A, et al. Measurement invariance of depression symptom ratings across African American, Hispanic/Latino, and Caucasian adolescent psychiatric inpatients. *Psychol Assess*. 2019;31(6):833-838. doi:10.1037/pas0000708
 57. Muris P, Steerneman P. The Revised version of the Screen for Child Anxiety Related Emotional Disorders (SCARED-R): First evidence for its reliability and validity in a clinical sample. *Br J Clin Psychol*. 2001;40(1):35-44. doi:10.1348/014466501163463
 58. Modi AC, Zeller MH. The IWQOL-Kids®: Establishing minimal clinically important difference scores and test-retest reliability. *Int J Pediatr Obes*. 2011;6(2-2):e94-e96. doi:10.3109/17477166.2010.500391
 59. Durso LE, Latner JD. Understanding self-directed stigma: development of the weight bias internalization scale. *Obes Silver Spring Md*. 2008;16 Suppl 2:S80-86. doi:10.1038/oby.2008.448
 60. Hilbert A, Baldofski S, Zenger M, Löwe B, Kersting A, Braehler E. Weight Bias Internalization Scale: Psychometric Properties and Population Norms. Urgesi C, ed. *PLoS ONE*. 2014;9(1):e86303. doi:10.1371/journal.pone.0086303
 61. Chamay-Weber C, Combescure C, Lanza L, Carrard I, Haller DM. Screening Obese Adolescents for Binge Eating Disorder in Primary Care: The Adolescent Binge Eating Scale. *J Pediatr*. 2017;185:68-72.e1. doi:10.1016/j.jpeds.2017.02.038
 62. Varni JW, Seid M, Kurtin PS. PedsQL™ 4.0: Reliability and Validity of the Pediatric Quality of Life Inventory™ Version 4.0 Generic Core Scales in Healthy and Patient Populations. *Med Care*. 2001;39(8):800-812. doi:10.1097/00005650-200108000-00006

63. Cohen J. *Statistical Power Analysis for the Behavioral Sciences*. 2. ed., reprint. Psychology Press; 2009.
64. Polanin JR, Snilstveit B. Converting between effect sizes. *Campbell Syst Rev*. 2016;12(1):1-13. doi:10.4073/cmpn.2016.3
65. Call CC, Devlin MJ, Fennoy I, Zitsman JL, Walsh BT, Sysko R. Who seeks bariatric surgery? Psychosocial functioning among adolescent candidates, other treatment-seeking adolescents with obesity and healthy controls. *Clin Obes*. 2017;7(6):384-392. doi:10.1111/cob.12211
66. Chu P, Patel A, Helgeson V, Goldschmidt AB, Ray MK, Vajravelu ME. Perception and Awareness of Diabetes Risk and Reported Risk-Reducing Behaviors in Adolescents. *JAMA Netw Open*. 2023;6(5):e2311466. doi:10.1001/jamanetworkopen.2023.11466
67. Grobman B, He L, Lan Z, Nimeri A, Apovian C, Turchin A. Race and Sex Disparities in Metabolic/Bariatric Surgery over 20 Years: A Cohort Study. *Ann Surg Open*. 2025;6(1):e540. doi:10.1097/AS9.0000000000000540
68. Kidd C, Loxton NJ, Uhlmann LR, Donovan CL. Integrating social media, body shame and psychological distress within the Elaborated Sociocultural Model. *Body Image*. 2024;50:101723. doi:10.1016/j.bodyim.2024.101723
69. Puhl RM, Lessard LM, Foster GD, Cardel MI. A Comprehensive Examination of the Nature, Frequency, and Context of Parental Weight Communication: Perspectives of Parents and Adolescents. *Nutrients*. 2022;14(8):1562. doi:10.3390/nu14081562
70. Ruiz VMT, Lima RBDS, Lima KF, Martins MC, Barbosa LP, Oriá MOB. Eating self-efficacy in overweight and obese children and adolescents: integrative review of instruments. *Rev Bras Enferm*. 2022;75(5):e20210301. doi:10.1590/0034-7167-2021-0301
71. Calcaterra V, Cena H, Pelizzo G, et al. Bariatric Surgery in Adolescents: To Do or Not to Do? *Children*. 2021;8(6):453. doi:10.3390/children8060453
72. Singh UD, Chernoguz A. Parental attitudes toward bariatric surgery in adolescents with obesity. *Surg Obes Relat Dis Off J Am Soc Bariatr Surg*. 2020;16(3):406-413. doi:10.1016/j.soard.2019.12.010

Appendix

Ethics documents



Initial Submission Form - Health Records Retrospective Research

Protocol title: **Demographic and Psychosocial Profiles in Teen Obesity Treatment: Surgery Versus Standard Care**

Project number(s): **2025-11437**

Form: **F11H-HRR-153356**

Nagano identifier: **MSc Project**

First submit date: **2025-03-14**

Principal investigator: **Julius Erdstein**

Last submit date: **2025-03-19**

Project's REB approbation date: **2025-04-15**

Form status: **Form ready**

General information

1. **Indicate the full title of the research study**

Demographic and Psychosocial Profiles in Teen Obesity Treatment: Surgery Versus Standard Care

2. **If relevant, indicate the full study title in French**

Profil démographiques et psychosociaux dans le traitement de l'obésité chez les adolescents : chirurgie versus soins standards

3. **Who initiated/created the study protocol or proposal?**

- ☐ Industry/Company (industry initiated)
- ☒ MUHC Investigator (investigator initiated)
- ☐ External Investigator, Foundation, Consortium/Cooperative group(s) (for example COG, SWOG, NIH, etc.)
- ☐ Student as part of an academic programme
- ☐ Resident as part of their academic trajectory in medicine
- ☐ Other

4. **Indicate the name of the Principal Investigator in our institution (MUHC)**

Erdstein, Julius

From which department is the principal investigator?

Pediatrics

Division

Adolescent Medicine

-
5. **Are there co-investigators and collaborators from the institution collaborating on the research project?**

Yes

List all the local co-investigators & collaborators involved in the research study

Alberga, Angela

Department of co-investigators & collaborators

Pediatrics

Division

Adolescent Medicine

-
6. **Indicate the name and the affiliation of the external collaborator(s), if any**

Dr. Simon Bacon

Professor, Concordia University

Department of Health, Kinesiology & Applied Physiology

Mr. Hector Silva, BSc

MSc Student

Department of Health, Kinesiology & Applied Physiology

Concordia University

-
7. **Identify the study coordinator(s)**

Silva, Hector

Indicate the role of the collaborator(s)

Student

-
8. **Indicate each site involved in the research project**

- ☐ Glen site
- ☐ Montreal General Hospital
- ☐ Montreal Neurological Institute & Hospital
- ☐ Lachine Hospital
- ☐ Allan Memorial Institute
- ☐ MUHC Reproductive Centre
- ☐ MUHC Adult Ophthalmology Clinic
- ☒ Other

Specify, if other

Gilman Pavillion

9. **Briefly introduce the research project, using lay terms and without making reference to the protocol**

Hypothesis/Study question (brief introduction of the question studied; about 5 lines)

The hypothesis is that adolescents choosing bariatric surgery will have a higher body mass index and a higher prevalence of baseline health conditions, including the presence of comorbidities (such as Type II Diabetes Mellitus and hypertension) and clinically abnormal blood work parameters (HbA1C, triglycerides, HDL-cholesterol, LDL-cholesterol, total cholesterol, and C-reactive protein levels). They will also have worse scores on psychosocial questionnaires.

Study objectives

The primary objective is to describe the demographic, physical, and psychological characteristics of teenagers who choose bariatric surgery compared to those who don't.

Methodology / Study design

A retrospective review of data collected from teenagers seen by the Centre of Excellence in Adolescent Severe Obesity (CEASO) at the Montreal Children's Hospital since 2017.

10. **Indicate the category(ies) pertaining to the research project**

Health Canada regulated research

☐ Experimental drug

Health Canada regulated research

☐ Cell therapy

Health Canada regulated research

☐ Medical device

Health Canada regulated research

☐ Software

Health Canada regulated research

☐ Radiopharmaceutical product

Health Canada regulated research

☐ Natural health product

Quasi-experimental research

☐ Cohort study

Quasi-experimental research

☐ Case-control study

Quasi-experimental research

☐ Cross-sectional study

Quasi-experimental research

☐ Population survey

☐ Descriptive research

☐ Qualitative research

☐ Research based on a mixed design (quantitative/qualitative)

☐ Creation of a databank or biological material (= primary objective of the research activity)

☐ Basic research

☒ Observational research

☐ Translational research

☐ Other

11. Indicate the specific characteristics (if needed)

- ☐ Research using an existing bank (eg; databank or biobank)
- ☐ Research that involves the creation of a bank (data or biospecimens)
- ☐ Research with a genetic or genomic component
- ☐ Research with a neuroimaging component
- ☐ Research with a banking component
- ☐ Research using assisted reproduction methods
- ☒ Research based solely on access to the user's file or solely using existing data (research or clinical-administrative data)
- ☐ Research using artificial intelligence methods
- ☐ Adaptive design trial
- ☒ Research involving university or graduate students

Students' level of education

- ☒ Masters
- ☐ Doctorate
- ☐ Post doctorate studies
- ☐ Medical resident
- ☐ Other

12. Estimated start date of the research project

2025-04-01

13. Indicate the expected duration of the study (in months)

4 months

14. **Indicate the source(s) of funding for the research project (please check all that apply)**

- ☐ Study funded by private industry(e.g. pharmaceutical or biotech company)
- ☐ Investigator-initiated with industry funding study
- ☐ Study funded by a federal funding agency
- ☐ Research funded by a provincial funding agency
- ☐ Research funded by a federal ministry
- ☐ Study funded by a provincial ministry
- ☐ Research funded by US Federal funding (eg: NIH, VA) or other countries
- ☐ Research funding from a non-profit (e.g. charity, foundation, etc.)
- ☐ Internal funding (eg: investigator/departmental funds,
- ☐ Other source(s) (e.g. self-funded)
- ☒ No funding

15. **Will the research project require a scientific evaluation at this institution (that of the reviewing REB)?**

Yes

16. **Was the research project already reviewed by another REB?**

No

Enrollment, recruitment & consent

1. **Please indicate the total number of participants to be recruited:**

For the entire study 148

For our institution: 148

2. **What's the profile of the participants?**

Check all applicable options

- ☒ Males
- ☒ Females

Select all applicable options

- ☒ Minors (less than 18 yrs of age)
- ☒ Adult
- ☐ Incompetent Adult
- ☐ Incompetent adult due to sudden circumstances

Select if applicable

- ☐ Research involving the First nations, Inuit and Métis peoples of Canada

Check all applicable options: Additional information about the research participants

- ☒ Patients seen for consultation (eg, external clinic, private clinic, day hospital, etc)
- ☐ Hospital patients
- ☐ Patients seen in the institution's emergency department
- ☐ Family members of participants
- ☐ Institution staff members
- ☐ People recruited from a control group
- ☐ People affected by a given program
- ☐ Former research subjects
- ☐ Students
- ☐ Other, specify (eg; healthy subjects)

Select if applicable:

- ☐ Research involving the recruitment of a participant not covered by the Régie de l'assurance maladie du Québec (RAMQ)

Privacy and confidentiality

1. **What is the principal strategy used to ensure the protection of participants' personal information?**

- ☐ Anonymous information (collected without an identifier)
- ☐ Anonymized information (identifiers have been redacted)
- ☒ Coded information (whose identifier has been removed and replaced by a code)
- ☒ Identifying information stored securely
- ☐ Another mechanism to ensure the protection of personal information

Please specify

The data used for this study will be from a departmental database in REDCap created with DPS authorization for QI purposes called, "Improving the quality of care for adolescents living with severe obesity". No identifiers are entered in the database, each patient is identified only by a code. The master list of code and corresponding patient MRN is kept separately in a password protected file on a restricted folder on the MUHC server.

Will research data or the informed consent form be included in the participants' medical files?

No

If applicable, please identify the people or organizations likely to have access to the personal information of the participants during the conduct of the project in addition to the representatives of the sponsor, regulatory authorities (such as Health Canada), the REB or the quality assurance.

Carla Farnesi (CEASO Coordinator)

Hector Silva (Master's Student, Project Coordinator))

Dr. Julius Erdstein (PI)

Is there a way to quickly contact the participants if needed?

Not applicable

2. **Please provide information related to the retention and protection of study data during the conduct of the study.**

Under the authority of which establishment or organization will the data be kept during the project?

Montreal Children's Hospital

Name of the contact person for storage - including AFTER the study is completed - if other than the person named as the primary contact for the study.

Carla Farnesi

Format

- ☐ Paper
☒ Electronic files
☐ Audio/video files
☐ Other

Please indicate research data protection policies aimed at ensuring restricted accessibility (e.g. file locked with username and password).

The master list of participants (MRN number only) and the corresponding Redcap ID is kept in a password protected file and saved in a restricted access folder on the MUHC server.
The departmental database, "Improving Quality of Care for Adolescents Living with Severe Obesity", is in REDCap and access is controlled by the database administrator.
All data extracted from REDCap for the purpose of this research study will be stored in a password protected and saved in restricted access folder on the secured Concordia University Server.

Please indicate the backup strategies aimed at reducing the risk of loss of research data (i.e.: back up on secure server).

The Concordia University server is regularly backed up and can offer a retrieval of information if needed.

What is the expected retention period of research data and project documents (after project closure)?

Other

Please specify and justify

7 years

3. **Identify the storage location for the project data, once it has been completed:**

Data will be stored on the MUHC server in a restricted folder and will be destroyed in seven years. There will be no paper copies.

Who is in charge of the archiving?

Each participating institution is responsible for archiving

Datas access

1. **Does the project involve a request for access to health and social services information (with or without consent)?**

Definition of health and social services information

Yes

"Act respecting health and social services information" table for researchers (available in French only)

Please select what applies:

Access will be WITHOUT consent (in whole or in part)

Have you consulted the RI-MUHC Data Warehouse (DW) Service to confirm if the health and social services information is available in the DW?

Visit The Institute's DW Service in the portal to learn more about how to access the Institute's Data Request Center

IMPORTANT: If you are able to obtain ALL requested data in an anonymized or aggregated format from the DW, you do not need to complete an EFVP.

No

You must complete the EFVP form (Évaluation des facteurs relatifs à la vie privée) to obtain access to health and social services information without consent.

EFVP Form

The form must be completed in French, signed and attached in Word format so that comments and modifications can be made if necessary.

EFVP Form 2025March07-FINAL.docx

Please complete the "Contractual aspects" section of the F11 form if the information covered by this request is to be communicated to a researcher or collaborator outside the researcher's organization, as an agreement must first be concluded with the latter's organization.

MUHC-specific assesement / Feasibility

1. **Will MUHC nurses be involved in the research project?**

For more information about the process, please click on this link

If you have made arrangements for the use of the CIM services or if you have your own dedicated Research nurse, AND you will NOT require MUHC nursing services, please answer "No" to this question.

No

-
2. **Please detail the involvement of human resources of the institution, other than the MUHC nurses, in the research project, for each of the sites involved:**

Please first identify the site. If there are none, please indicate. Click on the "add" button if more than one site involved.

There is no involvement of human resources of the institution for the research project.

3. **As part of the research project, will a contract/agreement be required?**

Yes

Please select the relevant contracts office between the McGill University Contracts Office and the RI-MUHC Research Agreements Office.

☒ Research Agreements Office at the Research Institute of the McGill University Health Centre (RI-MUHC)

Attach any contract(s) related to the research study

DTA_RI-MUHC_Dr_Erdstein_&_Concordia_Univ_18043_JS_6_March_2025.doc

You must submit a request via the MyContracts application on the RI-MUHC portal to start a review of a contract or research agreement. Uploading your documentation will start the process.

[Click here to submit a request via MyContracts](#)

☐ McGill Contracts Office

4. **Does the project require financial resources? If yes, please select which institution will be in charge of the funds.**

No

Have you confirmed that the funds you are receiving are greater than or equal to the costs of the procedures, interventions, or services that will be used for your project?

[Consult the pricelist for cost estimates of MUHC services used for research](#)

Yes

Project files

1. **Do you have a Study Protocol?**

Yes

Please attach the protocol with version date, page numbers & annexes.

[HHR_Template Protocol_v1-2025-03-14.docx](#)

Indicate the version date

2025-03-14

Indicate the version number

1

2. **Please specify the type of information to be collected for this project and/or attach data collection documents**

- Medical history:

☐ Patient medical history including presence of any known weight related comorbidities (i.e., Diabetes, hypertension, Obstructive sleep apnea, etc.). Demographic information such as ethnicity, age, and sex. Pertinent family history including self-reported parental information such as age, weight, height, employment status, if they underwent a previous MBS procedure, and the presence of weight related comorbidities.

- Physical exam:

☐ Measurement of height (m), weight (kg), waist and neck circumference (cm), and blood pressure (systolic/diastolic) (mmHg).

- Baseline bloodwork data:

☐ All variables included: Fasting status, Zinc, Hemoglobin A1c (HbA1C), Thyroid stimulating hormone (TSH), Testosterone, Vitamin D, Vitamin B12, Ferritin, parathyroid hormone (PTH), Iron, Transferrin, Iron saturation, Total cholesterol, Triglycerides, HDL-Cholesterol, LDL-Cholesterol, Total protein, fasting glucose, Gamma-glutamyltransferase (GGT), Sodium, Potassium, Chlorine, Creatinine, C-Reactive Protein, Total Calcium, Alanine aminotransferase (ALT), Alkaline phosphatase (ALP), Albumin, Thyroxine (T4), Luteinizing hormone (LH), Follicle stimulating hormone (FSH), Estradiol, Dehydroepiandrosterone (DHEA) Sulfate, and Microalbumin.

- Presence of comorbidities at baseline.

☐ Examples: Type II Diabetes Mellitus, hypertension, diagnosed depression, known eating disorder, etc.

- Scores from the following questionnaires

☐ Includes: Weight bias internalization, impact of weight on quality of life questionnaire, motivation, sleep, Adolescent binge eating disorder, food frequency and eating habits, SCARED-R for anxiety, beck depression inventory, physical activity enjoyment scale, and adolescent sedentary activity.

You can also join the list of data, or case report forms (CRF)

[Data Collection Document.xlsx](#)

3. **Do you have other documents relevant to your project to submit for review?**

Yes

PI Commitment and signature

1. **Privilege to conduct research**

Will this study be conducted at the Montreal Neurological Institute-Hospital (The Neuro)?

No

Does the principal investigator hold medical practice privileges at the MUHC?

Yes

Does the principal investigator have valid Human Research Privileges (for physicians and dentists listed on the MUHC CPDP) or Researcher Status (for non-physicians/dentists) issued by the RI-MUHC?

[For more information, click on this link](#)

Yes

Does the principal investigator have the appropriate level of institutional training required for this type of research?

[Click here to access the training](#)

Yes

Is the principal investigator a full-time or part-time McGill faculty member at or above the rank of assistant professor?

Yes

2. **Are you, or any of your collaborators, in a situation of conflict of interest as regards this research study?**

[McGill University "Regulation on Conflict of Interest"](#)

No

Institutions should ensure that real, potential or perceived institutional conflicts of interest that may affect research are reported to the REB through established conflict of interest mechanisms. The REB shall consider whether the institutional conflict of interest should be disclosed to prospective participants as part of the consent process.

[\(Source: Policy for the Responsible Conduct of Research, Fonds de recherche du Québec\)](#)

3. **Use this section for any comments or additional information**

Please note that Dr. Angela Alberga is a professor at Concordia University AND has PI privileges' at the RI-MUHC.

This project will be submitted to Concordia Ethics once approval has been granted from the MUHC.

Also, the Masters Student, Hector Silva, is targeting a June 2025 graduation because he is due to start medical school in the Fall of 2025.

Thanks for the taking the time to review this submission!

4. **You are submitting this initial review request as:**

Research study coordinator or collaborator

As study coordinator or collaborator,

☒ I certify that, to the best of my knowledge, the information in this form is correct.

Please attach the "Principal Investigator's commitment and signature" (link below) once it is completed and signed by the PI in this institution.

[Principal Investigator's commitment and signature](#)

[PI Commitment Signature-Hector-2025March.pdf](#)

Signature

Carla Farnesi

2025-03-14 21:00



2025-04-15

Dr. Julius Erdstein
Pediatrics

c/o: Hector Silva
email: hector.luca15@gmail.com

RE: Final REB Approval of a New Research Project

Demographic and Psychosocial Profiles in Teen Obesity Treatment:
Surgery Versus Standard Care (**MSc Project / 2025-11437**)

MUHC REB Co-Chair for the CTGQ panel: Me Marie Hirtle

Dear Dr. Erdstein,

Thank you for the initial submission of the research project indicated above.

On 2025-04-15, a delegated review of the research project was provided by member(s) of the McGill University Health Centre (MUHC) Research Ethics Board (REB), more precisely its Cells, Tissues, Genetics & Qualitative (CTGQ) panel. The research project was found to meet scientific and ethical standards for conduct at the MUHC.

The following documents were approved or acknowledged by the MUHC REB:

- Initial Submission Form (F11H-HRR-153356)
- **Signed commitment**
 - (PI Commitment Signature-Hector-2025March.pdf)
- **Research protocol**
 - (HHR_Template Protocol_v1-2025-03-14.docx) [Date: 2025-03-14, Version: 1]
- **Joindre contrat**
 - (DTA_RI-MUHC_Dr_Erdstein_&_Concordia_Univ_18043_JS_6_March_2025.doc)

This will be reported to the MUHC REB and will be entered accordingly into the minutes of the next CTGQ meeting.

Please be advised that you may only initiate the research project after all required reviews and decisions are received and documented and you have

received the MUHC authorization letter.

The approval of the research project is valid until 2026-04-15.

All research involving human subjects requires review at recurring intervals. To comply with the regulation for continuing review of at least once per year, it is the responsibility of the investigator to submit an *Annual Renewal Submission Form* (F9) to the REB prior to expiry. Please be advised that should the protocol reach its expiry before a Continuing review has been submitted, the data collected after the expiry date may not be considered valid. However, should the research conclude for any reason prior to approval expiry, you are required to submit a *Completion (End of a Study) Report* (F10) to the board once the data analysis is complete to give an account of the study findings and publication status.

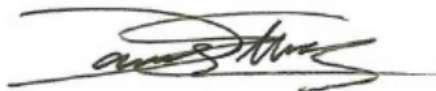
Furthermore, should any revision to the project or other development occur prior to the next continuing review, you must advise the REB without delay. Regulation does not permit initiation of a proposed study modification prior to its approval by the REB.

The MUHC REB is registered and works under the published guidelines of the *Tri-Council Policy Statement 2*, in compliance with the *Plan d'action ministériel en éthique de la recherche et en intégrité scientifique* (MSSS, 1998) and the *Food and Drugs Act* (2001.06.07), acting in conformity with standards set forth in the (US) *Code of Federal Regulations* governing human subjects research and functioning in a manner consistent with internationally accepted principles of good clinical practice.

We wish to advise you that the MUHC REB "working procedures" completely satisfies the requirements for Research Ethics Board Attestation (REBA) as stipulated by Health Canada. Neuro and MUHC research that is subject to US Federal Wide Assurance is conducted under FWA00000840.

We trust this will prove satisfactory to you. Thank you for your consideration in this matter.

Best Regards,



James Ellasus
Coordonnateur du CÉR du CUSM | MUHC REB Coordinator
pour: le co-président du CÉR du CUSM | for: MUHC REB Co-Chair

Signed on 2025-04-15 at 14:31



CERTIFICATION OF ETHICAL ACCEPTABILITY FOR RESEARCH INVOLVING HUMAN SUBJECTS

Name of Applicant: Hector Silva

Department: Faculty of Arts and Science\Health, Kinesiology and Applied Physiology

Agency: N/A

Title of Project: Demographic and Psychosocial Profiles in Teen Obesity Treatment: Surgery Versus Standard Care

Certification Number: 30021914

Valid From: June 03, 2025 To: June 02, 2026

The members of the University Human Research Ethics Committee have examined the application for a grant to support the above-named project, and consider the experimental procedures, as outlined by the applicant, to be acceptable on ethical grounds for research involving human subjects.

A handwritten signature in black ink, reading "Richard DeMont".

Dr. Richard DeMont, Chair, University Human Research Ethics Committee

Psychosocial questionnaires used at CEASO

ENGLISH ASSESSMENT QUESTIONNAIRES - CHILD

Patient MCH ID # _____

Date of Assessment (dd/mm/yyyy) _____

☒ Medical / ☐ Surgical

☒ Baseline / ☐ Follow-up: _____ months

Notes

The following questionnaires should be completed by the child.

You can use different ways to input your answers. Here are some examples on how you can do it:

1. You can bold your answer.

Pessimism

- 0 I am not discouraged about my future.
- 1 I feel more discouraged about my future than I used to be.
- 2 I do not expect things to work out for me.**
- 3 I feel my future is hopeless and will only get worse.

2. You can put an x in the appropriate box.

e) Do you sometimes have regrets or feel ashamed after you've eaten?	X	No (0)
--	---	-----------

OR

3. Print the document, fill in your answers. Take pictures/scan and send back via email to Carla Farnesi at Carla.farnesi@muhc.mcgill.ca

**** If any of the questions are not clear, feel free to email Carla**

Causes of Obesity

Instructions

Please rank the following factors in terms of how **important you think** they are in causing obesity.

	Not at all Important	Somewhat Important	Moderately Important	Very Important	Extremely Important
1. Physical Inactivity	1	2	3	4	5
2. Overeating	1	2	3	4	5
3. High Fat Diet	1	2	3	4	5
4. Genetic Factors	1	2	3	4	5
5. Poor Nutritional Knowledge	1	2	3	4	5
6. Psychological Problems	1	2	3	4	5
7. Repeated Dieting (Weight Cycling)	1	2	3	4	5
8. Restaurant Eating	1	2	3	4	5
9. Lack of Willpower	1	2	3	4	5
10. Metabolic Defect	1	2	3	4	5
11. Endocrine Disorder	1	2	3	4	5
12. Food addiction	1	2	3	4	5
13. Marketing/advertising of unhealthy foods	1	2	3	4	5
14. Pricing of foods (e.g., inexpensive unhealthy foods, more expensive healthier foods)	1	2	3	4	5

FOSTER, GARY D., THOMAS A. WADDEN, ANGELA P. MAKRIS, DUNCAN DAVIDSON, REBECCA SWAIN SANDERSON, DAVID B. ALLISON, AND AMY KESSLER. Primary care physicians' attitudes about obesity and its treatment. *Obes Res.* 2003;11:1168-1177.

MOTIVATION

Using a scale from one (low) to ten (high):

1. How **important** is it for you to make lifestyle changes to improve your overall health?

1		2		3		4		5		6		7		8		9		10
low																		high

2. How confident are you that you **could** make lifestyle changes to improve your health if you decided to?

1		2		3		4		5		6		7		8		9		10
low																		high

3. To what extent are you **trying** to make lifestyle changes to improve your health?

1		2		3		4		5		6		7		8		9		10
low																		high

Sleep Questions

1. How many hours do you usually spend sleeping in a 24 hour period, excluding time spent resting? _____

	Never (0)	Rarely	Sometimes	Most of the time	All of the time	Don't know (5)
2. How often do you have trouble going to sleep?	0	1	2	3	4	5
3. How often do you wake up in the middle of the night?	0	1	2	3	4	5
4. How often do you feel refreshed upon waking in the morning?	0	1	2	3	4	5
5. How often do you find it difficult to stay awake during normal waking hours?	0	1	2	3	4	5

ADO-BED Questionnaire

Instructions:

Circle the answers to the questions

1. Do you sometimes have a strong craving to eat although you are not really hungry or you have recently eaten?	Yes (1)	No (0)
---	------------	-----------

If you answered NO to question 1, please stop here.

If you answered Yes, continue with question 2:

2. In this situation, do you sometimes find yourself starting to eat and then being unable to stop? For example, have you in the past wanted to eat a few biscuits and been unable to stop until the pack was empty?	Yes (1)	No (0)
--	------------	-----------

3. In these moments when you find yourself eating although you are not hungry or when you can't stop eating:

a) Do you sometimes feel the need to be alone, to isolate yourself to eat?	Yes (1)	No (0)
b) Do you sometimes have the feeling of being very detached, not really in the moment, as if you were eating while day-dreaming?	Yes (1)	No (0)
c) Do you sometimes eat because you feel unsettled, unwell, sad, angry or bored?	Yes (1)	No (0)
d) Do you sometimes feel you eat too much or that you eat more than others?	Yes (1)	No (0)
e) Do you sometimes have regrets or feel ashamed after you've eaten?	Yes (1)	No (0)

4. How often do you experience not being able to stop eating or do you find yourself eating without being hungry?	<i>At least once a month</i> (1)	<i>2-3 times a month</i> (2)	<i>2-3 times per week</i> (3)	<i>every day</i> (4)
5. Since when have you experienced this?	<i>Less than 3 months</i> (1)	<i>More than 3 months</i> (2)		
6. When you are in these situations do you sometimes need to take action to eliminate what you have just eaten (exercise, skip the next meal, self induce vomiting. . .)	Yes (1)	No (2)		

Food Frequency and Eating Habits Questionnaire

	<u>Child</u>
How frequently do the following behaviors occur for you? 0-never 1-almost never 2-sometimes 3-frequently 4-always	
1. Eat while standing	
2. Eat straight from the pot/pan/bowl	
3. Eat while watching television, reading, working	
4. Eat when bored	
5. Eat when angry or in other negative mood states	
6. Eat in a disorganized way between meals	
7. Eat late in the evening or at night	
8. Eat in the living room/TV room	
9. Eat in the bedroom	
10. Eat in the office	
11. How often do you customarily ask for or take a second helping?	
17. How would you rate your eating pace compared to people of the same age: 1- Slow 2- Average 3- Fast	

Screen for Child Anxiety Related Emotional Disorders-Revised (SCARED-R) – Child Version

Instruction

Below, you will find a number of statements, which refer to children's fears and anxiety. Please read each statement carefully and indicate how frequently you have experienced that symptom **during the last 3 months**: *never or almost never, sometimes, or often*.

		0 Never or almost never	1 Sometimes	2 Often
1.	When I feel frightened, it is hard to breathe			
2.	I am afraid of heights			
3.	I get headaches or bellyaches when I am at school			
4.	I don't like to be with unknown people			
5.	When I see blood, I get dizzy			
6.	I want things to be in a fixed order			
7.	I get scared when I sleep away from home			
8.	I worry about others not liking me			
9.	When I get frightened, I feel like passing out			
10.	I think that I will be contaminated with a serious disease			
11.	I am nervous			
12.	I have strange thoughts that frighten me			
13.	I follow my mother or father wherever they go			
14.	People tell me that I look nervous			
15.	I feel nervous with people I don't know well			
16.	I am afraid to visit the doctor			
17.	I don't like going to school			
18.	When I get frightened, I feel like I am going crazy			
19.	I worry about sleeping alone			
20.	I am afraid to visit the dentist			
21.	I worry about being as good as other kids			
22.	I am afraid of an animal that is not really dangerous			
23.	I get scared when there is thunder in the air			
24.	I do things more than twice in order to check whether I did it right			
25.	I have frightening dreams about a very aversive event I once experienced			
26.	I want things to be clean and tidy			

		0 Never or almost never	1 Sometimes	2 Often
27.	When I get frightened, it feels like things are not real			
28.	I would feel scared if I had to fly in an aeroplane			
29.	I have nightmares about something bad happening to my parents			
30.	I worry about going to school			
31.	I perform rituals that help me to get less scared of my thoughts			
32.	When I feel frightened, my heart beats fast			
33.	I am scared when I get an injection			
34.	I am afraid of getting a serious disease			
35.	I feel weak and shaky			
36.	I have nightmares about something bad happening to me			
37.	I am so scared of a harmless animal that I do not dare to touch it			
38.	I worry about things working out for me			
39.	I doubt whether I really did something			
40.	When I get frightened, I sweat a lot			
41.	I am a worrier			
42.	I feel scared when I watch a medical operation on TV			
43.	I try not to think about a very aversive event I once experienced			
44.	Suddenly I get really frightened for no reason at all			
45.	I am afraid to be alone in the house			
46.	I get scared when I think back of a very aversive event I once experienced			
47.	It is hard for me to talk with unfamiliar people			
48.	When I get frightened, I feel like I am choking			
49.	People tell me that I worry too much			
50.	I don't like to be away from my family			
51.	I am afraid of having anxiety (or panic) attacks			
52.	I worry that something bad might happen to my parents			
53.	I feel shy with people I don't know well			
54.	I have unwanted thoughts about hurting other people			
55.	I worry about what is going to happen in the future			
56.	When I get frightened, I feel like throwing up			
57.	I worry about how well I do things			
58.	I am scared to go to school			
59.	I worry about things that happened in the past			
60.	When I feel frightened, I get dizzy			

		0 Never or almost never	1 Sometimes	2 Often
61.	I get scared in small, closed places			
62.	I have strange, scary thoughts that I prefer not to have			
63.	I am afraid of the dark			
64.	I have unbidden thoughts about a very aversive event I once experienced			
65.	I am afraid of an animal that most children do not fear			
66.	I don't like being in a hospital			
67.	I feel nervous when I am with other children or adults and I have to do something while they watch me (for example: read aloud, speak, play a game, play a sport)			
68.	I feel nervous when I am going to parties, dances, or any place where there will be people that I don't know well			
69.	I am shy			

Internal Use

Panic Disorder	
Specific Phobias- Environmental	
School Phobia	
Social Phobias	
Specific Phobias- Medical	
Obsessive Compulsive Disorder	
Separation Anxiety Disorder	
Generalized Anxiety Disorder	
Specific Phobias- Animals	
Post-traumatic stress disorder	
Total	

Impact of Weight on Quality of Life (IWQOL)-Kids

Instructions

Please answer the following statements by circling the number that best applies to you in the past seven days. Be as open as possible. There are no right or wrong answers.

Physical Comfort		ALWAYS TRUE	USUALLY TRUE	SOMETIMES TRUE	RARELY TRUE	NEVER TRUE
1.	Because of my weight I avoid using stairs whenever possible.	1	2	3	4	5
2.	Because of my weight it is hard for me to bend over to tie my shoes or to pick something up off the floor.	1	2	3	4	5
3.	Because of my weight it is hard for me to move around.	1	2	3	4	5
4.	Because of my weight it is hard for me to fit into seats in public places (e.g., movie theaters, desks at school, booths in restaurants).	1	2	3	4	5
5.	Because of my weight my knees or ankles hurt.	1	2	3	4	5
6.	Because of my weight it is hard for me to cross my legs.	1	2	3	4	5

Body Esteem		ALWAYS TRUE	USUALLY TRUE	SOMETIMES TRUE	RARELY TRUE	NEVER TRUE
7.	Because of my weight I am ashamed of my body.	1	2	3	4	5
8.	Because of my weight I don't like myself very much.	1	2	3	4	5
9.	Because of my weight I try not to look at myself in mirrors or in photographs.	1	2	3	4	5
10.	Because of my weight I have a hard time believing compliments that I receive from others.	1	2	3	4	5
11.	Because of my weight I am lacking in self-confidence.	1	2	3	4	5
12.	Because of my weight I avoid activities that involve wearing shorts or a bathing suit.	1	2	3	4	5
13.	Because of my weight it is very difficult for me to buy clothing.	1	2	3	4	5
14.	Because of my weight I don't like to change my clothes or undress in front of others.	1	2	3	4	5
15.	Because of my weight I am embarrassed to try out for activities at school.	1	2	3	4	5

Social Life		ALWAYS TRUE	USUALLY TRUE	SOMETIMES. TRUE	RARELY TRUE	NEVER TRUE
16.	Because of my weight people tease me or make fun of me.	1	2	3	4	5
17.	Because of my weight people talk about me behind my back.	1	2	3	4	5
18.	Because of my weight people avoid spending time with me.	1	2	3	4	5
19.	Because of my weight people stare at me.	1	2	3	4	5
20.	Because of my weight I have trouble making or keeping friends.	1	2	3	4	5
21.	Because of my weight people don't think I'm very smart.	1	2	3	4	5

Family Relations		ALWAYS TRUE	USUALLY TRUE	SOMETIMES TRUE	RARELY TRUE	NEVER TRUE
22.	Because of my weight family members treat me differently from the way they treat other people.	1	2	3	4	5
23.	Because of my weight family members talk about me behind my back.	1	2	3	4	5
24.	Because of my weight one or more people in my family reject me.	1	2	3	4	5
25.	Because of my weight my parents aren't proud of me.	1	2	3	4	5
26.	Because of my weight family members make fun of me.	1	2	3	4	5
27.	Because of my weight family members don't want to be seen with me.	1	2	3	4	5

© Copyright 2002 Ronette L. Kolotkin, Ph.D., Obesity and Quality of Life Consulting, Durham, NC
and Children's Hospital Medical Center, Cincinnati, OH All rights reserved. Do not
use without permission.

Internal Use

Physical Comfort	
Body Esteem	
Social Life	
Body Esteem	
Total Score	

Physical Activity Enjoyment Scale (Paces)

Instructions

Please rate how you feel about the physical activity you have been doing.

1. I enjoy it	1	2	3	4	5	6	7	I hate it
2. I feel bored	1	2	3	4	5	6	7	I feel interested
3. I dislike it	1	2	3	4	5	6	7	I like it
4. I find it pleasurable	1	2	3	4	5	6	7	I find it unpleasurable
5. I am very absorbed in the activity	1	2	3	4	5	6	7	I am not at all absorbed in the activity
6. It's no fun at all	1	2	3	4	5	6	7	It's a lot of fun
7. I find it energizing	1	2	3	4	5	6	7	I find it tiring
8. It makes me depressed	1	2	3	4	5	6	7	It makes me happy
9. It's very pleasant	1	2	3	4	5	6	7	It's very unpleasant
10. I feel good physically while doing it	1	2	3	4	5	6	7	I feel bad physically while doing it
11. It's very invigorating	1	2	3	4	5	6	7	It's not at all invigorating
12. I am very frustrated by it	1	2	3	4	5	6	7	I am not at all frustrated by it
13. It's very gratifying	1	2	3	4	5	6	7	It's not at all gratifying
14. It's very exhilarating	1	2	3	4	5	6	7	It's not at all exhilarating
15. It's not at all stimulating	1	2	3	4	5	6	7	It's very stimulating
16. It gives me a strong sense of accomplishment	1	2	3	4	5	6	7	It does not give me any sense of accomplishment at all
17. It's very refreshing	1	2	3	4	5	6	7	It's not at all refreshing
18. I felt as though I would rather be doing something else	1	2	3	4	5	6	7	I felt as though there was nothing else I would rather be doing

Reference: Kendziersi D, DeCarlo K. Physical activity enjoyment scale: Two validation studies. *Journal of Sport and Exercise Psychology*. 1991; 13; 50-64.

Beck Depression Inventory (BDI)-II

Instructions

This questionnaire consists of 21 groups of statements. Please read each group of statements carefully, and then pick out the **one statement** in each group that best describes the way you have been feeling during **the past two weeks, including today**. Circle the number beside the statement you have picked. If several statements in the group seem to apply equally well, circle the highest number for that group. Be sure you do not choose more than one statement for any group, including Item 16 (changes in sleeping pattern) or Item 18 (changes in appetite).

1. Sadness

- 0 I do not feel sad.
- 1 I feel sad much of the time
- 2 I am sad all the time
- 3 I am so sad or unhappy that I can't stand it.

2. Pessimism

- 0 I am not discouraged about my future.
- 1 I feel more discouraged about my future than I used to be.
- 2 I do not expect things to work out for me.
- 3 I feel my future is hopeless and will only get worse.

3. Past Failure

- 0 I do not feel like a failure.
- 1 I have failed more than I should have.
- 2 As I look back, I see a lot of failures.
- 3 I feel I am a total failure as a person.

4. Loss of Pleasure

- 0 I get as much pleasure as I ever did from the things I enjoy.
- 1 I don't enjoy things as much as I used to.
- 2 I get very little pleasure from the things I used to enjoy.
- 3 I can't get any pleasure from the things I used to enjoy.

5. Guilty Feelings

- 0 I don't feel particularly guilty
- 1 I feel guilty over many things I have done or should have done.
- 2 I feel quite guilty most of the time.
- 3 I feel guilty all of the time.

6. Punishment Feelings

- 0 I don't feel I am being punished.
- 1 I feel I may be punished.
- 2 I expect to be punished.
- 3 I feel I am being punished.

7. Self-Dislike

- 0 I feel the same about myself as ever.
- 1 I have lost confidence in myself.
- 2 I am disappointed in myself.
- 3 I dislike myself.

8. Self-Criticalness

- 0 I don't criticize or blame myself more than usual
- 1 I am more critical of myself than I used to be.
- 2 I criticize myself for all of my faults.
- 3 I blame myself for everything bad that happens.

9. Suicidal Thoughts or Wishes

- 0 I don't have any thoughts of killing myself.
- 1 I have thoughts of killing myself, but I would not carry them out.
- 2 I would like to kill myself.
- 3 I would kill myself if I had the chance.

10. Crying

- 0 I don't cry any more than usual.
- 1 I cry more than I used to.
- 2 I cry over every little thing.
- 3 I feel like crying, but I can't.

11. Agitation

- 0 I am no more restless or wound up than usual.
- 1 I feel more restless or wound up than usual.
- 2 I am so restless or agitated that it's hard to stay still.
- 3 I am so restless or agitated that I have to keep moving or doing something.

12. Loss of Interest

- 0 I have not lost interest in other people or activities.
- 1 I am less interested in other people or things than I used to be.
- 2 I have lost most of my interest in other people or things.
- 3 It's hard to get interested in anything.

13. Indecisiveness

- 0 I make decisions about as well as ever.
- 1 I find it more difficult to make decisions than usual.
- 2 I have greater difficulty in making decisions than I used to.
- 3 I have trouble making any decisions.

14. Worthlessness

- 0 I do not feel I am worthless
- 1 I don't consider myself as worthwhile and useful as I used to.
- 2 I feel more worthless as compared to other people.
- 3 I feel utterly worthless.

15. Loss of Energy

- 0 I have as much energy as ever.
- 1 I have less energy than I used to have.
- 2 I don't have enough energy to do very much.
- 3 I don't have enough energy to do anything.

16. Changes in Sleeping Pattern

- 0 I have not experienced any changes in my sleeping pattern
- 1a I sleep somewhat more than usual.
- 1b I sleep somewhat less than usual.
- 2a I sleep a lot more than usual
- 2b I sleep a lot less than usual
- 3a I sleep most of the day
- 3b I wake up 1-2 hours early and can't go back to sleep

17. Irritability

- 0 I am no more irritable than usual.
- 1 I am more irritable than usual.
- 2 I am much more irritable than usual.
- 3 I am irritable all the time.

18. Changes in Appetite

- 0 I have not experienced any changes in my appetite.
- 1a My appetite is somewhat less than usual.
- 1b My appetite is somewhat greater than usual.
- 2a My appetite is much less than before.
- 2b My appetite is much greater than usual.
- 3a I have no appetite at all.
- 3b I crave food all the time.

19. Concentration Difficulty

- 0 I can concentrate as well as ever.
- 1 I can't concentrate as well as usual.
- 2 It's hard to keep my mind on anything for very long.
- 3 I find I can't concentrate on anything.

20. Tiredness or Fatigue

- 0 I am no more tired or fatigued than usual.
- 1 I get more tired or fatigued to do a lot of things I used to do.
- 2 I am too tired or fatigued to do a lot of the things I used to do.
- 3 I am too tired or fatigued to do most of the things I used to do.

21. Loss of Interest in Sex

- 0 I have not noticed any recent change in my interest in sex.
- 1 I am less interested in sex than I used to be.
- 2 I am much less interested in sex now.
- 3 I have lost interest in sex completely.

Modified Weight Bias Internalization Scale

Instructions

Please rate your agreement with each item

	Strongly disagree	Disagree	Slightly disagree	Neither agree nor disagree	Slightly agree	Agree	Strongly agree
1. Because of my weight, I feel that I am just as competent as anyone	1	2	3	4	5	6	7
2. I am less attractive than most other people because of my weight.	1	2	3	4	5	6	7
3. I feel anxious about my weight because of what people might think of me.	1	2	3	4	5	6	7
4. I wish I could drastically change my weight.	1	2	3	4	5	6	7
5. Whenever I think a lot about my weight, I feel depressed.	1	2	3	4	5	6	7
6. I hate myself for my weight.	1	2	3	4	5	6	7
7. My weight is a major way that I judge my value as a person.	1	2	3	4	5	6	7
8. I don't feel that I deserve to have a really fulfilling social life, because of my weight.	1	2	3	4	5	6	7
9. I am OK being the weight that I am.	1	2	3	4	5	6	7
10. Because of my weight, I don't feel like my true self.	1	2	3	4	5	6	7
11. Because of my weight, I don't understand how anyone attractive would want to date me.	1	2	3	4	5	6	7

Pearl, R. L., & Puhl, R. M. (2014). Measuring internalized weight attitudes across body weight categories: validation of the modified weight bias internalization scale. *Body image*, 11(1), 89-92.

The Adolescent Sedentary Activity Questionnaire (ASAQ)

Think about a normal *school* week and write down how long (hours/minutes) you spend doing the following activities:

Activity	Monday	Tuesday	Wednesday	Thursday	Friday
Sitting in class at school?					
Watching tv?					
Watching videos / DVDs?					
Using the computer for fun?					
Using the computer for doing homework?					
Doing homework not on the computer?					
Reading for fun?					
Being tutored?					
Travel (car/bus/train)?					
Doing crafts or hobbies?					
Sitting around (chatting with friends on the phone / chilling)?					
Playing/practicing a musical instrument?					

Think about a *normal weekend*, and write down how long (hours/minutes) you spend doing the following activities on the weekend

Activity	Saturday	Sunday
Watching tv?		
Watching videos / DVDs?		
Using the computer for fun?		
Using the computer for doing homework?		
Doing homework not on the computer?		
Reading for fun?		
Being tutored?		
Travel (car/bus/train)?		
Doing crafts or hobbies?		
Sitting around (chatting with friends on the phone / chilling)?		
Playing/practicing a musical instrument?		
Going to church or Saturday school?		

ENGLISH ASSESSMENT QUESTIONNAIRES – PARENT/CAREGIVER

Patient MCH ID # _____

Date of Assessment (dd/mm/yyyy) _____

☒ Medical / ☐ Surgical

☒ Baseline / ☐ Follow-up: _____ months

Notes

The following questionnaires should be completed by the parent/caregiver.

You can use different ways to input your answers. Here are some examples on how you can do it:

1. You can bold your answer.

Pessimism

- 0 I am not discouraged about my future.
- 1 I feel more discouraged about my future than I used to be.
- 2 I do not expect things to work out for me.**
- 3 I feel my future is hopeless and will only get worse.

2. You can put an x in the appropriate box.

e) Do you sometimes have regrets or feel ashamed after you've eaten?	X	No (0)
--	---	-----------

OR

3. Print the document, fill in your answers. Take pictures/scan and send back via email to Carla Farnesi at carla.farnesi@muhc.mcgill.ca

**** If any of the questions are not clear, feel free to email Carla**

Food Frequency and Eating Habits Questionnaire

	<u>Mother</u> ☐ n/a	<u>Father</u> ☐ n/a
How frequently do the following behaviors occur for each of you? 0-never 1-almost never 2-sometimes 3-frequently 4-always		
1. Eat while standing		
2. Eat straight from the pot/pan/bowl		
3. Eat while watching television, reading, working		
4. Eat when bored		
5. Eat when angry or in other negative mood states		
6. Eat in a disorganized way between meals		
7. Eat late in the evening or at night		
8. Eat in the living room/TV room		
9. Eat in the bedroom		
10. Eat in the office		
11. How often do you customarily ask for or take a second helping?		
12. How often does your child buy his/her own sweets?		
13. How often do you or your spouse eat breakfast with the child?		
14. How often do you or your spouse eat lunch with the child?		
15. How often do you or your spouse eat afternoon snack with the child?		
16. How often do you or your spouse eat dinner with the child?		
17. How would you rate your eating pace compared to people of the same age: 1- Slow 2- Average 3- Fast		

Version 2.0 - Revised

18. In most cases each of you eats because: 0-you are hungry or it is meal time 1-you feel like it 2-you are responding to food cues		
19. If it is meal time and your child is not hungry, you prefer the child: 0- delay the meal, eat later 1- sit with the rest but not eat 2- sit with the rest but eat less 3- sit with rest and convince to eat 4- it is an irrelevant question the child is always hungry		
20. When it is meal time and you are not hungry, what would you respond? 1- Not eat 2- Eat less 3- Eat the same 4- It never happens 5- Unknown		
21. When your child asks to eat, does he/she claim to be hungry? 1- yes 2-no		
22. Usually when each of you eats 1-You asked for or took the food 2- The food was offered		

23. How often does your child usually eat the following foods? (both meals and snacks, at home and away from home)

	Product	Avg Serving	Never, <1/mo (0)	1-3/mo (1)	1/wk (2)	2-4/wk (3)	5-6/wk (4)	1/day (5)	2-3/day (6)	4-5/day (7)	>6/day (8)
<u>Milk</u>											
1.	3.25% (whole or homo) milk	1 cup/250ml									
2.	2% milk	1 cup/250ml									
3.	1% milk	1 cup/250ml									
4.	Skim or Non-Fat incl powdered milk	1 cup/250ml									
5.	Flavored milk	1 cup/250ml									
6.	Rice milk	1 cup/250ml									
7.	Soy milk	1 cup/250ml									
<u>Dairy Products</u>											
8.	Cottage cheese	1/2 cup/125ml									
9.	Yogurt (excl frozen yogurt)	1 cup/250ml									
10.	Ice cream, frozen yogurt	1 cup/250ml									
11.	Hard cheese (cheddar, marble, gouda)	1 slice/21g									
<u>Fruits and Vegetables</u>											
12.	Fruit (fresh, frozen or canned)	1 medium									
13.	Lettuce or green leafy salad	1/2 cup/125ml									
14.	Spinach, mustard greens or collards (excl. kale)	1/2 cup/125ml									
15.	All other types of vegetables (not mentioned above)	1/2 cup/125ml									

	Product	Avg Serving	Never, <1/mo (0)	1-3/mo (1)	1/wk (2)	2-4/wk (3)	5-6/wk (4)	1/day (5)	2-3/day (6)	4-5/day (7)	>6/day (8)
<u>Beverages</u>											
16.	Regular soft drinks	1 cup/250ml									
17.	Diet soft drinks	1 cup/250ml									
18.	Sports drinks (Gatorade, Powerade)	1 cup/250ml									
19.	Energy Drinks (Red Bull, Rage, etc)	1 cup/250ml									
20.	Fruit Juice (100%)	1 cup/250ml									
21.	Fruit-flavoured drinks (Kool-Aid, Punch)	1 cup/250ml									
22.	Vegetable juice	1 cup/250ml									
23.	Water	1 cup/250ml									
<u>Other</u>											
24.	Eating out or ordering meals										
25.	How often does the child eat breakfast?										

Pediatric Quality of Life (Teen 13-18 yo) – Parent Report

Instructions

In the past one month, how much of a problem has your teen had with...

Physical Functioning (<i>problems with...</i>)		NEVER	ALMOST NEVER	SOMETIMES	OFTEN	ALMOST ALWAYS
1.	Walking more than one block	0	1	2	3	4
2.	Running	0	1	2	3	4
3.	Participating in sports activity or exercise	0	1	2	3	4
4.	Lifting something heavy	0	1	2	3	4
5.	Taking a bath or shower by him or herself	0	1	2	3	4
6.	Doing chores around the house	0	1	2	3	4
7.	Having hurts or aches	0	1	2	3	4
8.	Low energy levels	0	1	2	3	4

Emotional Functioning (<i>problems with...</i>)		NEVER	ALMOST NEVER	SOMETIMES	OFTEN	ALMOST ALWAYS
1.	Feeling afraid or scared	0	1	2	3	4
2.	Feeling sad or blue	0	1	2	3	4
3.	Feeling angry	0	1	2	3	4
4.	Trouble sleeping	0	1	2	3	4
5.	Worrying about what will happen to him or her	0	1	2	3	4

Social Functioning (<i>problems with...</i>)		NEVER	ALMOST NEVER	SOMETIMES	OFTEN	ALMOST ALWAYS
1.	Getting along with other teens	0	1	2	3	4
2.	Other teens not wanting to be his or her friend	0	1	2	3	4
3.	Getting teased by other teens	0	1	2	3	4
4.	Not able to do things that other teens his or her age can do	0	1	2	3	4
5.	Keeping up with other teens	0	1	2	3	4

School Functioning (<i>problems with...</i>)		NEVER	ALMOST NEVER	SOMETIMES	OFTEN	ALMOST ALWAYS
1.	Paying attention in class	0	1	2	3	4
2.	Forgetting things	0	1	2	3	4
3.	Keeping up with schoolwork	0	1	2	3	4
4.	Missing school because of not feeling well	0	1	2	3	4
5.	Missing school to go to the doctor or hospital	0	1	2	3	4

Internal Use

Physical	
Emotional	
Social	
School	

Patient & Family intake questionnaire

► **BASELINE ASSESSMENT FORM**

Preferred Name: _____

Preferred Pronoun: He/Him She/Her They/Them Other _____

Gender Identity:

- | | | |
|----------------------------------|--|--|
| ☐ Female | ☐ Gender fluid | ☐ Trans male to female |
| ☐ Male | ☐ Agender | ☐ Other |
| ☐ Non-binary | ☐ Trans female to male | |

◀ **FAMILY DOCTOR** ▶

Médecin de famille ou pédiatre/Family physician or Pediatrician: Oui/Yes Non/No

Si oui nom et clinique/ If Yes name and clinic: _____

Si non, êtes-vous sur la liste d'attente/ If no are you on the waiting list?: Oui/Yes No/Non

◀ **ANTHROPOMETRICS** ▶

PATIENT

Date de naissance/ Date of Birth (yyyy/mm/dd) _____ **Age**/ Age _____

Taille/ Height (cm) _____ **Poids**/ Weight (kg) _____

IMC/ BMI (kg/m²) _____ % above 95th BMI Percentile: _____

Circonférence du cou/ Neck circumference (cm) _____

Tour de taille/ Waist circumference (cm) _____

Fréquence cardiaque/ Heart rate (bpm) _____

Pression artérielle/ Blood pressure : ____ / ____ mmHg

Rythme Respiratoire/ Respiration rate: _____ rrp/bpm

PARENTS

Mère biologique/ Biological mother

Taille/ Height _____ cm

inconnu/ unknown

Poids/ Weight _____ kg

inconnu/ unknown

- ☐ **Rapportées/** Self-reported
- ☐ **Mesurées/** Measured
- ☐ **Autre (qui a fourni l'information)/** Other
(who provided this information) _____

Age _____

Inconnu/ Unknown

Décédé (âge au décès)/ Deceased (age
of death) _____

Père biologique/ Biological father

Taille/ Height _____ cm

inconnu/ unknown

Poids/ Weight _____ kg

inconnu/ unknown

- ☐ **Rapportées/** Self-reported
- ☐ **Mesurées/** Measured
- ☐ **Autre (qui a fourni l'information)/** Other
(who provided this information) _____

. Age _____

Inconnu/ Unknown

Décédé (âge au décès)/ Deceased (age of
death) _____

▶ VACCINATIONS ◀

Routine Vaccinations Up to Date: Oui/Yes Non/No

COVID Vaccine : Oui/Yes Non/No

Influenza Vaccine : Oui/Yes Non/No

FAMILY HISTORY

	Mère biologique/ Biological mother			Père biologique/ Biological father			Grands-parents/ Grandparent			Tante ou Oncle/ Aunt or Uncle			Frère ou sœur/ Sibling		
	N/A			N/A			N/A			N/A			N/A		
	O/Y	N	I/U	O/Y	N	I/U	O/Y	N	I/U	O/Y	N	I/U	O/Y	N	I/U
1. Maladie cardiaque/ Cardiovascular disease															
2. Hypertension															
3. Dyslipidémie/ Dyslipidemia															
4. Diabète/ Diabetes															
5. Diabète gestationnel/ Gestational diabetes															
6. Hypo ou hyperthyroïdie/ Hypo or Hyperthyroidism															
7. Syndrome d'ovaire poly kystiques/ Polycystic ovarian syndrome															
8. Autre maladie endocriniens/ Other endocrine disease															
9. Obésité/ obesity															
10. Chirurgie bariatrique/ Bariatric Surgery															
11. Maladie respiratoire ou asthme/ Respiratory disease or asthma															

* N/A= Ne s'applique pas/ Not applicable, O/Y= Oui/ Yes, N= Non/ No, I/ U= Inconnu/ Unknown

	Mère biologique/ Biological mother			Père biologique/ Biological father			Grands-parents/ Grandparent			Tante ou Oncle/ Aunt or Uncle			Frère ou sœur/ Sibling		
	N/A			N/A			N/A			N/A			N/A		
	O/Y	N	I/U	O/Y	N	I/U	O/Y	N	I/U	O/Y	N	I/U	O/Y	N	I/U
12. Maladie rénale/ Kidney Disease															
13. Maladie gastro-intestinale/ Gastrointestinal Disease															
14. Stéatose hépatique non alcoolique/ Non-alcoholic fatty liver disease															
15. Problème de vésicule biliaire/ Gallbladder problems															
16. Maladie sanguine or anémie/ Blood disorders or anaemia															
17. Cancer															
18. Apnée obstructive du sommeil/ Obstructive sleep apnea															
19. Trouble alimentaire/ Eating disorders															
20. Depression															
21. Anxiété/ Anxiety															
22. Autre santé mentale/ Other Mental Health Disease															
23. Démence/ Dementia															

ACCOUCHEMENT/ BIRTH HISTORY

1. Poids à la naissance/ Birth weight _____ g / lbs / oz
Inconnu/ unknown

2. Age gestationnel/ Gestational age

- a. <37 semaines/ weeks
- b. 37-39 semaines/ weeks
- c. 40-41 semaines/ weeks
- d. >41 semaines/ weeks
- e. Inconnu/ unknown

3. Accouchement/ Delivery

- Vaginal
- Césarienne/ Cesarean

4. Complications

- a. Diabète gestationnel/ Gestational diabetes
 - Oui/ Yes
 - Non/ No
 - Inconnu/ Unknown
- b. Taille à la naissance/ Birth Size
 - Petit par rapport à leur âge gestationnel/ Small for gestational age
 - Gros par rapport à leur âge gestationnel/ Large for gestational age
 - Inconnu/ Unknown

5. Alimentation/ Feeding

	Oui / Yes	Non/ No	Durée/ Duration
Allaitement/ Breast fed			
Lait maternisé/ Formula			

Age lors de l'introduction d'aliment solide/ Age of introduction of solids: _____