

8-2012

Obesity and outcomes of bariatric surgery: A focus on patients with postoperative substance use disorders

Melissa Pulcini

Follow this and additional works at: <http://commons.emich.edu/theses>



Part of the [Psychology Commons](#)

Recommended Citation

Pulcini, Melissa, "Obesity and outcomes of bariatric surgery: A focus on patients with postoperative substance use disorders" (2012). *Master's Theses and Doctoral Dissertations*. 466.
<http://commons.emich.edu/theses/466>

This Open Access Thesis is brought to you for free and open access by the Master's Theses, and Doctoral Dissertations, and Graduate Capstone Projects at DigitalCommons@EMU. It has been accepted for inclusion in Master's Theses and Doctoral Dissertations by an authorized administrator of DigitalCommons@EMU. For more information, please contact lib-ir@emich.edu.

OBESITY AND OUTCOMES OF BARIATRIC SURGERY:
A FOCUS ON PATIENTS WITH POSTOPERATIVE SUBSTANCE USE DISORDERS

by

Melissa E. Pulcini

Thesis

Submitted to the Department of Psychology

Eastern Michigan University

in partial fulfillment of the requirements

for the degree of

MASTER OF SCIENCE

in

Clinical Psychology

Thesis Committee:

Karen K. Saules, Ph.D., Chair

Heather C. Janisse, Ph.D.

Tamara Loverich, Ph.D.

August 2012

Ypsilanti, Michigan

Acknowledgments

I would like to express my deep and sincere gratitude to The Graduate School at Eastern Michigan University and the Department of Psychology. My research would not have been possible without support from the Doctoral Fellow program. I would also like to thank my advisor, Dr. Karen K. Saules, for her invaluable guidance and support throughout this process.

Abstract

Recent evidence suggesting post-Roux-en-Y gastric bypass (RYGB) surgery patients are at an increased risk for developing substance use disorders (SUDs) has brought to light the importance of understanding how the postoperative development of a SUD may affect weight loss and psychosocial outcomes. The present investigation used a quasi-experimental, non-equivalent, matched pair between subjects group design to compare these outcomes in post-RYGB patients in inpatient treatment for SUDs with post-RYGB patients who reported no significant postsurgical substance-related problems. Participants were matched on sex, age, and time since surgery. Average weight losses of the two groups were not significantly different, but the SUD group exhibited a lower rate of surgical weight loss failure. The SUD group reported poorer psychosocial outcomes, including greater symptoms of depression, higher rates of probable Major Depressive Disorder (MDD), and poorer quality of life. No significant differences were found in rates of preoperative Binge Eating Disorder (BED) or postoperative behavioral excesses. Implications of these results for pre- and postsurgical care, in addition to addiction transfer theory, are discussed.

Table of Contents

Acknowledgements.....	ii
Abstract.....	iii
Introduction.....	1
Rationale for Present Study.....	34
Research Hypotheses.....	36
Method.....	39
Results.....	63
Discussion.....	84
References.....	101
Appendices	
Appendix A: Informed consent form for Brighton study participants	131
Appendix B: Recruitment letter to be mailed to potential control participants	139
Appendix C: Informed consent information sheet for control participants	141
Appendix D: Socio-demographics questionnaire.....	146
Appendix E: WHOQOL-BREF	149
Appendix F: PHQ-9.....	152
Appendix G: Behavioral Excess Questionnaire- Brighton participants.....	153
Appendix H: Behavioral Excess Questionnaire- Control participants.....	154
Appendix I: QEWP-R and Scoring Rubric	155
Appendix J: QEWP-R adapted for Brighton study	159
Appendix K: WHO – ASSIST V 3.0.....	164

List of Tables

Table 1: Participant characteristics.....	41
Table 2: WHOQOL-BREF domains and facets.....	44
Table 3: Mean scores of WHOQOL-BREF global items and transformed domains.....	67
Table 4: Substance Use Disorder status among recruited participants.....	81

List of Figures

Figure 1: Mean Percent Excess Weight Loss (EWL).....	65
Figure 2: Percent of groups meeting criteria for surgical failure.....	65
Figure 3: Transformed WHOQOL-BREF scores representing quality of life within physical, psychological, social, and environment domains.....	68
Figure 4: Mean Patient Health Questionnaire-9 (PHQ-9) scores.....	69
Figure 5: Percent of groups meeting Patient Health Questionnaire-9 (PHQ-9) criteria for probable Major Depressive Disorder (MDD).....	69
Figure 6: Gender by preoperative substance use group interaction on percent Excess Weight Loss (EWL) in those recruited for consideration into the control group.....	72
Figure 7: Gender by preoperative substance use group interaction on percent Excess Weight Loss (EWL) in inpatient SUDs treatment population.....	74
Figure 8: Gender by preoperative substance use group interaction on percent Excess Weight Loss (EWL) in inpatient SUDs treatment population.....	76
Figure 9: Prevalence of preoperative Binge Eating Disorder (BED)	78
Figure 10: Number of current behavioral excesses by preoperative BED group.....	78
Figure 11: Percent of participants recruited for consideration for inclusion into the control group who met QEWP-R criteria for probable Binge Eating Disorder (BED).....	84

Introduction

Obesity affects approximately one third of Americans, is associated with a host of adverse medical and psychosocial conditions, and is one of five leading global risks for mortality named by the World Health Organization (Flegal, Carroll, Ogden, & Curtin, 2010; World Health Organization [WHO], 2009). The most effective treatment for obesity and its related medical conditions is bariatric surgery (Karlsson, Taft, Rydén, Sjöström, & Sullivan, 2007; O'Brien et al., 2006; Padwal, Li, & Lau, 2003). Roux-en-Y gastric bypass (RYGB) is the most commonly performed type of bariatric surgery in the United States and is considered to be the “gold standard” treatment for morbid obesity (Pratt et al., 2009). Widely known risks associated with this procedure include nutritional deficiencies, anastomotic stricture, ulceration, dumping syndrome, and premature death. However, subtle risks that are not yet widely apparent to doctors or patients may exist. Recent research indicates that post-bariatric surgery patients may be at an increased risk for the development of or relapse to a substance use disorder (SUD; Ertelt et al., 2008; Saules et al., 2010). In this case, it will be important to understand other outcomes and characteristics of this bariatric surgery subpopulation and to explore potential mechanisms underlying this association.

The literature review that follows will cover obesity measurement, prevalence, trends, medical and psychosocial outcomes, etiology, and prevention. It then turns its focus to bariatric surgery types, weight loss outcomes, medical and psychosocial outcomes, and pre- and post-operative factors associated with weight loss outcome. Finally, the concept of maladaptive behavioral excesses as symptoms of behavioral addictions is discussed.

Very little is known about post-bariatric surgery patients who develop or relapse to SUDs, and there is debate as to whether certain types of eating pathology that are prevalent in

bariatric surgery candidates, namely binge eating disorder (BED), can be conceptualized as being part of an addictive process. The present study was designed to address limitations in the post-bariatric literature by comparing weight loss and psychosocial outcomes of post-RYGB surgery patients with postoperative substance use disorders relative to control participants (i.e., post-RYGB patients with no history of a postoperative substance use disorder) matched on three variables typically related to weight loss and psychosocial outcomes (i.e. sex, age at time of surgery, time since surgery). Preoperative BED prevalence will also be compared between groups. The relationship between retrospectively self-reported preoperative BED status and number and severity of postoperative maladaptive behavioral excesses endorsed (e.g. gambling, sex, and shopping behaviors) will also be assessed. Results may have implications for the appropriateness of conceptualizing binge eating as an addictive behavior and the possibility of postoperative “addiction transfer” in some individuals.

Obesity Measurement

Obesity is a condition involving excess adipose tissue, commonly referred to as body fat. There are several methods currently available that can be used to estimate adiposity, including underwater weighing, dual energy X-ray absorptiometry (DEXA), magnetic resonance imaging (MRI), bioelectrical impedance analysis (BIA), and total body electrical conductivity (TOBEC; Moyad, 2001). These methods tend to be costly, not widely available, and/or necessitate administration by skilled technicians, and thus are usually not practical to implement in large studies. Instead, another indirect measure of body fat, the Body Mass Index (BMI), is most commonly used for adults. BMI is based on height and weight and is calculated by dividing weight in kilograms (kg) by height in meters squared (m^2). The World Health Organization uses BMI as its standard unit for obesity statistics for adults and recommends a set of international

cut-offs for researchers, which include: Underweight <18.50 kg/m²; Normal range 18.50-24.99 kg/m²; Overweight ≥ 25.00 kg/m²; Obese ≥ 30.00 kg/m²; Obese class I 30.00 – 34.99 kg/m²; Obese class II 35.00 – 39.99 kg/m²; and Obese class III ≥ 40.00 kg/m² (WHO, 2010).

Although BMI is the most widely used method for estimating adiposity, there are several known problems with its use. Since BMI is based solely on weight and height, it cannot distinguish fat from bone, muscle, and other lean body mass. Given this deficit, it is not surprising that BMI has a tendency to overestimate body fat percentage in those with muscular builds, such as athletes, in addition to underestimating body fat percentage in those who have lost muscle, such as the elderly (National Institutes of Health [NIH], 2010). Furthermore, percentage of body fat, when ascertained by more accurate methods such as DEXA, in individuals with the same BMI value has been shown to vary significantly across ethnic and racial populations (Kagawa, Uenishi, Kuroiwa, Mori, & Binns, 2006; Rahman & Berenson, 2010). As a result, many scholars continue to advocate for the use of alternative measures of body fat in research (Burkhauser & Cawley, 2008). Nevertheless, BMI remains the most widely used method for the assessment of obesity, as it is inexpensive, widely available, and one of the few options available that can estimate obesity based on self-report.

Obesity Prevalence in the United States

The prevalence of obesity in adults aged 20-74 years in the United States was estimated using National Health and Nutrition Examination Survey (NHANES) data to be 33.8% in 2007-2008, with a slightly higher prevalence for women (35.5%) than for men (32.2%; Flegal, Carroll, Ogden, & Curtin, 2010). The category of obese class II or greater (BMI ≥ 35) described 14.3% of the sample population with women more likely to meet this criterion than men (17.8% vs.

10.7%, respectively). The prevalence of class III obesity (BMI \geq 40) was estimated at 5.7%, again with women more likely than men to be affected (7.2% vs. 4.2%, respectively).

Flegal et al. (2010) also found obesity prevalence to differ significantly by race, ethnicity, and age range. For example, non-Hispanic black women in the United States were reported to have a markedly high prevalence of class III obesity (14.2%), with the highest prevalence (17.7%) seen in the age range of 40-59 years of age. In comparison, non-Hispanic white women have a class III obesity prevalence of 6.4% (7.3% prevalence in 40-59 year olds), and Hispanic women have a prevalence of 7.0% (8.0% prevalence in 40-59 year olds). Caution should be exercised when interpreting these findings, given the aforementioned limitations of BMI as a measurement of adiposity. For example, taking into account Rahman and Berenson (2010)'s finding that white and Hispanic women have 2.9% more body fat than black women at a given BMI would lead one to believe the gap between class III obesity prevalence among these racial groups is not as wide as it would otherwise seem.

Trends in Obesity Prevalence Worldwide

The worldwide prevalence of obesity in adults has been increasing across several countries in recent decades, with countries with historically higher obesity rates showing more rapid increases (Sassi, Devaux, Cecchini, & Rusticelli, 2009). For example, Australia's obesity rates rose from 8.4% in 1989 to 18.6% in 2004-2005; Austria's rose from 6.0% in 1983 to 12.2% in 2006-2007; Canada's rose from 13.5% in 1994-1995 to 16.4% in 2005; England's rose from 14.2% in 1991 to 23.5% in 2005; France's rose from 5.5% in 1990 to 9.3% in 2004; Italy's rose from 6.3% in 1994-1995 to 8.6% in 2005; South Korea's rose from 2.4% in 1998 to 3.6% in 2001; Spain's rose from 8.2% in 1987 to 11.8% in 2003; the United States' rose from 12.6% in 1978 to 32.9% in 2005 (Sassi et al., 2009). Similarly, the rates of overweight and obesity in

preschool children worldwide have increased from 4.2% in 1990 to an estimated 6.7% in 2010, and they are projected to reach 9.1%, by 2020 (de Onis, Blossner, & Borghi, 2010).

Projected future worldwide weight trends include a possible stabilization or slight decline in overweight rates, with a projected continued increase in obesity rates (Sassi et al., 2009). This implies that many individuals who are currently overweight are projected to become obese. Countries with historically low levels of obesity, such as France and South Korea, are expected to see progressively rapid increases in overweight in the next decade (Sassi et al 2009). The United States, which saw especially marked increases in obesity prevalence between the periods of 1976-1980 and 1988-1994 and between the periods of 1988-1994 and 1999-2000, may now be seeing stabilization in obesity rates (Flegal et al., 2010). Estimates of obesity prevalence in female adults living in the US showed no significant changes between 1999 and 2008, and while male adults living in the US have shown an increase in the past decade, there were no significant differences in this group among the last three time points measured: 2003-2004, 2005-2006, and 2006-2007 (Flegal et al., 2010).

Obesity-Related Medical Outcomes

Overweight/obesity has been named one of the five leading global risks for mortality by the World Health Organization and is associated with three of the other four identified risks: hypertension, high blood glucose levels, and physical inactivity (WHO, 2009). Also a risk factor for hypercholesterolemia and raised triglyceride levels, obesity is associated with increased prevalence of cardiovascular diseases (CVDs), the leading cause of death in the world accounting for almost one third of all mortality (WHO, 2003; Mendis, 2010). Obesity is also a primary risk factor for type 2 diabetes, as excess adipose tissue can have a contributory role in increased insulin resistance, resulting in increased blood glucose levels. Other potentially life-

threatening conditions with well-established links to obesity include several types of cancers, obstructive sleep apnea, the development of gallstones, and asthma (Arif, Rohrer, & Delclos, 2005; Must et al., 1999). Consequently, obesity is associated with a reduced life expectancy; one large epidemiological study found that adults who were obese at age 40 lost 6-7 years of life compared to those in the normal weight range (Peeters et al., 2003).

Obesity has also been shown to increase the risk of complications following a number of surgical procedures and is associated with micronutrient deficiencies and the exacerbation of polycystic ovary syndrome (PCOS) symptoms (Brewer & Balen, 2010; Dowsey, Liew, Stoney, & Choong, 2010; Xanthakos, 2009). This condition is also associated with a host of other non-life threatening medical conditions, including osteoarthritis, stress incontinence, gout, and gastroesophageal reflux disease, which have potential to negatively impact quality of life (Jeong, 2008; Roddy, Zhang, & Doherty, 2007; Tincello et al., 2010; Yildiz et al., 2010).

Obesity-Related Psychosocial Outcomes

Anxiety. Obesity may be associated with anxiety. A recent meta-analysis found a moderate positive association between anxiety disorders and obesity (Garipey, Nitka, & Schmitz, 2010). This association may be influenced by sex and current weight loss treatment status, among other factors. In a study of a German urban population, Herpertz et al. (2006) found the point prevalence of anxiety disorders to be significantly higher in obese female controls (9.8%), obese women in conventional weight loss programs (15.3%), and obese women considering bariatric surgery (17.5%), when compared to normal-weight women (4.7%). Among men, obese controls had a higher anxiety disorder point prevalence rate (8.3%) than did normal-weight subjects (4.3%), but this was not true of men in conventional weight loss programs (4.4%) or in men considering bariatric surgery (4.0%).

Depression. Obesity may also be associated with depressive symptomatology. Higher rates of current and lifetime depressive disorders in obese men and women compared to normal weight controls have been reported, with a stronger association in women (Black, Goldstein, & Mason, 1992; Herpertz et al., 2006). The link between Major Depressive Disorder (MDD) and obesity may be mediated by levels of social and physical activity (de Wit et al., 2010). A recent meta-analysis of longitudinal studies found depression to increase the risk of developing obesity and vice versa (Luppino et al., 2010). The association between depression and obesity seems to vary with obesity severity, as class III obesity is associated with more depressive symptoms than obesity classes I and II (Castres, Folope, Dechelotte, Tourny-Chollet, & Lemaitre, 2010; Wadden et al., 2006).

Binge Eating Disorder. Binge eating disorder (BED), a proposed category for inclusion in the *DSM-V*, is characterized by recurrent episodes of consuming unusually large amounts of food in a short period of time accompanied by a sense of loss of control during consumption; these episodes cause significant distress and occur in the absence of regular dysfunctional compensatory behaviors. One study found the lifetime prevalence rates of BED in obese control women (5.4%), obese women participating in conventional weight loss treatment (9.3%), and obese women considering obesity surgery (7.8%) to each be significantly higher than the corresponding rate in normal-weight women (0%; Herpertz et al., 2006). Results of several studies suggest that obese individuals with BED experience increased psychiatric comorbidity, eating disorder psychopathology, subjective distress, and deficits in quality of life, compared to obese individuals without BED (Wonderlich, Gordon, J. E. Mitchell, Crosby, & Engel, 2009). Among obese bariatric surgery candidates, those with binge eating disorder display higher rates

of Axis I psychopathology and report greater symptoms of depression and lower self-esteem than their non- binge-eating counterparts (Jones-Corneille et al., 2010).

Health-Related Quality of Life. Obesity is associated with impaired health-related quality of life (HRQoL) and disability; results have been consistent as assessed across a variety of self-report measures (Alvarez-Blasco, Luque-Ramírez & Escobar-Morreale, 2010; Anandacoomarasamy et al., 2009; Corica et al., 2006; Strain et al., 2010). Class III obesity is linked to greater impairment of the physical aspects of the Short Form 36-item Health Survey (SF-36) than class I-II obesity (Castres et al., 2010). Among class III obese individuals seeking bariatric surgery, HRQoL does not seem to vary depending on the type of bariatric surgery being pursued (i.e., RYGB, BPD-DS, and AGB; Strain et al., 2010).

The relationship between obesity and pain, in particular, is the subject of a large body of literature. There is a well-documented association between obesity and chronic pain in individuals of diverse ages, ranging from children to the elderly (McCarthy, Bigal, Katz, Derby, & Lipton, 2009; Wilson, Samuelson, & Palermo, 2010). Obesity has also been found to have a negative mediating effect on pain outcomes of various procedures and treatments, including knee arthroscopy, total knee replacement, hip and knee arthroplasty, and cognitive-behavioral pain treatment (Gandhi, Razak, Davey, & Mahomed, 2010; Harrison, Morrell, & Hopman, 2004; Núñez et al., 2009; Sellinger et al., 2010). Individuals with chronic pain who are also obese have increased rates of disability and depressive symptoms, as well as reduced quality of life for physical functioning, when compared to their nonobese counterparts (Marcus, 2004).

Weight Bias. Weight bias against obese individuals is a well-established phenomenon with a large body of literature (Puhl & Brownell, 2001). One recent study found evidence for bias against overweight and obese women when making hypothetical decisions regarding

employment, adoption, and helping behaviors, with weight bias being the strongest in hypothetical employment termination and hiring situations (Swami, Pietschnig, Stieger, Tovée, & Voracek, 2010). Among bariatric surgery candidates, the most commonly reported stigmatizing experiences include comments by children, negative assumptions by others, interpersonal attacks, and environmental barriers, such as chairs being too small and the lack of availability of appropriately-sized medical equipment (Friedman, Ashmore, and Applegate, 2008; Sarwer, Fabricatore, Eisenberg, Sywulak, & Wadden, 2008) There is an association between the subjective experience of weight bias and increased depressive symptoms in both bariatric surgery candidates and obese individuals seeking traditional weight loss treatment (Carels et al., 2010; Sarwer et al., 2008).

Body Image. Poor body image is more common in obese individuals than their nonobese counterparts (Dixon, Dixon, & O'Brien, 2002). Recent research suggests that body image dissatisfaction may mediate the relationship between obesity and depressive symptomatology and may be a unique contributor to binge eating in African American women (Napolitano & Himes, 2010).

Substance Use Disorders.

Obese and overweight. Past-year and lifetime history of illicit drug use (e.g. cocaine, opiates, marijuana) does not appear to be associated with overweight or obesity in either gender, but two recent studies have reported a positive association between obesity and lifetime rates of alcohol-use disorders (AUD) in men (Barry & Petry, 2009). Compared with an 8.5% lifetime prevalence rate for AUD in normal-weight male controls, Herpertz et al. (2006) reported a 13.9% prevalence rate in obese males. Barry and Petry (2009) also found an elevated risk for lifetime alcohol abuse and dependence in obese males compared to their normal weight counterparts.

Obese individuals seeking bariatric surgery. Point prevalence estimates of SUD in obese individuals seeking bariatric surgery are low (e.g. 1.7%), but there is conflicting evidence as to whether bariatric surgery candidates have a higher prevalence of lifetime history of SUD than the general population (Kalarchian et al., 2007). For example, Kalarchian et al. (2007) reported rates of lifetime history of alcohol abuse (17.7%) and alcohol dependence (13.2%) in bariatric surgery candidates that were higher than those found in the 2001-2003 National Comorbidity Survey Replication (13.2% and 5.4%, respectively; Kessler, et al., 2007) but similar to those found in the 2001-2002 National Epidemiologic Survey on Alcohol and Related Conditions (17.8% and 12.5%, respectively; Hasin, Stinson, Ogburn, & Grant, 2007).

Prevalence estimates of lifetime SUD in obese individuals seeking bariatric surgery have been inconsistent (e.g., 21.4% in Ivezaj et al., 2011; 13.3% in Jones-Corneille et al., 2010; 32.6% in Kalarchian et al., 2007). Since SUD assessments in Kalarchian et al. (2007) and Jones-Corneille et al. (2010) were conducted prior to surgery using the Structured Clinical Interview for DSM-IV Axis I Disorders (SCID-I), were independent of the preoperative screening and approval process, and were conducted on mixed surgery type samples, the origin of this large discrepancy is unclear. Ivezaj et al. (2011), who assessed presurgical SUD retrospectively using an online survey, reported a prevalence estimate intermediate to Kalarchian et al. (2007) and Jones-Corneille et al. (2010).

Sex differences in presurgical AUD prevalence may exist within bariatric surgery candidates as they do within the obese population. For example, Herpertz et al. (2006) reported a 26% lifetime prevalence rate for AUD in male bariatric surgery candidates and an 8.5% rate in normal-weight male controls. In contrast, lifetime history of AUD was actually less prevalent in female bariatric surgery candidates (1.0%) than in normal-weight female controls (3.2%).

Another study failed to find an elevated lifetime prevalence rate of AUD in a primarily female (79.5%) sample of morbidly obese bariatric surgery candidates; the authors did not report on sex differences (Black et al., 1992).

Bariatric Surgery for the Treatment of Obesity

Bariatric surgery is the most effective treatment of obesity in adults, far outperforming lifestyle and pharmaceutical interventions (Karlsson, Taft, Rydén, Sjöström, & Sullivan, 2007; O'Brien et al., 2006; Padwal, Li, & Lau, 2003). Its popularity in the United States has risen in recent decades. Some attribute the particularly marked increase between 1990 and 2000, during which bariatric surgery procedures were estimated to have risen sixfold, to the growing prevalence of obesity, the withdrawal of the diet medication fenfluramine-phentermine (fen-phen) from the market, the development of less invasive laparoscopic techniques, and increased media attention (Trus, Pope, & Finlayson, 2005). While rates of adolescents undergoing bariatric surgery in the United States are estimated to have tripled between 2000 and 2003, they continue to remain a small minority of those who have the procedure, representing less than 1% of the total bariatric surgery population each year (Tsai, Inge, & Burd, 2007). The two most common types of bariatric surgeries performed in the United States are gastric bypass procedures and adjustable gastric banding (Pratt et al., 2009).

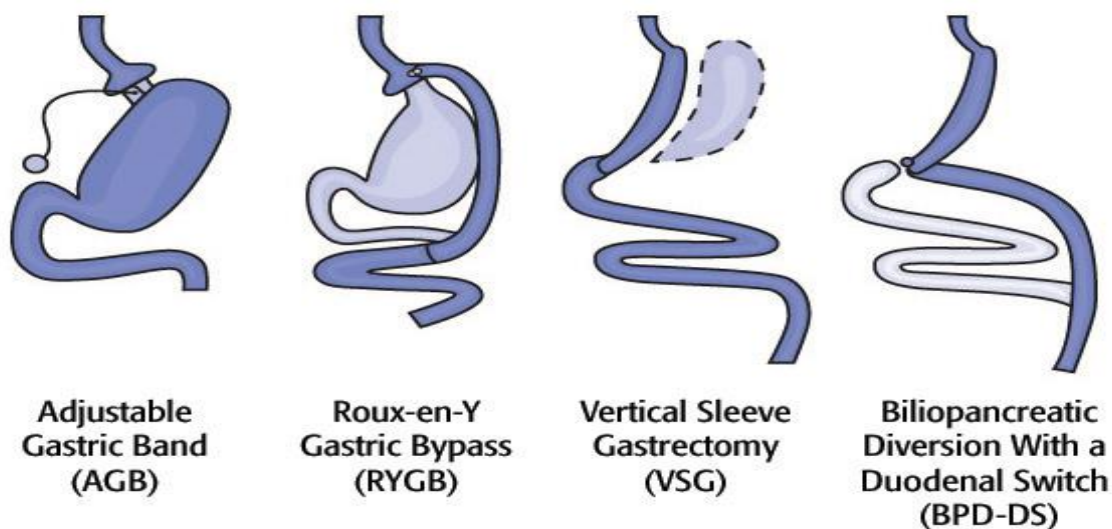


Diagram of Surgical Options. Image credit: Walter Pories, M.D. FACS.

Gastric bypass. Gastric bypass surgeries are a group of similar procedures used to treat class III obesity, as well as class II obesity in individuals with substantial obesity-related medical comorbidities. These surgeries are combined restrictive and malabsorptive procedures.

Surgeons create a reduction in stomach size by dividing the stomach into two parts by staples, the smaller section of which acts as a new stomach with markedly reduced capacity. The larger section of the stomach and a section of the small intestine are then bypassed by connecting a lower part of the small intestine with the newly formed pouch (as in RYGB) or gastric sleeve (as in BPD-DS). This bypass results in the reduction of time nutrients spend in the intestines and, consequently, reduced absorption of calories.

Gastric bypass surgeries accounted for more than 80% of the 66,339 bariatric surgeries performed at 225 American Society for Metabolic and Bariatric Surgery (ASMBS) Bariatric Surgery Centers of Excellence (BSCOE) across the United States from August 2005 to May 2007 (Pratt et al., 2009). Among gastric bypass surgeries, Roux-en-Y gastric bypass (RYGB) is

the most commonly performed type in the United States (DeMaria, Pate, Warthen, & Winegar, 2010; Pratt et al., 2009).

Adjustable gastric banding. Adjustable Gastric Banding (AGB) is the second most common type of bariatric surgery in the United States, accounting for approximately 13 – 40% of procedures (DeMaria, Pate, Warthen, & Winegar, 2010; Pratt et al., 2009). AGB is a restrictive procedure in which a hollow silicone band is positioned around the top of the stomach to create a small pouch with a narrow passage leading into the rest of the stomach. The band's diameter can be adjusted by the removal or addition of saline through a small port surgically implanted into the abdominal wall. Food and beverage restriction increase as band diameter decreases. Frequent band adjustments in the years following surgery are necessary to optimize weight loss outcomes (Shen et al., 2004).

Although individuals who undergo AGB tend to lose less weight than their RYGB counterparts, many choose AGB because the procedure is reversible and is associated with fewer peri- and postoperative complications (DeMaria, Pate, Warthen, & Winegar, 2010).

Bariatric Surgery Weight Loss Outcomes

Roux-en-Y gastric bypass surgery typically results in a 30-38% loss of total body weight 1 year after surgery, while adjustable gastric banding surgery typically results in a 14-21% weight loss in the same amount of time (Hofsø et al., 2010; Jones-Corneille et al., 2009; Sjöström et al., 2004; Valezi, Junior, de Menezes, de Brito, & de Souza, 2010). Individuals who undergo either type of surgery, however, tend to regain a portion of lost weight in subsequent years. A ten year study tracking weights of gastric bypass and gastric banding patients reported weight loss to be maximal at one year post-surgery in both groups, and found weight losses in the gastric banding group to have declined from 21.0% at one year to 13.2% at ten years, and in

the gastric bypass group to have declined from a 38.0% at one year to 25.0% at ten years (Sjöström et al., 2004).

Bariatric Surgery Medical Outcomes

Cardiovascular diseases. Reduction in cardiovascular diseases and cardiovascular disease risk factors are among the foremost benefits of bariatric surgery. Blood pressure levels decrease significantly after bariatric surgery, which results in the resolution of hypertension in many individuals (Frezza, Wei, & Wachtel, 2009; Kligman, Dexter, Omer, & Park, 2008). In gastric bypass patients hypertensive at the time of surgery, Carson et al. (1994) found that hypertension was resolved in 54% of cases and improved in 15% of cases when measured one year later. Similarly, Cottam, Atkinson, Anderson, Grace, and Fisher (2006) reported hypertension to have resolved in 56% of AGB patients and 81% of RYGB patients three years after surgery.

Consistently elevated C-reactive protein (CRP) levels are a risk factor for cardiac events and strokes. Levels of this protein have been shown to decrease significantly within 3 months of gastric bypass surgery (Zagorski, Papa, & Chung, 2005). Total cholesterol and LDL-cholesterol levels also decrease significantly after bariatric surgery, while levels of HDL-cholesterol increase (Kligman et al., 2008). These represent favorable changes since high total cholesterol and LDL-cholesterol are associated with cardiovascular disease, while high levels of HDL-cholesterol are thought to be protective against heart attack. Physical activity levels also tend to increase after bariatric surgery, indicating lower risk for cardiovascular events (Bond et al., 2009).

One large study found the prevalence of cardiovascular diseases in a group of bariatric surgery patients to have decreased from 43.6% at baseline to 23.4% at 1-4 months post-surgery (Crémieux, Ledoux, Clerici, Crémieux, & Buessing, 2010). Another study found favorable

changes in cardiac function in bariatric surgery patients with pre-existing severe cardiomyopathy (McCloskey et al., 2007).

The Framingham risk equations are designed to estimate the 10-year risk of having a cardiovascular event, defined as angina pectoris, myocardial infarction, unstable angina, or cardiovascular death, based on the predictors of sex, total cholesterol, HDL cholesterol, smoking status, systolic blood pressure, and use of medication for the treatment of hypertension (Wilson et al., 1998). Using these equations, Arterburn et al. (2009) found the estimated 10-year cardiovascular event risk in RYGB patients dropped from 6.7% at baseline to 5.4% at one year post-surgery, while Kligman et al. (2008) found a more dramatic risk reduction from 6.7% to 3.2%, also in RYGB patients at one year post-surgery.

Diabetes mellitus type 2. Gastric bypass surgery is associated with the subsequent remission of type 2 diabetes, or amelioration of diabetic symptoms, in most patients with type 2 diabetes at the time of surgery. Reported rates of diabetic remission in studies of gastric bypass surgery patients typically range between 67% and 91% (Brancatisano, Wahlroos, & Brancatisano, 2008; Hofsø et al., 2010; Pories et al., 1995; Pournaras et al., 2010). Diabetic remission, however, is not solely a function of the weight loss associated with gastric bypass surgery. In a study comparing gastric banding patients with Type 2 diabetes with their gastric bypass counterparts at two years post-surgery, Pournaras et al. (2010) found that 72% of the gastric bypass patients, compared with only 17% of gastric banding patients, demonstrated remission of Type 2 diabetes, despite having lost similar percentages of total body weight (29.5% vs. 28.5%, respectively). Furthermore, gastric bypass patients with type 2 diabetes tend to show improved insulin resistance within days to weeks of the surgery, before any significant weight loss has occurred (Pournaras et al., 2010; Rubino et al., 2004).

Cancer. Bariatric surgery is associated with a subsequent reduction in the incidence of cancer (Adams et al., 2009; Christou, Lieberman, Sampalis, & Sampalis, 2008; Sjöström et al., 2009). Christou et al. (2008) reported a 78% reduction in cancer incidence in a group of post-bariatric surgery patients who maintained significant weight loss when compared to matched obese controls, while Sjöström et al. (2009) reported a 39% decreased first-time cancer incidence in women. Interestingly, however, Sjöström et al. (2009) did not find a similar difference in first-time cancer incidence in men.

Other medical conditions. The severity of obstructive sleep apnea is reduced with bariatric surgery; a recent meta-analysis of twelve studies found mean apnea hypopnea index (AHI) scores decreased from 54.7 events/hour pre-surgery to 15.8 events/hour post-surgery, representing a 71% reduction in events per hour (Greenburg, Lettieri, & Eliasson, 2009). Bariatric surgery has also been found to be effective in reducing the symptoms of polycystic ovary syndrome, asthma, and chronic obstructive pulmonary disease (Crémieux, Ledoux, Clerici, Crémieux, & Buessing, 2010; Eid et al., 2005; Maniscalco et al., 2008). Surgically-induced weight loss has also been associated with reversal of early signs of osteoarthritis, in addition to reduction of pre-existing osteoarthritis-related pain (Abu-Abeid, Wishnitzer, Szold, Liebergall, & Manor, 2005; Lementowski & Zelicof, 2008).

Reduced mortality. Several studies have reported reduced overall mortality in post-bariatric surgery patients when compared to severely obese controls (Adams et al., 2010; Busetto et al., 2007; Sjöström, Narbro, Sjöström, & Karason, 2007; Peeters et al., 2007). Mortality rate reduction is most pronounced when comparing rates of deaths related to diabetes, heart disease, and cancer (Adams et al., 2010). In a review of the literature, Christou (2009) noted a positive,

linear relationship between percentage of excess weight lost and the relative reduction in the risk of death in post-bariatric surgery patients.

Adverse events. Numerous adverse medical outcomes have also been associated with bariatric surgery. Deaths within 30 days of surgery occur in approximately .17 and .06% of RYGB and AGB surgery patients, respectively (Tice, Karliner, Walsh, Petersen, & Feldman, 2008). Cottam et al. (2006) reported rates of reoperation in 3-years-post-laparoscopic AGB surgery patients to be 15% for minor surgeries (e.g. port replacement, diagnostic endoscopic procedures) and 8% for major surgeries (e.g. band removal, prolapse); similarly, of those who had laparoscopic RYGB surgery, 13% required reoperation for minor issues (e.g. diagnostic endoscopic procedures) and 5.3% necessitated another major surgical procedure (e.g. ventral hernia, obstruction) within 3 years post-surgery. In adjustable gastric banding surgery, slippage of the band can occur at any time post-surgery and, although rare, has the potential to cause life-threatening conditions, including total dysphagia and ischemia of the gastric pouch (Kriwanek, Schermann, Abdullah, & Roka, 2005). In a large prospective study, band slippage, band leakage, and band penetration occurred in 2.7, 1.8, and 1.6% of AGB patients within five years of surgery, respectively (Steffen, Biertho, Ricklin, Piec, & Horber, 2003).

Gastric bypass patients are at risk of developing postoperative marginal ulcers at the site of the surgically created connection of the stomach to the small intestine, a complication which occurs in approximately 4-7% of cases (Gumbs, Duffy, & Bell, 2006). Post-bariatric surgery patients are also at increased risk for the development of gallstones due to the rapid speed of surgically-induced weight loss (Jonas, Marsk, Rasmussen, & Freedman, 2010).

Reduced absorption of nutrients as a consequence of gastric bypass surgery has been associated with nutritional deficiencies, the most common of which are iron and B12 (Skroubis

et al., 2002). Postoperative nutritional deficiencies can lead to a variety of adverse outcomes, including anemia and neurological dysfunction (Koffman, Greenfield, Ali, & Pirzada, 2006; Vargas-Ruiz, Hernández-Rivera, & Herrera, 2008). Anemia is among the most frequent complications of gastric bypass surgery; one study found the prevalence to have increased from 6.6% at baseline to 63.6% at three years post-surgery (Vargas-Ruiz et al., 2008).

Dumping syndrome is a constellation of symptoms that many bariatric surgery patients experience after eating and is more likely to occur after the ingestion of sugar-rich foods. Symptoms include heart palpitations, sweating, shakiness, headache, diarrhea, nausea, vomiting, and abdominal pain. These symptoms occur when the undigested contents of the stomach are moved, or “dumped,” into the small intestine too rapidly. Rates of postoperative dumping syndrome appear to be higher in individuals who were diabetic preoperatively; Padoin et al. (2009) reported that 44.9% of gastric bypass patients who were diabetic at the time of surgery exhibited postoperative dumping syndrome, while only 5.6% of their non-diabetic counterparts were similarly affected.

Bariatric Surgery Psychosocial Outcomes

Anxiety. A reduction in anxiety may be likely to occur in the years immediately following bariatric surgery. Wolfe and Terry (2006) found significantly decreased anxiety symptom severity and frequency using single item measures at eighteen months post-surgery, while Mamplekou, Komesidou, Bissias, Papakonstantinou, and Melissas (2005) found similar results using the Symptom Checklist-90-Revised (SCL-90R) anxiety index scores two years post-surgery. The results of studies with longer follow-up periods, however, suggest these postsurgical improvements in anxiety may attenuate over time. Karlsson et al. (2007) found a 37% reduction in anxiety symptoms, as measured by the Hospital Anxiety and Depression Scales

(HADS), at 1 year post-surgery, but only a 20 and 23% improvement at 6 and 10 years post-surgery, respectively. Using the same measure, Kruseman, Leimgruber, Zumbach, and Golay (2010) found no significant change in anxiety scores eight years after gastric bypass surgery, when compared to baseline values.

Depression. Depressive symptoms initially decrease after bariatric surgery. Brancatisano, Wahlroos, and Brancatisano (2008) reported a reduction in Beck Depression Inventory-II (BDI-II) scores from a baseline mean of 17.3 to a thirteen-month post-surgery follow-up mean of 7.2, representing a mean diagnostic shift from scores indicative of mild depression to those suggesting only minimal symptoms. Another study found a smaller, but still statistically significant, improvement in BDI-II scores from 13.7 at baseline to 9.7 and 9.3 at 1 and 2 years post-surgery, respectively (Thonney, Pataky, Badel, Bobbioni-Harsch, & Golay, 2010). Likewise, others have reported reductions in SLC-90R depression index scores and HADS depression scores two years post-surgery (Mamplekou et al., 2005; Thonney et al., 2010).

Similar to anxiety, however, it may be the case that postoperative improvements in depressive symptoms attenuate over time. One study reported improvements in SLC-90R depression index scores at 6 months and 1 year post-surgery with a subsequent return to baseline levels at the 2 year mark, while another study failed to find significant change in HADS depression scores eight years after gastric bypass surgery (van Hout, Fortuin, Pelle, & van Heck, 2008; Kruseman et al., 2010). Karlsson et al. (2007) found a significant reduction in the prevalence of depression at both one and ten years post-surgery, but while HADS depression scores at 1 year showed a 50% improvement from baseline, this figure declined to 27% at 10 years post-surgery. Despite this 27% improvement, the prevalence of depression 10-years post-surgery remained elevated when compared to that of the nonobese reference population (15% vs.

6%, respectively). These long-term follow-up study results serve as a caution against regarding bariatric surgery as sufficient treatment for comorbid depression in obese individuals seeking bariatric surgery.

Binge eating disorder. Bariatric surgery may have a favorable effect on binge eating frequency in those with a preoperative history of binge eating disorder. Scholtz et al. (2007) found that two thirds of adjustable gastric banding patients with current or past BED at the time of surgery achieved or maintained the resolution of the disorder 5 years postoperatively. Another study used the Eating Disorder Exam (EDE) to assess the number of days during the previous four weeks in which patients with preoperative BED endorsed objective binge episodes at a pre-surgery research visit and at a subsequent 1-year postoperative follow-up visit. Results indicated a significant decline in days with objective binge episodes (12.8 vs. 2.5 days/four weeks, respectively; Jones-Corneille et al., 2009). Using the Binge Eating Scale (BES), Larsen et al. (2004) found reduced prevalence of binge eating episodes indicative of an eating disorder in bariatric surgery patients at short-term (< 2 years) and long-term (> 2 years) postoperative follow-up visits when compared to obese individuals seeking bariatric surgery who have not yet undergone the procedure.

Health-related quality of life. Health-related quality of life (HRQoL) has been reported to improve up to ten years after bariatric surgery (Adams et al., 2010; Chang et al., 2010; Karlsson et al., 2007; Kolotkin, Crosby, Gress, Hunt, & Adams, 2009; Nguyen et al., 2001; Sarwer et al., 2010). Chang et al. (2010) found initial improvement in HRQoL scores in patients who underwent laparoscopic RYGB, followed by a slight downward trend 3-6 months post-surgery and subsequent renewed improvement between 6 months and 1 year. The authors theorized the slight decline at 3-6 months post-surgery might have been attributable to surgery-

related medical complications, which were promptly treated. Improvements in HRQoL are also evidenced by reports of reductions in joint pain and prescription pain medication use following bariatric surgery (Brancatisano et al., 2008; Crémieux et al., 2010).

HRQoL is affected by the type of surgical technique used. In a randomized controlled trial of class III obese individuals undergoing gastric bypass surgery, HRQoL was found to improve more rapidly in those who had their procedures performed laparoscopically than those in the open surgery condition, a finding which is supported by decreased length of hospital stay (3 vs. 4 days, respectively) and quicker return to work (32.2 vs. 46.1 days, respectively) and daily living activities (8.4 vs. 17.7 days, respectively; Nguyen et al., 2001).

Social interactions. Improvements in quality of social interactions in adult and adolescent patients following bariatric surgery have been widely reported (Bennett, H. Wang, Schirmer, & Northup, 2007; Sugerma et al., 2003; Karlsson et al., 2007; Zeller, Modi, Noll, Long, & Inge, 2009). Such gains do not require patients to reach a nonobese weight; Bennett et al. (2007) found that formerly super-obese individuals ($\text{BMI} \geq 50.00 \text{ kg/m}^2$) who remained class II obesity or heavier ($\text{BMI} \geq 35.00 \text{ kg/m}^2$) after surgery still reported improved social relationships.

Marital relationships. Dramatic weight loss in a short period of time, coupled with other effects of the surgical procedure, can act as a catalyst for both positive and negative changes in marital relationships. In a small, retrospective interview study in which one partner in each married couple had undergone bariatric surgery within the past three years, Neill, Marshall, and Yale (1978) identified spousal autonomy as the major area of postoperative marital conflict; increased patient participation in social activities was often reported to lead to spousal anger and withdrawal, non-patient spouses sometimes expressed confusion or frustration over

their partners' increased expression of confidence and assertiveness, some couples began arguing more about role responsibilities, and many patient and non-patient spouses expressed fears of abandonment. Neill et al. (1978) subsequently concluded that the majority of marital relationships deteriorate or end in divorce postoperatively, despite self-reported improvements in depression. In contrast, Goble, Rand, and Kuldau (1986) reported a reduction in marital conflict in the majority of couples. The latter study's finding is in line with more recent research, which concludes bariatric surgery has a favorable impact on marital relationships except in cases in which marital discord was present prior to surgery (Applegate & Friedman, 2008). Applegate and Friedman (2008) point out that changes induced by bariatric surgery exacerbate preexisting marital problems in many couples. Although bariatric surgery is associated with increased marital satisfaction on average, the level of satisfaction reported is still lower than that in the nonobese reference population (Macías, Leal, López-ibor, Rubio, & Caballero, 2004).

Body image. Individuals who have undergone bariatric surgery report significant improvements in body image in the months immediately following the procedure (Dixon et al., 2002; Madan, Beech, & Tichansky, 2008; Sarwer et al., 2010; van Hout et al., 2008). These improvements are positively correlated with percent weight loss (Dixon et al., 2002; Sarwer et al., 2010). Since most studies to date have focused on the two years directly following bariatric surgery, the long term effect of bariatric surgery on body image is less clear. Dixon et al. (2002) found improvements in appearance evaluation remained steady when measured 1, 2, 3, and 4 years postoperatively, but pointed out that these levels still remain significantly lower than community reference scores. It may be the case that concern over bariatric surgery-related complications that have a bearing on appearance, such as surgical scars, hair loss due to anemia, and hanging excess skin, offsets some of the positive effects of weight loss on body image in

some individuals. Pecori, Cervetti, Marinari, Migliori, and Adami (2007) found Body Uneasiness Test scores in women with a history of gastric bypass surgery who were no longer obese and were seeking cosmetic body contouring procedures (e.g. torsoplasties, abdominoplasties, mastoplasties, thighplasties, and brachioplasties) to be less favorable than those of women with a history of gastric bypass who were not seeking body contouring, and similar to those of obese women with no history of bariatric surgery.

Substance use disorders. Prevalence estimates of SUD during the years following RYGB surgery are between 17 and 22%. In a study of 141 post-RYGB patients, Reslan, Saules, and Schuh (2012) found a postoperative SUD prevalence of 17.7% at 6.13 ± 2.69 years post-surgery. Similarly, Ivezaj (2011) reported a postoperative SUD prevalence of 18.8% at 2.7 ± 2.33 years post-surgery in a mixed bariatric surgery type community sample.

Alcohol use disorders, in particular, also appear to be prevalent in the period following RYGB surgery. In a sample of 51 post-bariatric surgery patients at 3.6 ± 0.6 years postsurgery, Suzuki et al. (2012) reported 21.4% of post-RYGB patients to have current AUD. Postoperative AUD prevalence estimates for post-RYGB patients are higher than those reported for post-LAGB patients (e.g. 0%; Suzuki et al., 2012).

There is preliminary evidence to suggest that post-RYGB patients might be at an increased risk for SUD after surgery. In a study of 70 post-RYGB surgery patients, Ertelt et al. (2008) noted two cases of spontaneous development of alcohol dependence in women who were beyond the typical age of onset for the disorder. Another study reported the prevalence of AUD symptoms to be significantly elevated during the second postoperative year relative to the year prior to surgery and the first preoperative year (King et al., 2012). In addition, Saules et al. (2010) found that 2-6% of individuals recently admitted at a comprehensive substance abuse

treatment facility had a history of bariatric surgery; this figure is considerably higher than the United States adult population bariatric surgery history base rate of well under 1%. While it is not yet clear if this increased risk can be primarily attributed to the elevated rate of lifetime substance use disorders in bariatric surgery candidates, it is worth noting that many (approximately 60%) of the aforementioned inpatients who were positive for a history of bariatric surgery reported no preoperative heavy substance use in a retrospective interview (Wiedemann et al., in preparation). This finding suggests that post-bariatric patients might be at an elevated risk for postoperative SUD beyond the risk conferred by presurgical history of SUD, an idea which is bolstered by the observation that these post-bariatric patients were beyond the typical age of SUD onset. More studies are warranted to explore the possibility that post-bariatric surgery patients are at increased risk for the development of or relapse to a SUD.

Completed suicide. Rates of suicide in the post-bariatric surgery population appear elevated. One recent study found a significantly higher rate of suicide in patients who had undergone bariatric surgery in Pennsylvania between 1995 and 2005 compared with age and sex-matched suicide rates in the United States (Tindle et al., 2010). Another found a 58% increased rate of death from nondisease-related causes, including suicide and accidents, in post-bariatric surgery patients compared to controls (Adams et al., 2007). In an unrelated study on diabetes and bariatric surgery, Pories et al. (1995) noted suicide to be a major cause of death in their 14-year study, accounting for 8.8% of all mortality.

Preoperative Factors Associated with Weight Loss Outcome

Age. Younger age at time of surgery is associated with greater postoperative excess weight loss in RYGB patients. Several studies, including a large retrospective analysis, have found younger age to be a predictor of greater percent excess weight loss (%EWL) in RYGB

patients at 1 year post-surgery (Averbukh et al., 2003; Carlin, O'Connor, Genaw, & Kavar, 2007). Similarly, Kruseman et al. (2010) reported younger age at time of surgery was associated with successful weight loss outcome ($\geq 50\%$ EWL) in RYGB patients 8 years post-surgery ($p < 0.04$).

Sex. Two recent studies identified male sex as predictive of poor weight loss outcome in AGB patients (Nguyen, Sloan, Nguyen, Hartman, & Hoyt, 2009; Thalheimer et al., 2009). In contrast, weight loss outcome in gastric bypass patients has not been found to vary significantly based on sex (Carlin, O'Connor, Genaw, & Kavar, 2007; Harvin, DeLegge, & Garrow, 2008; Mathus-Vliegen, 2007).

Race. There is some evidence for racial disparities in bariatric surgery weight loss outcome. Several studies have found that Caucasian bariatric surgery patients lose a significantly greater percentage of excess weight than their African American counterparts up to 3 years post-surgery, although the etiology of this disparity remains unclear (Carlin, O'Connor, Genaw, & Kavar, 2007; Harvin, DeLegge, & Garrow, 2008; Parikh et al., 2006). Parikh et al. (2006) found that preoperative BMI did not mediate this relationship. None of these studies, however, assessed income as a potential mediator or discussed the potential impact of social contagion. Differences among other racial groups have not been thoroughly assessed.

Body mass index. Several studies have found a lower preoperative BMI to be a predictor of greater percentage of EWL (Carlin, O'Connor, Genaw, & Kavar, 2007; Chen et al., 2009; Dallal, Quebbemann, L. H. Hunt, & Braitman, 2009; Lutfi, Torquati, Sekhar, & Richards, 2006). Despite this apparent consensus, there have been a few aberrant findings reported in the RYGB literature. Kruseman et al. (2008), for example, reported baseline BMI to not be a predictor of successful weight loss outcome ($\geq 50\%$ EWL) in RYGB patients 8 years post-

surgery, while Averbukh and colleagues (2003) reported *higher* preoperative BMI to be a predictor of greater percentage of EWL in RYGB patients at 1 year postsurgery.

Depression. A chart review study of RYGB patients found higher depression scores, as measured by the BDI, to significantly predict a higher percentage of excess weight loss at one year postsurgery (Averbukh et al., 2003). Likewise, Odom et al. (2010) reported higher baseline BDI scores to be associated with decreased risk of significant weight regain in the postsurgical period.

History of substance use disorders. A preoperative history of substance abuse or dependence may be positive prognostic factor with regard to weight loss outcome (Clark et al., 2003; Heinberg & Ashton, 2010; Sogg, 2010). One recent study found that bariatric surgery patients with a preoperative history of substance abuse or dependence achieved a significantly greater percentage of EWL than did those without a history of substance abuse or dependence at 6 months ($71.3 \pm 58.2\%$ vs. $50.0 \pm 23.1\%$, $p < .01$) and 9 months post-surgery ($81.0 \pm 63.6\%$ vs. $56.4 \pm 29.0\%$, $p < .01$), with a trend towards significance at 12 months ($79.0 \pm 34.7\%$ vs. $61.4 \pm 28.1\%$, $p < .09$; Heinberg & Ashton, 2010). Similarly, Clark et al. (2003) found that RYGB patients who reported a history of outpatient or inpatient treatment for substance abuse ($n = 10$) lost a greater percentage of excess weight than did those with no such history at 2 years post-surgery ($n = 70$) ($79 \pm 16\%$ vs. $67 \pm 16\%$, $p < .05$). Additional research using longer term follow-up periods and larger sample sizes of patients positive for a history of substance abuse, and reporting on post-surgical substance abuse relapse status, is warranted.

Postoperative Factors Associated with Weight Loss Outcome

Time lapse since surgery. Time lapse since surgery is related to weight loss outcome in AGB patients. Studies, however, differ on method of assessing weight loss outcome (e.g.

%EWL vs. dichotomous surgical success status) and type of sample being analyzed (e.g. intention-to-treat vs. only those with the gastric band still in place). Using percentage of excess weight loss as the primary outcome variable in a study of AGB patients, Lanthaler et al. (2010) reported best results at 5 years post-surgery ($73.2 \pm 29.6\%$), compared with 1 ($57.1 \pm 23.0\%$) and 10 years post-surgery ($64.0 \pm 32.1\%$). In an intention-to-treat analysis (including those who required the gastric band removed) that assessed weight loss every 6 months over a postoperative period of 7 years, surgical success rate ($\text{EWL} \geq 50\%$) in AGB patients was maximal at 2 years post-surgery (53.8%) and declined to 42.9% by 7 years (Suter, Calmes, Paroz, & Giusti, 2006). However, %EWL in patients with the gastric band still in place at 7 years was relatively stable between 2 and 7 years post-surgery.

RYGB patients exhibit a similar pattern. In a study following adult RYGB patients for 8 years post-surgery, EWL percentages were maximal at 2 years post-surgery ($M = 72.6$, $SD = 14.9$), declining to $69.7 \pm 15.1\%$ at 5 years and $66.8 \pm 7.6\%$ at 8 years (Valezi, Junior, de Menezes, de Brito, & de Souza, 2010). Similarly, in a sample of individuals who underwent either RYGB or vertical banded gastroplasty (VBG), those who had the operation less than 5 years ago exhibited significantly greater percentage of EWL than did those who had the operation more than 5 years ago ($M = 53.5$, $SD = 26.5$ vs. $M = 41.1$, $SD = 29.7$; Mathus-Vliegen, 2007). In adolescents, weight loss following RYGB surgery seems to plateau at 1 year for non-Hispanic Caucasians and 1.5 years for individuals of Hispanic ethnicity (de la Cruz-Muñoz et al., 2010). Taken together, these studies indicate that the typical bariatric surgery patient reaches a peak percentage of excess weight loss between 1 and 5 years post-surgery, with subsequent decline.

Postoperative substance use disorders. The relationship between weight loss and the development of or relapse to a substance use disorder in the period following bariatric surgery is unknown.

Hypothesized Etiology of Postoperative SUDs in RYGB Patients

There are a number of hypothesized explanations for an increased risk of developing or relapsing to a substance use disorder following RYGB surgery, including decrease in body weight, altered drug metabolism, behavior change, and addiction transfer.

Decrease in body weight. The effects of ethanol and many other drugs (e.g. pain medication) are inversely proportional to body weight. Therefore, if one does not correct for the dramatic change in body weight following RYGB surgery when consuming such drugs, a greater effect will be experienced. One study of 19 RYGB patients provides preliminary evidence that RYGB patients may adjust for this effect by consuming significantly less alcohol at 6 months post-surgery, but future studies with longer follow-up time periods and larger, more diverse samples are needed (Woodard, Downey, Hernandez-Boussard, & Morton, 2010).

Altered drug metabolism. RYGB surgery is a procedure which drastically alters the digestive tract and, as a result, alcohol and drug metabolism. These substances may be metabolized more quickly after surgery. In a study of postsurgical ethanol absorption, the median time to peak blood alcohol concentration (BAC) was 10 minutes in RYGB patients, compared with 30 minutes in weight and age matched controls (Klockhoff, Näslund, & Jones, 2002). Maximum BAC was also found to be significantly higher in the RYGB group than the control group. These findings suggest that RYGB patients who consume alcohol feel the effects of it more strongly and quickly than they would have felt prior to surgery, a hypothesis which is supported by findings from a qualitative study (Ivezaj et al., 2010). Since drugs that act quickly

and powerfully are more likely to produce addictions than those that act slowly and weakly, it could be hypothesized that individuals would be more likely to develop an AUD post-RYGB surgery than they would be if they never underwent the procedure.

Behavior change. Behavior change catalyzed by dramatic postoperative weight loss is another possible explanation for an increased risk of developing or relapsing to a SUD. It is possible that dramatic weight loss can lead to increased desire to attend social events, where alcohol and other substances are more readily available, due to improvements in body image and self-confidence, decreases in fatigue, and increases in amounts of positive attention received from others (e.g., compliments).

Addiction transfer. Another hypothesized explanation underlying the potential increased risk for development of postoperative substance use disorders in bariatric patients is the concept of addiction transfer, also referred to as addiction substitution. Addiction transfer is said to occur when an individual exchanges one compulsive behavior for another (McFadden, 2010). Several anecdotal reports of addiction transfer in post-bariatric surgery patients have surfaced in the media, including those of three women featured on the October 24, 2006 episode of Oprah entitled *Suddenly Skinny* (“Suddenly Skinny,” 2006). Although addiction transfer has not received empirical support on the whole, bariatric surgery to treat obesity may be a special case of “overcoming” an addiction (in those who were addicted to food). That is, since it is virtually impossible to overeat during the immediate postoperative period, individuals may be conceptualized to have broken the addictive cycle without acquiring the skills that they would otherwise have gained from self change strategies or psychologically oriented treatments for food addiction. In patients who used food to regulate mood in the presurgical period, it is unclear as to which methods, if any, they may utilize to replace this function. It is possible that

many patients replace overeating with another dysfunctional reward-seeking behavior. More research should be conducted to assess the veracity of post-bariatric addiction transfer. If evidence for the existence of post-bariatric addiction transfer is found, research into prevention efforts will be warranted.

In order to consider addiction transfer as a viable explanation for the development of postoperative SUDs in certain bariatric surgery patients, one would likely conceptualize certain types of overeating as symptoms of a “behavioral addiction.”

Maladaptive Behavioral Excesses as Symptoms of Behavioral Addictions

Theoretical perspective. There is currently little consensus in classifying, diagnosing, and treating excessive reward-seeking behavior (e.g., overeating, overbuying, excessive gambling; Grusser, Poppelreuter, Heinz, Albrecht, & Sass, 2007). Excessive reward-seeking behavior does not have its own category in the *DSM-IV-TR* (American Psychiatric Association [DSM-IV-TR], 2000). These behaviors are considered by some to be manifestations of an emotion-focused coping strategy used to combat stress or other negative mood (in contrast to active problem-solving coping strategies; Grusser et al., 2007). If this emotion-focused coping strategy becomes problematic (e.g., continued behavior despite serious negative consequences, especially when healthier active coping strategies are not pursued in conjunction), the behaviors may be considered maladaptive. In this way, frequent reward seeking can often be considered a maladaptive behavioral excess.

Certain types of excessive reward seeking behavior (e.g., pathological gambling, hair pulling, and excessive spending) are considered to be symptoms of impulse-control disorders in the *DSM-IV-TR*. However, it has also been hypothesized that maladaptive behavioral excesses and pharmacological addictions (which are classified as substance-related disorders) share an

underlying biopsychological process (Goodman, 2008; Lejoyeux, Mc Loughlin, & Adès, 2000; Wareham & Potenza, 2010). Goodman (2008) described this process (generally known as the “addictive process”) as an interaction of impairments in the systems of motivation-reward, affect regulation, and behavioral inhibition. Like psychoactive substances, maladaptive behavioral excesses produce short-term rewards that encourage continued behavior despite knowledge of adverse consequences (Grant, Potenza, Weinstein, & Gorelick, 2010; Odlaug & Grant, 2010). The repetition of these behaviors may lead to long-term change in neural motivation and reward circuitry (e.g., decreased dopamine response to addiction stimuli in pathological gamblers and computer game addicts) that resembles that which is seen in those with substance dependence (Weinstein, 2010). In addition, many scholars have argued that conceptualizing maladaptive behavioral excesses as addictions is useful in developing effective treatment approaches (Odlaug & Grant, 2010; Tavares, Zilberman, & el-Guebaly, 2003).

Overeating that persists despite marked distress and knowledge of adverse consequences may also be conceptualized as a maladaptive behavioral excess with aspects of its biopsychosocial process similar to those of pharmacological addictions. Indeed, deficits in dopaminergic activity in mesolimbic and mesocortical pathways have been found among both obese and pharmacologically addicted populations, and it has been hypothesized that the reduced dopaminergic activity in obese individuals may contribute to pathological overeating as a method of compensation for these underactivated circuits (Wang et al., 2001).

In conceptualizing overeating as an addiction, Davis and Carter (2009) posit that it would be inappropriate to include all cases of excessive food consumption in a “food addiction” taxon and argue that that binge eating should be specifically targeted for this purpose. Binge Eating Disorder (BED) is proposed for inclusion in the *DSM-5* under the category of Eating Disorders

(rather than under the category of Impulse-Control Disorders like other behavioral excesses). According to the proposed diagnostic criteria, a BED diagnosis would necessitate recurrent episodes of binge eating (i.e., objective overeating within a discrete period of time [2 hours] and a subjective sense of loss of control during the episode), marked distress regarding the binge eating, an average binge-eating frequency of at least once per week for three months, and the absence of recurrent inappropriate compensatory behavior. Binge-eating episodes also must be associated with at least three of the following five symptoms: 1) eating much more rapidly than usual, 2) eating until feeling uncomfortably full, 3) eating large amounts of food when not feeling physically hungry, 4) eating alone due to feeling embarrassed by how much one is eating, and 5) feeling disgusted with oneself, depressed, or very guilty after overeating (American Psychiatric Association, 2011).

As with the case of other maladaptive behavioral excesses, it has also been hypothesized that pharmacological addictions and binge eating share an underlying biopsychological process (Avena, Rada, & Hoebel, 2008; Barry, Clarke, & Petry, 2009; Bello & Hajnal, 2010; Drevnowski, Krahn, Demitrack, Nairn, & Gosnell, 1995; Pelchat, 2002; Shinohara et al., 2004). Impairments in dopamine signaling, for example, have been implicated in binge eating and substance dependence. In binge eaters, it has been theorized that impairments in dopamine signaling are caused by sustained activation of dopaminergic systems as a consequence of recurrent binge eating (Bello & Hajnal, 2010). Dopamine receptor D2 (DRD2) seems to play an integral role in this process. Johnson and Kenny (2010) have found that obese rats exhibited downregulation of DRD2 and a pattern of palatable food consumption resistant to interruption by an aversive conditioned stimulus; lean rats, on the other hand, did not demonstrate such compulsive-like feeding behavior. Likewise, there is also preliminary evidence to suggest that

the upregulation of DRD2 is associated with weight loss. A study using positron-emission computed tomography (PET) to assess changes in DRD2 availability in gastric bypass patients found increased availability within six weeks following surgery, and this increase was associated with amount of weight lost (Steele et al., 2010).

It is common for individuals with one pharmacological addiction to have additional concurrent pharmacological addictions (Kessler, Chiu, Demler, Merikangas, & Walters, 2005). Therefore, if maladaptive behavioral excesses share an underlying biopsychological process with pharmacological addictions, as has been proposed, it might be expected that those with a pharmacological addiction are also more likely to exhibit concurrent “behavioral addictions.”

Co-occurrence of behavioral addictions and substance use disorders.

Pathological gambling. Gambling problems are more prevalent and tend to be more severe in individuals with substance use disorders. A large national community survey conducted in Canada found the risk of moderate or high severity gambling to be almost three times higher for individuals with substance dependence or harmful alcohol use (el-Guebaly et al., 2006). Among gamblers, substance-abusers tend to engage in heavier gambling than their non-substance-abusing counterparts (Ladd & Petry, 2003; Liu, Maciejewski, & Potenza, 2009).

Compulsive buying. Few studies have assessed current or lifetime prevalence of substance use disorders in compulsive buyers. Christenson et al. (1994) reported a significantly elevated rate of lifetime substance use disorders in compulsive buyers compared with other consumers (45.8% vs. 12.5%). Compulsive buyers were identified as such if they endorsed having “strong urges to buy which cannot be controlled” and met criteria for compulsive buying on the Compulsive Buying Scale (Christenson et al., 1994). Another study reported no cases of current substance use disorder in a sample of depressed inpatients with compulsive buying ($n =$

21); however, this finding may not be generalizable to minimally-moderately depressed populations (Lejoyeux, Haberman, Solomon, & Adès, 1999).

Video game/Internet addictions. Studies of individuals endorsing compulsive and problematic computer use found a 10-14% prevalence rate of current substance use disorders and a 38-55% prevalence rate of lifetime history of substance use disorders (Black, Belsare, & Schlosser, 1999; Shapira, Goldsmith, Keck, Khosla, & McElroy, 2000). These figures are higher than those identified in a nationally representative sample (3.8% twelve-month prevalence; 14.6% lifetime history; Kessler, Berglund, Demler, Jin, & Merikangas, 2007; Kessler, Chiu, Demler, Merikangas, & Walters, 2005). Another study found that prevalence of current substance use disorders in video game players increased linearly with time spent playing per day (Wenzel, Bakken, Johansson, Gotestam, & Oren, 2009).

Rationale for Present Study

The relationship between weight loss and the development of or relapse to a substance use disorder in the period following bariatric surgery is unknown. This area warrants study because post-bariatric surgery patients may be at an elevated risk for postoperative substance use disorders compared with the general adult population (Ertelt et al., 2008; Saules et al., 2010). As bariatric surgery grows in popularity, so does this postoperative SUD subpopulation and the importance of understanding the nature of its weight loss and psychosocial outcomes. It may be the case that certain subgroups of bariatric patients do very well on one outcome (e.g. weight loss) but poorly on another serious outcome (e.g. development of a substance use disorder). Furthermore, understanding the relationship between weight loss and postoperative substance use disorder in bariatric surgery patients (taking into account a preoperative history of substance use disorders) may shed light on recent findings that history of preoperative substance abuse is

associated with more favorable weight loss outcome (Clark et al., 2003; Heinberg & Ashton, 2010). Neither Clark and colleagues (2003) nor Heinberg and Ashton (2010) controlled for postoperative SUD. Thus, it remains unclear if the mechanism behind favorable weight loss in patients with a preoperative history of SUD is related to current substance use (and its related factors) or other variables (e.g. skills gained as a result of successful treatment of substance addiction).

The present study was designed to improve knowledge of weight loss and psychosocial outcomes of Roux-en-Y gastric bypass surgery patients with postoperative substance use disorders relative to control post-RYGB patients matched on variables that may be related to these outcome variables (i.e. age at time of surgery, sex, time since surgery). Those in treatment for substance use disorders were expected to score more poorly on measures of depressive symptomatology and health-related quality of life. Preoperative substance use disorder presence was also assessed. Knowledge of the relationship between weight loss and postoperative SUD (controlling for a preoperative history of substance use disorders) was expected to be useful in interpreting published findings that history of preoperative substance abuse is associated with greater weight loss outcome (Clark et al., 2003; Heinberg & Ashton, 2010). The mechanism behind favorable weight loss in patients with a preoperative history of SUD may be related to current substance use (and its related factors) or other variables (e.g. skills gained as a result of successful treatment of substance addiction). Number and frequency of maladaptive behavioral excesses are also assessed. It was expected that patients in treatment for substance use disorders would endorse greater number and severity of maladaptive behavioral excesses, which would lend support to the notion that these behaviors share part of a biopsychological process with pharmacological addiction. It was also hypothesized that a greater percentage of post-bariatric

patients in treatment for substance use disorders would endorse preoperative BED than would the post-bariatric patients without postoperative problematic substance use. Furthermore, patients indicating a history of BED during the preoperative period were predicted to endorse a greater number and severity of postoperative maladaptive behavioral excesses. The latter two findings would lend support to the conceptualization of binge eating as an addictive behavior, as well as to the theory that “addiction transfer” may occur during the postoperative period in certain individuals.

Research Hypotheses

Hypothesis 1

It was hypothesized that the post-bariatric patients in treatment for substance use disorders would exhibit percentages of total body weight loss and EWL that were statistically equivalent to those of post-bariatric patients without postoperative substance use disorder. A preliminary analysis of percent excess weight loss in post-RYGB patients being treated for a current substance use disorder at a hospital in Brighton, Michigan ($75.3 \pm 23.8\%$ at 6.4 ± 3.2 years post-surgery) yielded similar findings to the 66-77% EWL that is typically reported in the general RYGB literature for patients 4-8 years post-surgery (Christou, Look, & Maclean, 2006; Kofman, Lent, & Swencionis, 2010; Pulcini, Saules, Wiedemann, & Ivezaj, 2011; Valezi, Junior, de Menezes, de Brito, & de Souza, 2010). The use of post-bariatric controls (i.e. those without any indication of a postoperative substance use disorder) matched on variables that have been linked to weight loss outcome in bariatric surgery patients (e.g., age and time since surgery) was intended to facilitate closer group comparison.

Hypothesis 2

It was hypothesized that the post-bariatric patients in treatment for substance use disorders would report poorer quality of life than the post-bariatric controls, as measured by the WHOQOL-BREF. Patients in treatment for substance use disorders tend to report poorer quality of life than the general population (Morgan, Morgenstern, Blanchard, Labouvie, & Bux, 2003). Such a relationship has been demonstrated within a variety of populations, including those with severe mental illnesses (Urbanoski, Cairney, Adlaf, & Rush, 2007). We expected the same type of relationship to hold true within the post-RYGB population.

Hypothesis 3

It was hypothesized that the post-bariatric patients in treatment for substance use disorders would report greater symptoms of depression than the post-bariatric controls, as measured by total score on the PHQ-9, and that a greater number of these participants will score at or over the 10 point cutoff for probable MDD (Kroenke et al., 2001). A national epidemiological survey conducted in the United States found that 32.8% of individuals who reported seeking treatment for an alcohol disorder within the past year and 44.3% of individuals who reported seeking treatment for a drug disorder within the past year also met criteria for MDD within that time frame (Grant et al., 2004). These figures are much higher than the general population 12-month MDD prevalence estimates of 6.7%-7.2% (Grant et al., 2004; Kessler, Chiu, Demler, Merikangas, & Walters, 2005). Similarly, rates of 12-month dysthymia are also elevated in the substance use disorder treatment seeking population, supporting the hypothesis of higher PHQ-9 scores in the current SUD sample (Grant et al., 2004).

Hypothesis 4

It was hypothesized that the post-bariatric patients with preoperative history of substance use disorders would exhibit a greater percentage of total body weight loss and EWL than the post-bariatric patients without preoperative history of problematic substance use. Such a relationship has been found up to 2 years post-surgery; however, very few published studies have assessed this relationship (Clark et al., 2003; Heinberg & Ashton, 2010).

Hypothesis 5

It was hypothesized that the post-bariatric patients in treatment for substance use disorders would endorse a greater number and severity of behavioral excesses than post-bariatric patients without postoperative substance use disorders. Given that it is common for individuals to have more than one concurrent pharmacological addiction, it may be possible that individuals with one (or more) pharmacological addiction(s) are also more likely to have concurrent “behavioral addictions” (Kessler, Chiu, Demler, Merikangas, & Walters, 2005). Evaluating behavioral excesses is a necessary, but not sufficient, step in determining if these behaviors should be regarded as “addictions.” The gambling literature provides some support for this hypothesis, in that problematic gambling, a “behavioral excess,” is consistently found to be more prevalent and more severe in individuals with substance use disorders (el-Guebaly et al., 2006; Liu, Maciejewski, & Potenza, 2009).

Hypothesis 6

It was hypothesized that more post-bariatric patients in treatment for substance use disorders would retrospectively report preoperative binge eating disorder than would post-bariatric patients without a history of postoperative substance use disorder. It was also hypothesized that individuals retrospectively endorsing preoperative binge eating disorder would endorse a greater number and severity of maladaptive behavioral excesses. These findings

would lend support to the conceptualization of binge-eating behavior as an addictive behavior and the idea that postoperative “addiction transfer” occurs in some individuals.

Method

Participants

The present study’s main sample consists of 52 individuals with a history of Roux-en-Y gastric bypass (RYGB) surgery. Half of these individuals ($n = 26$) were being treated for one or more substance use disorders (SUDs) at the time of enrollment in a previous study (described below). The other half (the control group recruited for the present study; $n = 26$) had no postoperative history of SUDs and were matched to the postoperative SUDs group on sex and caliper matched on age at time of surgery and time since surgery. These enrollment numbers were based on an *a priori* power analysis using an expected large effect size ($d = .8$) and power = 0.8, which yielded a minimum sample size for each group in a two-tailed *t*-test and chi-square test (1 df) to be 26 for a 95% confidence interval.

Postoperative SUD group (i.e., Brighton group). The post-operative SUDs group consisted of individuals with a history of RYGB surgery who were admitted to Brighton Hospital for substance use treatment. These individuals’ data were collected during a previous study, which sought to track the prevalence of bariatric surgery history in inpatients being treated for substance use disorders (Saules et al., 2010). Brighton Hospital houses a substance abuse treatment facility that is located in Brighton, MI and commonly receives referrals from across the Midwest. Participants had voluntarily enrolled in Brighton Hospital’s detoxification, rehabilitation, or partial hospitalization programs, which are designed for the treatment of individuals with severe substance abuse and/or dependence problems who require medical

oversight. See Table 1 for characteristics of the 26 Brighton participants for whom control participants were able to be matched.

Non- postoperative SUD group (i.e., control group). The control group consisted of individuals who underwent RYGB surgery at the St. Vincent Bariatric Center of Excellence in Carmel, IN but did not evidence postoperative substance use disorder. They were selected through a matching process, which consisted of matching to the postoperative SUDs group on sex and caliper matching to the postoperative SUDs group on age at time of surgery and time since surgery. This was a sample of convenience, as participants were only recruited from one out of hundreds of facilities that perform bariatric surgeries in the United States. See Table 1 for characteristics of the 26 eligible control participants.

Table 1

Participant Characteristics

Demographic variables	Brighton (n=26) ^a	Control (n=26)
Gender (% female)	80.8%	80.8%
Race (% White)	92.3%	96.2%
Age	48.04 (8.31)	49.77 (8.09)
Age at time of surgery	41.92 (7.88)	42.14 (8.11)
Education (yrs)	14.63 (2.20)	13.84 (2.03)
Preoperative BMI (kg/m ²)	54.29 (12.02)	53.48 (8.74)
Time since Surgery (yrs)	6.76 (2.76)	7.63 (2.97)
Marital status		
Single, divorced, or separated	38.5%	11.5%
Married or living with partner	61.5%	88.5%
Employment status		
Employed at least part time	53.8%	69.2%
Economic status		
Barely enough to get by	11.5%	30.8%
Enough, but no more	50.0%	19.2%
Solidly middle class	15.4%	42.3%
Plenty of extras	15.4%	7.7%
Luxuries	7.7%	0.0%
Annual household income		
>150 thousand	12.0%	0.0%
100-149 thousand	8.0%	11.5%
75-99 thousand	4.0%	34.6%
50-74 thousand	36.0%	15.4%
25-49 thousand	32.0%	23.1%
10-24 thousand	4.0%	11.5%
Not sure/ Prefer not to say	4.0%	3.8%
Substance Use Disorder type		
Alcohol-only	50.0%	0%
Alcohol plus one other drug	15.4%	0%
Alcohol plus two or more other drugs	11.5%	0%
Opiates-only	19.2%	0%
Two or more drugs (no alcohol)	3.8%	0%

Note. Data are presented as percentages for all categorical variables, and as *M (SD)* for Age, Age at time of surgery, Education, Preoperative BMI, and Time since surgery.

^an=26 except for annual household income (n=25)

Measures

Anthropometric measures. Measured height and current weight, used to calculate BMI, were obtained from medical records of Brighton participants. Preoperative weight was obtained via paper-and-pencil self-report questionnaire. Height and weight of control participants were obtained from Internet survey self-report.

Socio-demographics questionnaire. Questions regarding socio-demographic information (e.g., race/ethnicity, relationship status, and years of education) administered to Brighton participants were also administered to control participants (Appendix D).

World Health Organization Quality of Life—BREF (WHOQOL-BREF). The WHOQOL-BREF is an abbreviated version of the WHOQOL-100 consisting of 26 five-point Likert items designed to assess quality of life across four domains: physical health, psychological health, social relationships, and environment (Harper, 1996). Domains are assessed by a group of items, with each item belonging to a distinct facet (Table 2). In the copy of the WHOQOL-BREF provided in Appendix E, one asterisk (*) denotes items belonging to Domain 1 (physical health), ** denotes Domain 2 (psychological domain), *** denotes Domain 3 (social relationships), and **** denotes Domain 4 (environment). There are 7, 6, 3, and 8 items used to assess Domains 1 through 4, respectively. The global rating items of quality of life (Item 1: “How would you rate your quality of life?”) and satisfaction with general health (Item 2: “How satisfied are you with your health?”) are not used in calculating domain scores; rather they can be analyzed separately. Each item is assigned a score of 1 through 5, with higher scores indicating better quality of life. Each possible item response has an associated anchor, however, the anchors vary according to the question asked (e.g. 1 = *Very poor*, 2 = *Poor*; 3 = *Neither poor nor good*; 4 = *Good*; 5 = *Very good*). Items 3, 4, and 26 are reverse-scored. Item scores within each

domain are averaged and then transformed to a 0-100 scale to yield the domain score. Higher transformed domain scores are indicative of better self-reported quality of life in that domain. The WHOQOL-BREF does not derive an overall quality of life score from domain scores. However, the global rating items of quality of life and satisfaction with general health (as described above) can be evaluated separately.

Table 2

WHOQOL-BREF Domains and Facets

Domain	Facet
Physical health	Activities of daily living Dependence on medicinal substances and medical aids Energy and fatigue Mobility Pain and discomfort Sleep and rest Work Capacity
Psychological	Bodily image and appearance Negative feelings Positive feelings Self-esteem Spirituality / Religion / Personal beliefs Thinking, learning, memory and concentration
Social relationships	Personal relationships Social support Sexual activity
Environment	Financial resources Freedom, physical safety and security Health and social care: accessibility and quality Home environment Opportunities for acquiring new information and skills Participation in and opportunities for recreation / leisure activities Physical environment (pollution / noise / traffic / climate) Transport

Note. Table from Harper (1996).

The WHOQOL-BREF has been found to have good psychometric properties. A field trial of the WHOQOL-BREF using a large sample of adults throughout 23 countries ($N=11,830$) found Cronbach's α to be 0.82, 0.81, 0.68, and 0.80 in the physical health, psychological, social, and environment domains, respectively, suggesting acceptable to good levels of internal consistency reliability in each domain (Skevington, Lotfy, & O'Connell, 2004). Each domain has also been shown to be able to distinguish between ill and well subjects indicating good discriminant validity (Harper & Power, 1998). Test-retest reliability, as assessed by Pearson r correlations in four of the participating WHOQOL field trial centers with a 2-8 week test-retest interval, were adequate in each domain (.66 for physical health, .72 for psychological health, .76 for social relationships, and .87 for environment; Harper & Power, 1998). Results of a confirmatory factor analysis suggest that the 4-domain model fits the WHOQOL-BREF international field trial data well, indicating good construct validity; exploratory factor analyses (Varimax rotation) failed to find a better solution than the 4-domain model (Skevington et al., 2004).

WHOQOL-BREF may also be an appropriate measure of quality of life in the substance use disorder population, in addition to the general population. In a study evaluating psychometric properties of the WHOQOL-BREF in males with alcohol dependence, Barros da Silva Lima, Fleck, Pechansky, de Boni, and Sukop (2005) found satisfactory convergent validity with the Short Form-36 quality of life measure and good internal consistency in each domain (α s ranging from 0.78 to 0.89).

Patient Health Questionnaire-9 (PHQ-9). The PHQ-9 is a nine-item measure of depressive symptomatology based on the Diagnostic and Statistical Manual-IV (*DSM-IV*) diagnostic criteria for depressive disorders (Appendix F; Kroenke, Spitzer, & Williams, 2001).

Responses to each of the nine Likert-type items are assigned a score on a 0-3 range based on reported symptom frequency (0 = *Not at all*, 1 = *Several days*, 2 = *More than half the days*, 3 = *Nearly every day*). The measure is comprised of one scale, and no items are reverse scored. Item scores are summed, yielding total scores ranging from 0 to 27. Higher scores indicate greater depressive symptom severity (Minimal =0-4, Mild =5-9, Moderate =10-14, Moderately severe =15-19, and Severe =20-27). A score of 10 is often used as a cut point for identifying individuals with potential major depressive disorder; Kroenke et al. (2001) found the use of that threshold to yield a sensitivity of .88 and a specificity of .88. Individuals with depressive disorders other than MDD tend to yield scores intermediate to these two groups.

The PHQ-9 has been shown to have good psychometric properties. Cronbach's alpha for this instrument was found to be .89 in patients recruited from primary care clinics, .86 in those recruited from obstetrics-gynecology sites, and .87 in those in residential substance abuse treatment facilities (Hepner, Hunter, Edelen, Zhou, & Watkins, 2009; Kroenke, et al., 2001). In a study of individuals referred to a mental health provider by their primary care physician, Cameron, Crawford, Lawton, and Reid (2008) calculated Cronbach's alpha for this instrument to be .83 at the beginning of treatment and .92 at the end of treatment. Item-total correlations at time points were acceptable overall (ranging from .42 to .79), and were highest for *Feeling down* (beginning: .65; end: .79) and lowest for *Thoughts of self-harm* (beginning: .42; end: .62). These figures suggest good internal reliability consistency of the PHQ-9 in populations seeking diverse types of health care. The PHQ-9 has also been shown to have good temporal stability over a one-week period ($r_{(1CC)} = 0.81$; Löwe et al., 2011).

The PHQ-9 has also been found to correlate significantly higher with the Hospital Anxiety and Depression Scale (HADS) depression subscale than it does with the HADS anxiety

subscale in patients seeking mental health services (.68 vs. .48), providing evidence for both convergent and discriminant validity of the measure (Cameron, Crawford, Lawton, & Reid, 2008). Additionally, Hepner, Hunter, Edelen, Zhou, and Watkins (2009) found a high correlation between the PHQ-9 and Beck Depression Inventory-II (BDI-II) in patients in residential substance abuse treatment facilities ($r = .76$). The PHQ-9 and BDI-II seemed to identify moderate and severe depression in a similar fashion in this substance abuse population, but the PHQ-9 concluded more individuals to have mild depressive symptoms while the BDI suggested more individuals had minimal symptoms. Therefore, the PHQ-9 may be more sensitive than the BDI-II in detecting low levels of depression. Hansson, Chotai, Nordstrom, and Bodlund (2009) performed an exploratory factor analysis of the PHQ-9 using principal component analysis (Varimax rotation), which resulted in one factor that explained 56.5% of the variance.

Behavioral Excess Questionnaire. The Behavioral Excess Questionnaire is a 7-item measure that was developed for exploratory use in the Brighton study. It was designed to assess the presence of non-substance related behavioral excesses. Brighton participants were instructed to select how often they participated in the following activities during the 4 weeks before entering the substance treatment facility: Internet surfing, gambling, videogame playing, sexual behavior outside of a committed relationship, eating sweets in amounts that most people would consider excessive, eating carbohydrates in amounts that most people would consider excessive, and eating large amounts of food very late at night (Appendix G).

The Behavioral Excess Questionnaire administered to the control participants had been modified from that which was administered to the Brighton participants in the following two ways: First, the wording in the opening question was changed from “During the four weeks

before you came to Brighton...” to read “During the past four weeks...” Second, behavioral excess categories for shopping and shoplifting were added to the questionnaire for exploratory analysis in the control group due to anecdotal reports made by participants in the Brighton study and colleagues in the field (Appendix H). Responses from these two items were not included in calculating the total score of the measure.

Items are Likert-type and are scored as follows: 1 = *Not at all*, 2 = *Several days a week*, 3 = *More than half the days*, 4 = *Nearly everyday*. No items are reverse scored. Higher item scores indicate greater frequency of behavior. Different frequency thresholds are assigned to each behavior to determine if participants’ scores on that item indicate a behavioral excess; unique thresholds are used because behaviors are not likely to become maladaptive at the same frequency. Thresholds were defined as follows: *Several days a week*: Shoplifting; *More than half of the days*: Sexual behavior outside of a committed relationship, Gambling, Eating sweets in amounts that most people would consider excessive, Eating carbohydrates in amounts that most people would consider excessive, Eating large amounts of food very late at night, and Shopping; *Nearly everyday*: Surfing the Internet for more than two hours (not for work purposes), and Videogame playing. The *Several day* category was not chosen as a cut-off point for most behaviors because the only response option available to participants to indicate lower frequency was *Not at all*; it is, therefore, unclear as to which of these two options a person who engages in a behavior 1-2x per week would endorse. Responses meeting or exceeding (i.e., indicating more frequent behavior) an item’s frequency threshold were considered to indicate the presence of a behavioral excess, while responses not meeting an item’s frequency threshold were considered to indicate the absence of a behavioral excess. A dichotomous variable representing the presence or absence of a behavioral excess (1 = *present*, 0 = *absent*) was created for each

behavior assessed in the questionnaire. These dichotomous variables were then summed, and the total represents the number of behavioral excesses currently engaged in by the participant.

Scores between groups were also compared on the individual item-level in order to assess group differences in frequency of specific behavioral excesses (e.g., gambling).

Psychometric properties of this exploratory instrument have not been assessed. While the use of this questionnaire was not ideal, it was necessary to use in order to facilitate control group comparison with the Brighton participants. Recognizing the weakness in this measure, conclusions drawn from its results were tempered accordingly.

Questionnaire on Eating and Weight Patterns- Revised (QEWP-R). The QEWP-R is a 28-item self-report measure designed to assess the criteria necessary for the binge eating disorder (BED) diagnosis, as defined by the proposed diagnostic criteria for BED in the *DSM-IV-TR* (*DSM-IV-TR*, 2000; Spitzer, Yanovski, & Marcus, 1994). The main criterion of BED is an average of 2 or more objective binge episodes (OBEs) per week during the past 6 months. The QEWP-R assesses the individual components of an OBE (i.e. consumption of what most people would regard as an unusually large amount of food within a discrete period of time [e.g. 2 hours] and a subjective sense of loss of control during the episode), as well as the average weekly frequency of these OBEs. It also differentiates between individuals with probable BED and those with probable bulimia nervosa via items assessing presence and frequency of purge symptoms. Additional BED criteria assessed by the QEWP-R include marked distress regarding the OBEs and the presence of at least three of the following five associated symptoms: 1) eating much more rapidly than usual, 2) eating until feeling uncomfortably full, 3) eating large amounts of food when not feeling physically hungry, 4) eating alone due to feeling embarrassed by how

much one is eating, and 5) feeling disgusted with oneself, depressed, or very guilty after overeating.

Responses to 17 of the 28 items on the QEWP-R are used to determine BED diagnostic status. Some of these items are dichotomous (e.g. 1 = *yes* and 2 = *no*), while others are multiple choice (e.g. 1 = *less than one day/ week*; 2 = *1 day per week*; 3 = *2 or 3 days per week*; 4 = *4 or 5 days per week*; 5 = *nearly every day*). Item responses were only assigned values for data entry and analysis purposes. Values assigned to items were not added together to yield a total scale score. Rather, item responses either did or did not satisfy a requirement for the BED diagnosis. Scored test results reflected the presence/absence of a presumptive diagnosis of BED. There are no reverse scored items and there is no range of possible scores other than the absence or presence of BED. See Appendix I for QEWP-R scoring rubric. The version of the QEWP-R that was modified for use in the Brighton study was also used in the proposed investigation for the sake of consistency (Appendix J).

The QEWP-R has acceptable psychometric properties. Using the Eating Disorders Exam (EDE) interview as the gold standard in the diagnosis of BED, the QEWP-R yielded a sensitivity of .74 and specificity of .35 (Celio, Wilfley, Crow, J. Mitchell, & Walsh, 2004). The QEWP-R has moderate temporal stability in the diagnosis of BED over a three-week interval ($k = .58$; Nangle, Johnson, Carr-Nangle, & Engler, 1994). BED diagnostic agreement between the QEWP-R and Eating Disorder Exam- Questionnaire (EDE-Q) is fair in bariatric surgery candidates ($k = .26$; Elder et al., 2006). Individuals meeting BED criteria on the QEWP-R have lower levels of self-esteem ($p < .05$) and higher levels of stress ($p < .05$) than both their overeating and control counterparts, suggesting divergent and convergent validity, respectively (Striegel-Moore, Wilson, Wilfley, Elder, & Brownell, 1998). Adolescents classified as having

BED based on an adolescent version of the QEWP-R also endorsed significantly higher levels of depressive symptomatology and eating concerns than those without BED diagnoses, which also demonstrates convergent validity (W. G. Johnson, Grieve, Adams, & Sandy, 1999).

Under QEWP-R scoring guidelines (Appendix J), which are based on the *DSM-IV-TR* proposed diagnostic criteria for BED, an average of at least 2 OBEs per week are required to meet BED criteria. However, arguments have been made that this criterion should be lowered to an average of 1 OBE per week based on findings of little difference in psychological and behavior variables between those with subthreshold and full-syndrome BED (Elder et al., 2006; Striegel-Moore, Wilson, Wilfley, Elder, & Brownell, 1998). The *DSM-5* criteria for BED proposed by the Eating Disorders work group reflects these findings, and many researchers are already using this new frequency criterion in their studies (“Binge Eating Disorder,” 2011; Bocchieri-Ricciardi et al., 2006; Jones-Corneille et al., 2010). Therefore, this study’s primary analyses adhered to the original QEWP-R scoring rubric (Appendix J) with the exception of using the threshold of an average of at least 1 OBE per week instead of 2 OBEs per week. Exploratory analyses were then conducted using the original threshold of an average of at least 2 OBEs per week.

WHO-ASSIST V3.0 questionnaire. The World Health Organization Alcohol, Smoking and Substance Involvement Screening Test Version 3.0 (WHO-ASSIST V3.0) is designed to detect substance use problems in primary and general medical care settings. A modified version of the WHO-ASSIST V3.0 (Appendix K) was used in this study to assess problematic and heavy substance use prior to surgery and after surgery among the control sample only. Questions not theoretically relevant to the primary aims of the study were omitted in order to reduce participant response burden. These questions included those regarding tobacco use and lifetime history of

injected drug use. In addition, the Opioid category was divided into two separate categories (i.e., Opioids in Pill Form and Injected Opioids) in order to increase clarity.

The modified questionnaire has two sets of seven questions, each with up to 10 subparts (assigned letters b-k). The first set of questions assessed substance use prior to surgery, while the second set assessed substance use subsequent to surgery. In each set, questions 2-7 were only asked in regard to those substances the participant endorsed in Question 1. The assessment of postoperative substance use in the control sample was conducted in order to permit exclusion of those with any evidence of a postoperative substance use disorder. Exclusion of participants from the study's primary analysis was warranted by one or more of the following frequency conditions: Alcohol use daily or almost daily; Cannabis use weekly or more often; Any of the substances represented in items c-j monthly or more often. Exclusion also occurred when a participant answered "Once" or more often on Question 4 for items b-j, "Monthly" or more often on Question 5 for items b-j, or "yes" on questions 6 or 7 on items b-j. Note that tobacco was not assessed using this questionnaire.

Each of the two sets of questions was scored separately in the following way. Question 1 was not scored. Questions 2-5 were multiple choice and were scored as follows: 0 = *Never*, 3 = *Once or twice*, 4 = *Monthly*, 5 = *Weekly*, 6 = *Daily or almost daily*. Questions 6-7 were dichotomous and were scored as follows: 0 = *No*, 3 = *Yes*. For each substance category (e.g. alcoholic beverages), the appropriate parts of questions 2-7 were summed to yield the Specific Substance Involvement score (ASSIST-SSI score). The ASSIST-SSI score was used to identify a risk level for the alcoholic beverage category as follows: 0-10 = *Low*, 11-26 = *Moderate*, 27+ = *High*. All other classes of substances were categorized as follows: 0-3 = *Low*, 4-26 = *Moderate*, 27+ = *High*. Normally, a total substance involvement score (ASSIST-TSI score) can

also be calculated by summing response scores for questions 1-8 across the original 10 drug classes. Due to the present survey's modification of the drug classes and the omission of question 8, however, modified ASSIST-TSI scores were calculated by summing response scores for questions 1-7 across the 10 modified drug classes.

The WHO-ASSIST has good psychometric properties. Data from a multi-site international study yielded Cronbach's alpha for ASSIST-TSI scores to be .89 and ASSIST-SSI scores to range from .77 to .94, suggesting good internal consistency (Humenuik et al., 2008). Concurrent validity was also supported by significant correlations found between ASSIST scores and scores from the Alcohol Use Disorders Identification Test (AUDIT; $r = .82$) and the Severity of Dependence Scale (SDS; $r = 0.59$; Humenuik et al., 2008).

Procedures

The present investigation included secondary analysis of data from a study conducted at Brighton Hospital, a Midwestern substance abuse treatment facility. This study received approval from the institutional review boards at Eastern Michigan University and Providence Hospital and Medical Centers in February 2009, and it was renewed annually for two years thereafter. Additionally, the present investigation included data collection via Internet survey, which necessitated approval from the institutional review boards at Eastern Michigan University and St. Vincent Carmel Hospital in Carmel, IN.

Post-operative SUDs group. Inpatients at a substance abuse treatment facility in Brighton, MI who reported a history of Roux-en-Y gastric bypass (RYGB) surgery ($n = 56$) had already completed the components necessary for this study. Recruitment procedures are explained in Wiedemann et al. (in preparation). Briefly, history of bariatric surgery was routinely assessed upon intake to the treatment facility during their standard admission History

and Physical Examination procedures. Patients indicating a history of bariatric surgery were asked if they would be interested in participating in a research study assessing outcomes of post-bariatric surgery patients who developed problems with substance use after surgery. They were told that the study's aim was to better understand the factors which might contribute to some weight-loss surgery patients being more likely to experience substance abuse or dependence. As each potential participant was identified, Brighton Hospital staff scheduled a session for the individual with a member of the Eastern Michigan University (EMU) research team. Each of these sessions was conducted at Brighton Hospital while individuals were undergoing treatment for one or more SUDs. Informed consent was obtained by a member of the EMU research team at the beginning of the session prior to the collection of any study data. The researcher then conducted a 40-minute semi-structured interview, which focused the patient's experience with RYGB, substance use, and the perceived interaction between these two. Next, the participant was asked to complete a paper-and-pencil questionnaire, which included a question on preoperative weight. Additional information (e.g., admission date, current diagnoses) was obtained via chart review. Participants received compensation in the form of \$10 gift cards for each phase of the study (interview and questionnaire phases).

Control group. A group of individuals with a history of RYGB surgery and no evidence of a postoperative substance use disorder was recruited for comparison. Identification of potential control participants was performed by our collaborator, Dr. Leslie Schuh, at the St. Vincent Bariatric Center of Excellence in Carmel, IN using an internal database maintained at that facility. Identified individuals, each of whom had a history of RYGB, were matched on sex, and caliper matched on age at time of surgery (within two years) and time since surgery (within one year).

Potential control participants identified by Dr. Schuh were sent an information packet from St. Vincent Carmel Hospital via postal mail. The information packet contained the following: a recruitment letter (Appendix B) and an informed consent information sheet (Appendix C). The recruitment letter served to explain the nature of the study and the reason for being contacted and provided instructions on how to participate or learn more about the study. This letter also directed interested individuals to the URL of the study survey website, provided the individual with a unique participant ID number, and explained that a \$10 Amazon gift card would be offered as compensation for study completion. The informed consent information sheet contained all of the elements of a traditional informed consent form, including an explanation of participant rights, potential risks and benefits, as well as the voluntary nature of the study.

Interested individuals were instructed to complete the survey online at their convenience. At the beginning of the survey, individuals were prompted to enter their participant ID number, rather than their name, which obviated the need for participant names linked with their responses to be sent over the Internet. Surveys were conducted through SurveyMonkey.com, LLC, a web-based survey tools provider that employs SSL encryption to promote secure transmission of data over the Internet and pledges to keep all of its users' survey questions, responses, and results in strict confidence (SurveyMonkey.com LLC., 2010).

After entering a participant ID, the next page of the survey reiterated the informed consent information that was provided in hardcopy via postal mail. Those who indicated agreement to the study's terms were allowed to proceed to the rest of survey, while those who did not indicate agreement were not allowed to proceed. Individuals with questions regarding

the study were asked to contact the study's principal investigator before proceeding, and contact information was provided on that page.

At the last page of study survey, participants were provided a link to a compensation survey and encouraged to complete it if they would like to be sent a \$10 Amazon gift card for compensation. The separate compensation survey requested the email address to which he or she would like the electronic Amazon gift card to be sent. It also gave the participant the option of receiving the gift card via postal mail. Responses to the compensation survey were not linked to those of the study survey.

Since the PHQ-9 included an item that assessed for suicidal ideation and thoughts of self-harm, all participants were provided the National Suicide Prevention Lifeline phone number (1-800-273-TALK) and website address (<http://www.suicidepreventionlifeline.org/>) at the end of the study survey as a precautionary measure. Calls to the National Suicide Prevention Lifeline, a 24-hour, confidential suicide prevention hotline, are automatically routed to the nearest crisis center nationwide. Hotline staff provide counseling and mental health referrals to anyone in suicidal crisis or emotional distress.

St. Vincent Carmel Hospital researchers followed up with each potential participant by calling him or her within 10 days of the sending of the recruitment letter. The purpose of this call depended on the individual's response thus far. It served as a follow-up call for those who had already completed the Internet survey, a reminder call for those who intended to complete the survey but had not done so yet, and an opportunity for other individuals to ask questions or decline participation. The researcher offered to email the study survey URL to interested participants for their convenience. Interested individuals who did not wish to complete the study online were offered the option of completing the questionnaires on hard copy via postal mail.

No more than one voicemail per available phone number was left for potential subjects who had not shown any interest in the study (i.e., did not make an attempt to contact us). Messages left on the voicemail of potential participants were respectful of the patients' privacy (e.g., they did not include the information that the individual had a history of bariatric surgery). In order to ensure participants were contacted as intended, a tracking spreadsheet was created and maintained. In the event of identified matched-control participant ineligibility for the primary data analyses (i.e., a probable postoperative SUD was suggested by the Internet survey), decision not to participate, or repeated failure to be contacted, a replacement matched-control individual was identified by Dr. Schuh and was contacted in the same manner as were the original matches.

The control participant recruitment process began on 9/16/11 and ended on 2/19/12, spanning a period of over 5 months. During this time, a total of 199 individuals were sent an initial inquiry letter via postal mail, of which 25 were returned to sender due to outdated or invalid address. Of the remaining 174 individuals, 51 were unable to be contacted via phone or email due to disconnected or invalid accounts, and 1 was deceased. Of the remaining 122 individuals, 39 completed the survey. Twenty-six of these 39 individuals were eligible control participants, 7 were ineligible control participants (i.e., those whose responses suggested they may have had problematic substance use in the postoperative period), 5 were control participants who were eligible with the exception that the SUD group participant they had been matched to had already been matched to another control participant, and 1 was a control participant who would have been eligible but was erroneously matched with an ineligible SUDs group participant who had received surgery for reasons other than obesity and was within the normal weight range at the time of her surgery. Recruitment was closed upon obtaining data from the minimum number of 26 eligible participants due to the slow rate of study response.

Design

This was a quasi-experimental study with a matched-pair, between-subjects, non-equivalent groups design. There were two nonrandomly assigned groups: post-bariatric patients in treatment for substance use disorders (SUDs) and post-bariatric controls (i.e., post-bariatric patients without a postoperative history of SUDs). Groups were matched on sex, and caliper matched on age at time of surgery (within 2 years) and time since surgery (within 1 year). Participants were assessed at one postsurgical timepoint. This study also used retrospective pretests (i.e. presurgical weight, presurgical binge-eating episode presence and frequency, presurgical substance use presence and frequency) in order to compare postsurgical change in these variables across groups. This design was chosen as a practical method for comparing weight and psychosocial outcomes of bariatric surgery in those who do, and do not, experience postoperative SUDs.

Analysis

Data were analyzed using SPSS version 19.0. All data were screened using frequency distributions and descriptive statistics. Outliers were checked for data entry error. The original intention was to treat missing data via maximum likelihood estimation. Very little data was missing, however, and listwise case deletion was used instead. Of the main variables used in the primary analyses, only 1 participant in the control group was missing data on preoperative BED status. No other cases were missing in regard to the other main study variables, which were preoperative and current BMI, percent EWL, each of the four quality of life domain scores, total PHQ score, and preoperative and postoperative substance use risk scores.

Correlation and covariation matrices were examined. Any independent variable that correlated strongly with the independent variable of interest (i.e., postoperative SUD status) was

noted as a potential confounding variable, if theoretically relevant. The relationship of the potential confounding variable to the dependent variable in question (i.e., percentage of excess weight loss) was then examined with a Pearson product-moment correlation. If the correlation was high, group differences on the potential confounding variable were assessed using *t*-tests. If groups differed, it was concluded that this variable may confound results.

Data were determined to meet assumptions of statistical tests before proceeding with planned analyses. Alternate statistical tests were used when assumptions of planned tests were not met. The data were assessed for the multivariate statistical testing assumptions of normality, linearity, and homoscedasticity. A Shapiro-Wilk test of each variable of interest was used to assess univariate normality. Significance of skewness and kurtosis were evaluated at an alpha level of .01. Bivariate scatterplots for all subsets of variables were also examined; roughly elliptical patterns were taken to support the assumption of multivariate normality and linearity. Homoscedasticity was assessed through a visual inspection of bivariate scatterplots and Levene's Test for Equality of Variances.

Inferential statistical procedures also assume simple random sampling. This assumption had been violated since participants in the study populations did not have an equal chance of being selected for participation in the study given the matching procedure. These tests, however, are somewhat robust to this type of violation. The assumption of independence in independent samples *t*-tests, Analysis of Variance (ANOVA), and ANCOVA was met since participant responses did not influence one another.

Two additional assumptions required testing prior to ANCOVA use (Mertler & Vannatta, 2010). First, the assumption of linearity between the covariate and dependent variable was determined to be supported if bivariate scatterplots showed a roughly elliptical pattern. Second,

the assumption that the regression slopes for the covariate were equal for each group in the analysis was supported if the F test for the interaction of the independent variable and the covariate did not reach significance.

Unlike parametric tests (e.g., t -test, ANOVA, ANCOVA), the chi-square test is distribution free. However, it includes an additional assumption that the sample size is sufficiently large to yield an expected frequency of ≥ 5 for each cell. As a result, a nonparametric test without this assumption, Fisher's exact test, was used when any expected cell frequencies were less than 5.

Analyses for hypothesis 1. Originally, the intention was to conduct a one-way ANCOVA at alpha level .05 with postoperative SUD status as the independent variable (two levels: postoperative SUD, non- postoperative SUD), %EWL as the dependent variable, and preoperative BMI as a covariate (since preoperative BMI has been identified as a predictor of weight loss outcome in RYGB patients in the literature). This analysis was then to be repeated with % total body weight loss as the dependent variable. However, the postoperative SUD group and non- postoperative SUD group did not differ significantly on mean preoperative BMI (See Results section). Therefore, preoperative BMI was not considered to be a confound in the analyses comparing these two groups, which obviated the need for an ANCOVA. Instead, paired samples t -tests were performed to compare percent total body weight change and %EWL between the post-bariatric patients in treatment for SUDs and the post-bariatric controls.

It was then originally the intention that if no statistically significant differences were found, statistical equivalence of these variables would be tested using inferential confidence intervals (ICI; Tryon, 2001). Although the difference was not significant, this analysis was not theoretically relevant given that the post-bariatric patients in treatment for SUDs lost *more*

weight than the post-bariatric controls. In other words, this study sought to examine whether post-RYGB patients with SUDs lost at least as much weight as did post-RYGB patients without postoperative SUDs, and this question was already answered.

Analyses for hypothesis 2. It was originally the intent to perform a series of one-way ANOVAs at alpha level .05 with postoperative SUD status as the independent variable and six dependent variables (the four subscales of the WHOQOL-BREF and the global rating items of quality of life and satisfaction with general health) with the Bonferroni correction post-hoc test to prevent alpha inflation. The data, however, were not normal. Therefore, a series of Related-Samples Wilcoxon Signed Ranks tests with the Bonferroni correction post-hoc tests to prevent alpha-inflation were deemed more appropriate to use since this test is non-parametric and designed for analysis of paired data.

Analyses for hypothesis 3. It was originally the intent to perform a two-tailed paired *t*-test at alpha level .05 to compare mean PHQ-9 scores between the postoperative SUD and non-postoperative SUD groups. The data, however, were not normal. Therefore, a Related-Samples Wilcoxon Signed Ranks test was more appropriate to use since this test is non-parametric and designed for analysis of paired data. Difference between groups in the frequency of occurrence of probable MDD (defined as ≥ 10 points on the PHQ -9) was then compared using a chi-square test, as planned.

Analyses for hypothesis 4. Since probable preoperative SUDs status in the postoperative SUDs group and control group were determined using different methodologies (i.e., interview vs. WHO-ASSIST questionnaire, respectively), the impact of preoperative SUDs were explored in each group separately, in addition to an overall combined comparison. It was originally the intent to conduct an ANCOVA with preoperative SUD status as the independent

variable (two levels: preoperative SUD, non-preoperative SUD), %EWL as the dependent variable, and any theoretically relevant variables that significantly differ between groups as covariates. This analysis was then to be repeated with % total body weight loss as the dependent variable. ANCOVAs, however, were not necessary due to lack of significant differences between groups as per independent samples *t*-tests.

Analyses for hypothesis 5. It was originally the intent to perform a two-tailed paired *t*-test at alpha level .05 to compare mean number of behavioral excesses endorsed between the postoperative SUD and non- postoperative SUD groups. The data, however, were not normal. Therefore, a Related-Samples Wilcoxon Signed Ranks test was more appropriate to use since this test is non-parametric and was designed for analysis of paired data.

It was also the intention to conduct a Mann-Whitney U-test in order to compare severity of behavioral excesses between the postoperative SUD and non- postoperative SUD groups (with severity being an ordinal variable assigned a ranking based on endorsed frequency category). However, a comparison of the severity of behavioral excesses could not be completed as planned due to the structure of the questionnaire and the low rates of excesses endorsed. This is explained in greater detail in the Results section.

Analyses for hypothesis 6. Difference in the frequency of occurrence of probable preoperative BED (as determined by the QEWP) between the postoperative SUD and non-postoperative SUD groups was assessed using a chi-square test, as planned. The original intent was to then use an independent samples *t*-test to compare mean number of behavioral excesses endorsed between the BED and non-BED groups; however, an Independent-Samples Mann-Whitney U-test was used instead due to lack of normality of the data distribution.

It was then originally the intention to conduct a Mann-Whitney U-test in order to compare severity of behavioral excesses between the BED and non-BED groups (with severity being an ordinal variable assigned a ranking based on endorsed frequency category). However, a comparison of the severity of behavioral excesses could not be completed as planned due to the structure of the questionnaire and the low rates of excesses endorsed. This is explained in greater detail in the Results section.

Results

For each analysis, group data for relevant variables were checked for normality using the Shapiro-Wilk test. Nonparametric tests were used to analyze data that was not normal and could not achieve normality with the appropriate transformation (Mertler & Vannatta, 2010). Data were assessed with respect to all other assumptions relevant to the statistical tests performed.

The postoperative SUD group and non- postoperative SUD group did not differ significantly on mean preoperative BMI ($M = 54.3$, $SD = 12.0$ kg/m² vs. $M = 53.5$, $SD = 8.7$ kg/m², $p = 0.78$). Therefore, preoperative BMI was not considered to be a confound in the analyses comparing these two groups.

Participant Characteristics Results

It was anticipated that some demographic characteristics of the control group would be similar to those of the Brighton group (in addition to variables which have been matched), since Brighton Hospital and St. Vincent Bariatric Center are both located in the Midwest (Brighton, MI and Carmel, IN, respectively), and the majority of bariatric patients seen at each facility are Caucasian. It was also conjectured that the vast majority of members of both groups had adequate health insurance policies that allowed for the expensive process of bariatric surgery. However, economic similarities were uncertain since the bariatric surgeries were, on average,

7.20 years ago, and substance use disorders have been linked with unemployment and financial difficulties. It, therefore, was thought that the control participants might indicate a higher economic status.

As expected, *t*-tests revealed no significant differences in mean age, preoperative BMI, years of education, or time lapse since surgery between the Brighton and control groups. Chi-square and Fisher's Exact tests also revealed no significant differences in frequency of sex, race (Caucasian vs. non-Caucasian), or marital status (Single/divorced/separated vs. Married/living with a partner) between groups. Economic status was dichotomized into \geq "We are solidly middle class" and \leq "We have enough to get by, but no more" based on this breakpoint being the closest to the midpoint of the distribution of responses, and a Fisher's Exact test revealed no significant difference in frequency of category membership between groups, $p = .577$. See Table 1 for characteristics of the Brighton and control participants.

Hypothesis 1 Results

It was hypothesized that the post-bariatric patients in treatment for SUDs (i.e., the Brighton group) would exhibit percentages of total body weight loss and EWL not significantly different from those of post-bariatric patients without postoperative SUDs (i.e., the control group). It was thought that post-bariatric patients in treatment for SUDs would demonstrate levels of weight loss that were at least as successful as the post-bariatric controls.

A paired samples *t*-test revealed no significant differences in percent total body weight change between the post-bariatric patients in treatment for SUDs ($M = -38.2$, $SD = 11.8$) and the post-bariatric controls ($M = -34.7$, $SD = 15.0$), $t(25) = -.842$, $p = .42$. Likewise, no significant differences in %EWL between the post-bariatric patients in treatment for SUDs ($M = 74.4$, $SD = 22.1$) and the post-bariatric controls ($M = 66.5$, $SD = 27.6$) were found, $t(25) = .992$, $p = .33$.

Time since surgery among the post-bariatric patients in treatment for SUDs ($M = 6.76$, $SD = 2.76$) and the post-bariatric controls ($M = 7.63$, $SD = 2.97$) were comparable, $t(50) = -1.091$, $p = .281$.

In an exploratory analysis, the frequency of individuals in each group meeting surgical failure criteria (defined as $< 50\%$ EWL) was also examined. Nine out of the 26 post-bariatric controls (34.6%) met surgical failure criteria, compared with only 3 out of the 26 post-bariatric patients in treatment for SUDs (11.5%). The difference in frequency between groups was significant, $\chi^2(1, N = 52) = 3.90$, $p = .048$, indicating that significantly fewer post-bariatric patients in treatment for SUDs met the $\%EWL < 50\%$ cutoff for surgical failure relative to their age, sex, and time lapse since surgery matched-controlled counterparts with no postoperative history of SUDs.



Figure 1. Mean Percent Excess Weight Loss (EWL). *ns*.

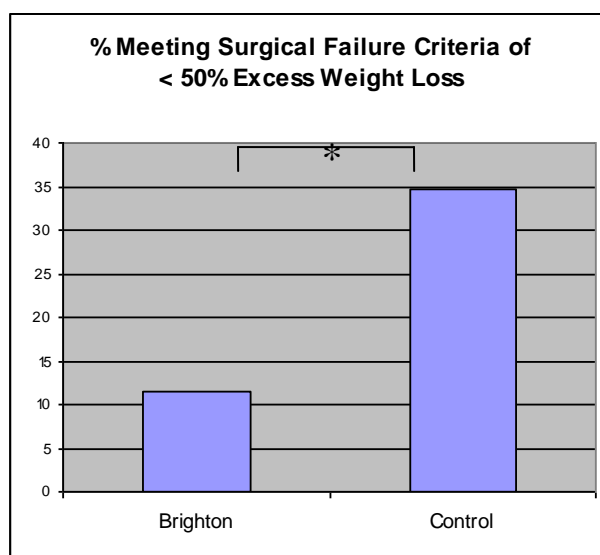


Figure 2. Percent of groups meeting criteria for surgical failure. Surgical failure is defined as $< 50\%$ EWL. $*p < .05$.

Hypothesis 2 Results

It was hypothesized that the post-bariatric patients in treatment for SUDs would report poorer quality of life than the post-bariatric controls, as measured by the WHOQOL-BREF.

Related-Samples Wilcoxon Signed Ranks tests revealed significantly lower quality of life scores for the postoperative SUD group relative to the post-bariatric control group in regard to the two global rating items (Item 1: “How would you rate your quality of life?”; Item 2: “How satisfied are you with your health?”), indicating less favorable perception of quality of life and lower satisfaction with general health, respectively ($z = -4.255, p < .001$; $z = -2.281, p = .023$). Related-Samples Wilcoxon Signed Ranks tests also indicated significantly lower quality of life scores for the postoperative SUD group relative to the post-bariatric control group in regard to the Physical ($z = -2.706, p = .007$), Psychological ($z = -2.706, p = .006$), and Social ($z = -2.559, p = .010$) domains, but not the Environmental domain ($z = -1.050, p = .294$). After the Bonferroni correction was applied to prevent alpha inflation, only the global rating item 1, the Physical domain, and the Psychological domain scores remained significantly different between the two groups.

Although the Wilcoxon Related-Samples Signed Ranks tests yield Mean Ranks and Sums of Ranks (rather than Mean scores), mean scores and standard deviations are reported in Table 3 for descriptive purposes.

Table 3

Mean Scores of WHOQOL-BREF Global Items

	Brighton (n=26)	Control (n=26)
Global rating item 1: How would you rate your quality of life?	2.62 (1.20)	4.31 (0.84)
Global rating item 2: How satisfied are you with your health?	2.69 (0.93)	3.46 (1.21)

Note. Data are presented as *M (SD)*. Global rating items range from scores of 1 through 5, with higher scores indicating better quality of life.

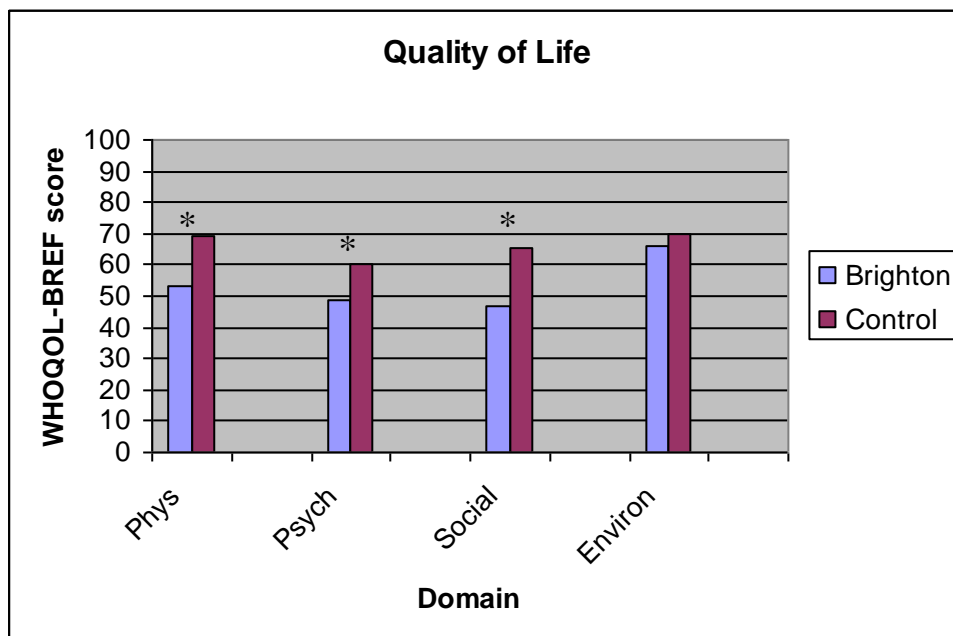


Figure 3. Transformed WHOQOL-BREF scores representing quality of life within physical, psychological, social, and environment domains. Transformed WHOQOL-BREF domain scores range from 0 to 100, with higher scores indicating better quality of life. $*p \leq .01$.

Hypothesis 3 Results

It was hypothesized that the post-bariatric patients in treatment for SUDs would report greater symptoms of depression than the post-bariatric controls, as measured by total score on the PHQ-9, and that a greater number of these participants would score at or over the 10 point cutoff for probable MDD.

A Related-Samples Wilcoxon Signed Ranks test revealed significantly higher PHQ-9 scores for the postoperative SUD group ($Mdn = 14.0$, $M = 14.5$, $SD = 5.7$) relative to the non-postoperative SUD group ($Mdn = 5.5$, $M = 7.0$, $SD = 7.0$), indicating greater symptoms of depression in the former, $z = -3.26$, $p = .001$. Five out of the 26 individuals (19.2%) in the non-postoperative SUD group met PHQ-9 criteria for probable MDD, compared with 22 out of the 26 (84.6%) individuals in the postoperative SUD group who met criteria. The difference in

frequency between groups was significant, $\chi^2(1, 52) = 22.3, p < .001$, indicating that a significantly greater proportion of the postoperative SUD group met the PHQ-9 10 point cutoff for probable MDD.

Although the Wilcoxon Related-Samples Signed Ranks tests yield Mean Ranks and Sums of Ranks (rather than Mean scores), Mean scores and standard deviations are reported in Figure 4 for descriptive purposes.

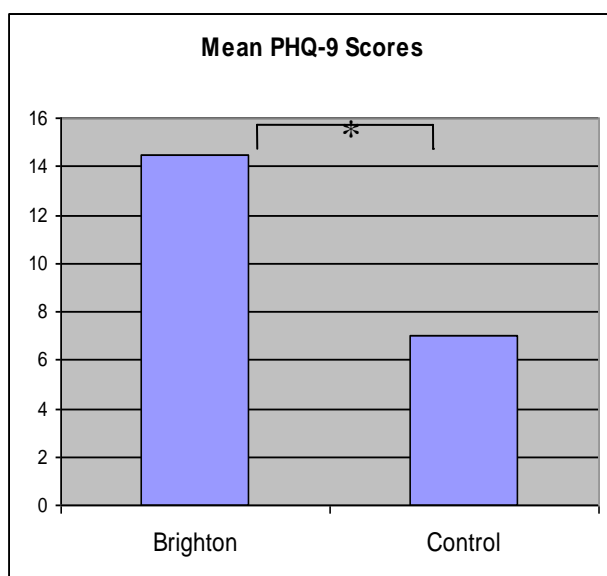


Figure 4. Mean Patient Health Questionnaire-9 (PHQ-9) scores. PHQ-9 scores represent depressive symptom presence and severity, with higher scores indicating greater depression. $*p = .001$.

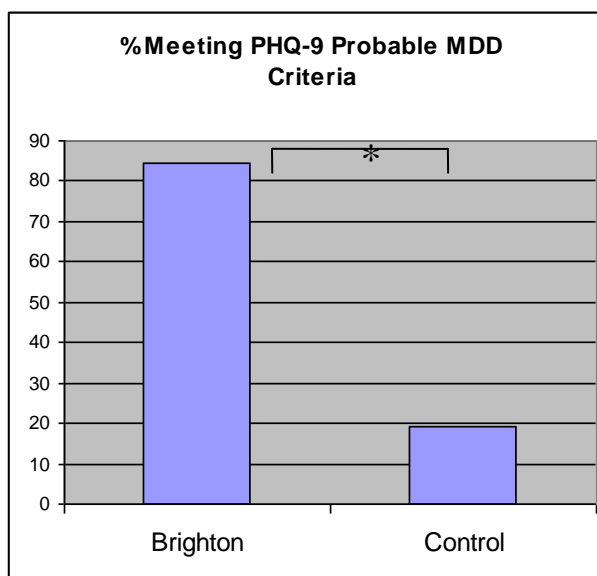


Figure 5. Percent of groups meeting Patient Health Questionnaire-9 (PHQ-9) criteria for probable Major Depressive Disorder (MDD). Probable MDD is defined as PHQ-9 scores of ≥ 10 .

Hypothesis 4 Results

It was hypothesized that the post-bariatric controls with a preoperative history of SUDs would exhibit a greater percentage of total body weight loss and EWL than the post-bariatric controls without a preoperative history of SUDs. As stated above, individuals recruited for

consideration for inclusion into the post-bariatric control group were formally assessed for preoperative substance use risk using the WHO-ASSIST, while the post-bariatric patients in treatment for SUDs were informally assessed for history of preoperative problematic substance use via interview. Due to this difference in methodology, as well as the likely difference in severity of SUDs between groups, the impact of preoperative SUDs on weight loss was explored in each group separately, in addition to the combined sample.

Control group. All 39 participants recruited for consideration for inclusion into the post-bariatric control group (which includes those who were ineligible) were divided into a preoperative SUDs group and non- preoperative SUDs group. The preoperative SUDs group was defined as participants with 1 or more substances that met Moderate or High risk criteria according to the ASSIST-SSI scores collected (i.e., Alcoholic beverages, Cannabis, Cocaine, Amphetamine type stimulants, Inhalants, Sedatives or Sleeping Pills, Hallucinogens, Opioids in pill form, Injected Opioids, Other). The non- preoperative SUDs group was defined as participants with 0 substances that met Moderate or High risk criteria according to the ASSIST-SSI scores (i.e., for each substance queried, participants either did not endorse any use of the substance prior to surgery or they endorsed use of the substance but their usage was classified as Low Risk).

Seven out of the 39 participants (17.9%) met Moderate or High risk criteria for one or more substances in the preoperative period. In other words, 3 out of the 10 men (30%) and 4 out of the 29 women (13.8%) met criteria. These seven individuals formed the preoperative SUDs group, as described above, while the other 32 individuals met Low risk criteria and formed the non- preoperative SUDs group.

An independent samples *t*-test failed to reveal a significant difference in %EWL for the preoperative SUDs group ($M = 85.4, SD = 29.1$) and the non- preoperative SUDs group ($M = 68.1, SD = 26.1$), $t(37) = -1.561, p = .127$. Likewise, an independent samples *t*-test failed to reveal a significant difference in % total body weight change for the preoperative SUDs group ($M = -41.5, SD = 15.7$) and the non- preoperative SUDs group ($M = -34.8, SD = 13.4$), $t(37) = 1.161, p = .253$. Since no significant difference in weight loss between groups was found, it was not necessary to explore the contribution of variables theoretically related to weight loss (e.g., preoperative BMI) through their use as covariates.

In an exploratory analysis, a two-way ANOVA was used to investigate the presence of a gender by preoperative substance use group interaction in regard to %EWL. Despite being underpowered due to the low number of participants in the preoperative SUDs group ($n = 7$), the test revealed a gender by preoperative substance use group interaction that trended toward significance, $F(1, 35) = 3.552, p = .068$. There were no significant main effects for gender, $F(1, 35) = .294, p = .591$, or for preoperative SUDs group, $F(1, 35) = .974, p = .337$. See Figure 6.

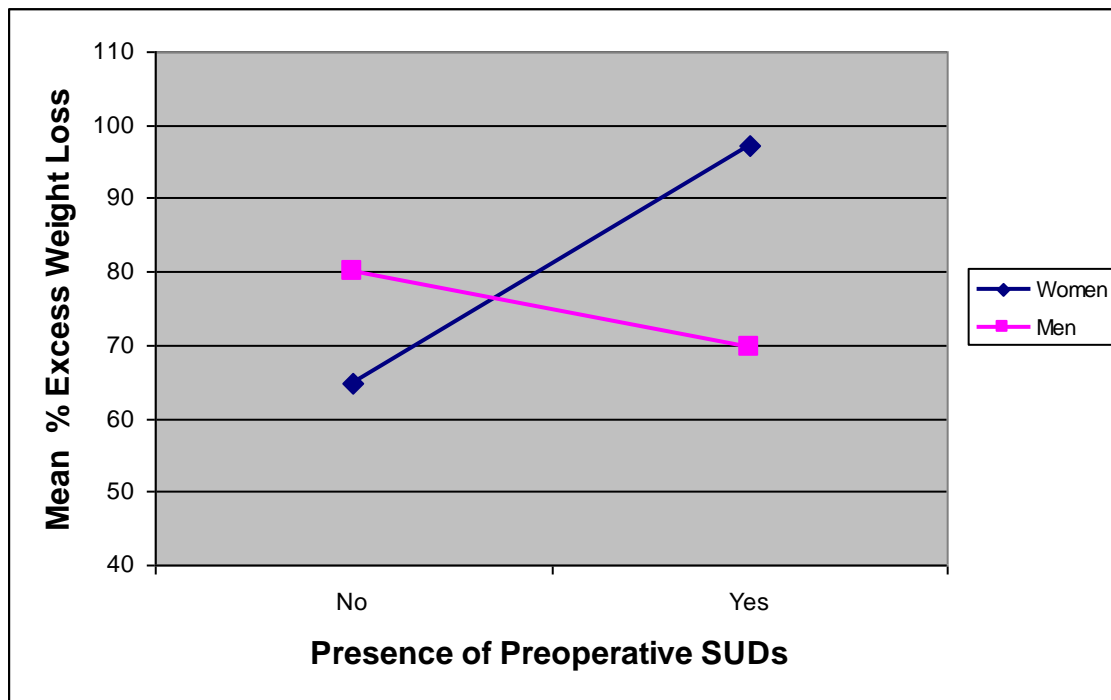


Figure 6. Gender by preoperative substance use group interaction on percent Excess Weight Loss (EWL) in those recruited for consideration into the control group. $p=.068$.

Given this trend toward significance in the gender by preoperative substance use group interaction effect on %EWL, separate *t*-tests for each gender were warranted. Women who met Moderate or High risk criteria for one or more substances in the preoperative period demonstrated a significantly greater %EWL than women classified as Low risk across all substances ($M = 97.2, SD = 27.5$ vs. $M = 64.7, SD = 27.3$), $t(27) = -2.207, p = .036$. Among the men, the opposite relationship was seen but the difference was not significant ($M = 69.6, SD = 27.4$ vs. $M = 80.0, SD = 17.9$), $t(8) = .724, p = .490$.

Postoperative SUDS group. Thirteen out of the 42 participants (31.0%) in the postoperative SUDs group were determined to have probable preoperative SUDs based on the interviewer's clinical judgment. In other words, 3 out of the 9 men (33.3%) and 10 out of the 33 women (30.3%) met criteria for probable preoperative SUDs. The %EWL for one of the participants in the preoperative SUDs group could not be calculated due to lack of height data.

Note that the 42 participants in this analysis include both those who were successfully matched to a control participant and those who were not, since there was no theoretical reason to limit this analysis to only those who were matched.

An independent samples *t*-test failed to reveal a significant difference in %EWL for the preoperative SUDs group ($M = 82.8, SD = 28.7$) and the non- preoperative SUDs group ($M = 75.1, SD = 19.8$), $t(39) = -.991, p = .328$. Likewise, an independent samples *t*-test failed to reveal a significant difference in % total body weight change for the preoperative SUDs group ($M = -34.1, SD = 14.0$) and the non- preoperative SUDs group ($M = -38.1, SD = 9.5$), $t(40) = -1.09, p = .282$. Since no significant difference in weight loss between groups was found, it was not necessary to explore the contribution of variables theoretically related to weight loss (e.g., preoperative BMI) through their use as covariates.

In an exploratory analysis, a two-way ANOVA was used to investigate the presence of a gender by preoperative substance use group interaction effect on %EWL. The test revealed a gender by preoperative substance use group interaction that was not significant, $F(1, 37) = .265, p = .610$. There was no significant main effect for preoperative SUDs group, $F(1, 37) = .476, p = .499$. There was, however, a significant main effect for gender, $F(1, 37) = 4.678, p = .037$, with women ($M = 81.1, SD = 23.1$) losing a greater percentage of excess weight than men ($M = 64.0, SD = 15.3$).

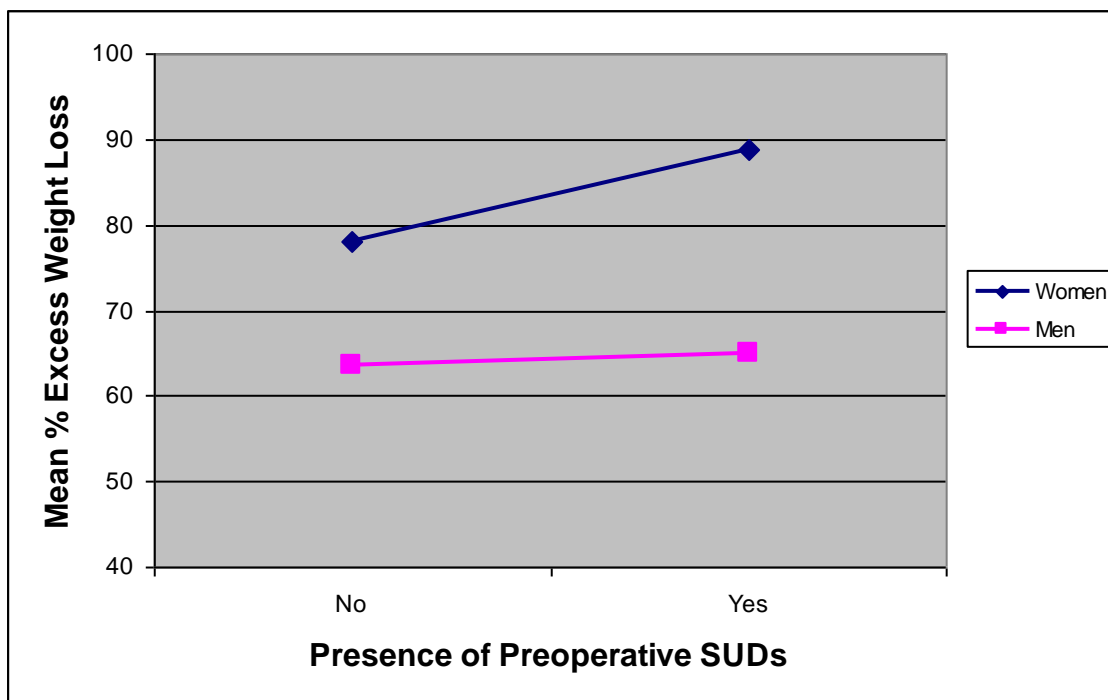


Figure 7. Gender by preoperative substance use group interaction on percent Excess Weight Loss (EWL) in inpatient SUDs treatment population. *ns*.

Since a significant main effect for gender on %EWL was found, gender differences in type of current SUD and alcohol consumption were then explored. Participants were divided into groups based on the presence or absence of AUD diagnoses. It was found that all five males (100%) and 15 out of the 21 females (71.4%) had an AUD. The remaining six females (28.6%) had a SUD that did not involve alcohol. A Fisher's Exact test failed to reveal a significant difference in gender frequency between SUD type groups, $p = .236$. Among men and women with AUDs, there was no significant difference in mean daily number of alcoholic drinks consumed ($M = 18.6$, $SD = 6.3$ vs. $M = 18.1$, $SD = 13.1$, respectively), $t(20) = -.084$, $p = .934$.

Combined sample. Twenty out of the 81 participants in the combined sample (24.7%) were determined to have probable preoperative SUDs. In other words, 6 out of 19 men (31.6%) and 14 out of 62 women (22.6%) met criteria for probable preoperative SUDs. The %EWL for

one of the participants in the preoperative SUDs group could not be calculated due to lack of height data.

An independent samples *t*-test failed to revealed a trend toward significance in difference in %EWL for the preoperative SUDs group ($M = 83.8, SD = 28.1$) and the non- preoperative SUDs group ($M = 71.4, SD = 23.4$), $t(78) = -1.915, p = .059$. However, there was no significant difference in % total body weight change for the preoperative SUDs group ($M = -36.7, SD = 14.7$) and the non- preoperative SUDs group ($-36.4, SD = 11.7$), $t(79) = .097, p = .923$. Since no significant difference in weight loss between groups was found, it was not necessary to explore the contribution of variables theoretically related to weight loss (e.g., preoperative BMI) through their use as covariates.

In an exploratory analysis, a two-way ANOVA was conducted to investigate %EWL as a function of gender and preoperative SUD status. The test revealed a gender by preoperative substance use group interaction effect on %EWL that was not significant, $F(1, 76) = 3.186, p = .078$. There were also no significant main effects for gender, $F(1, 76) = 2.591, p = .112$, or for preoperative SUDs group, $F(1, 76) = 1.143, p = .288$.

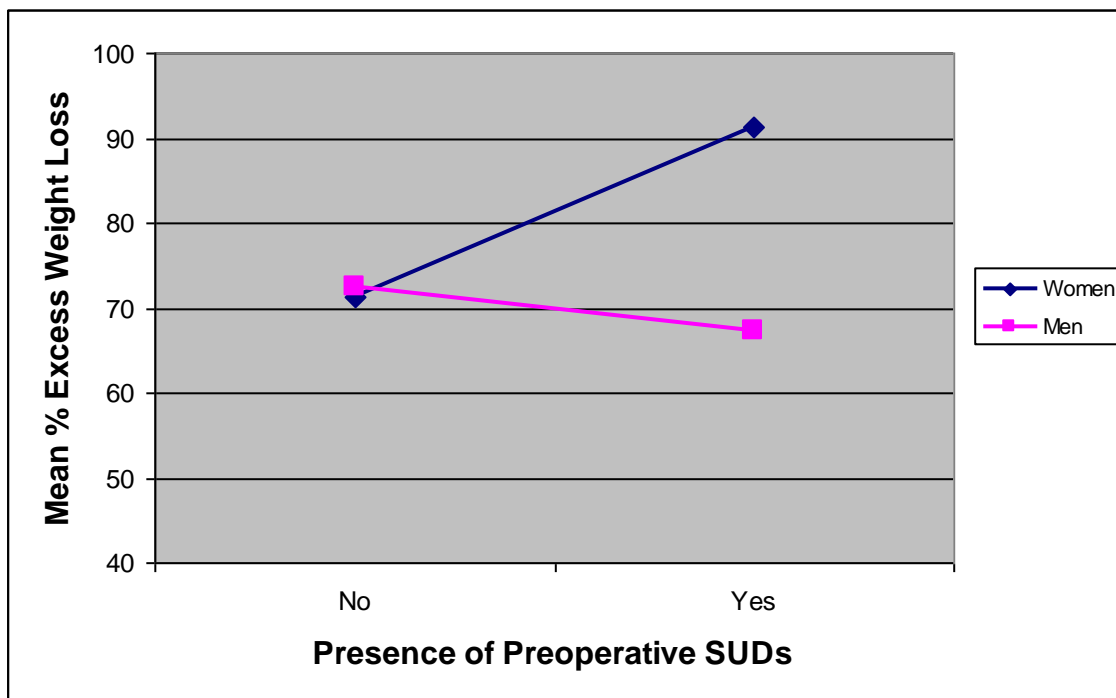


Figure 8. Gender by preoperative substance use group interaction on percent Excess Weight Loss (EWL) in inpatient SUDs treatment population. *ns*.

Hypothesis 5 Results

It was hypothesized that the post-bariatric patients in treatment for SUDs would endorse a greater number and severity of behavioral excesses in the past 4 weeks than would the post-bariatric controls.

Behavioral excesses used in calculation of the total were Internet Usage, Gambling, Videogame Playing, and Sexual behavior outside a committed relationship. Eating-related excesses were excluded, as well as those assessed in one but not both groups (i.e., Shopping and Shoplifting were only assessed for the control group) for this primary analysis. A Related-Samples Wilcoxon Signed Ranks test revealed no significant differences in number of behavioral excesses endorsed by the post-bariatric patients in treatment for SUDs ($Mdn = 0.0$, $M = .24$, $SD = .60$) and the post-bariatric controls ($Mdn = 0.0$, $M = .16$, $SD = .37$), $z = -.649$, $p = .516$.

A comparison of the severity of behavioral excesses could not be completed as planned due to the structure of the questionnaire and the low rates of excesses endorsed. The behavioral excesses Surfing the Internet for more than two hours (not for work purposes) and Videogame playing could not be rated on severity because their thresholds were defined as the response option of the greatest frequency (i.e., *Nearly everyday*). No participants met threshold criteria for the two behavioral excesses that it would have been possible to rate for severity (i.e., Gambling and Sexual behavior outside of a committed relationship).

In exploratory analyses, eating-related excesses and the excesses assessed in only the post-bariatric control group (i.e., Shopping and Shoplifting) were examined. A Related-Samples Wilcoxon Signed Ranks test revealed no significant differences in number of eating-related behavioral excesses (i.e., excessive levels of eating sweets, eating carbohydrates, and night eating) endorsed by the post-bariatric patients in treatment for SUDs ($Mdn = 0.0$, $M = .346$, $SD = .797$) and post-bariatric controls ($Mdn = 0.0$, $M = .157$, $SD = .464$), $z = -.831$, $p = .406$. None of the 39 participants recruited for consideration for the post-bariatric control group endorsed Shoplifting, while 3 out of these 39 participants (7.7%) met criteria for excessive Shopping for personal items.

Hypothesis 6 Results

It was hypothesized that more post-bariatric patients in treatment for SUDs would retrospectively report BED at time of surgery than would post-bariatric patients without a history of postoperative SUDs. Eight out of the 26 post-bariatric patients in treatment for SUDs (30.8%) met criteria for BED at time of surgery, compared to 8 out of 25 post-bariatric patients without a history of postoperative SUDs (32.0%). The preoperative BED status of 1 participant in the non-postoperative SUDs group could not be determined due to incomplete data. A chi-square test

revealed no significant difference in frequency of retrospectively assessed preoperative BED between groups, $\chi^2(1, 51) = .009, p = .925$.

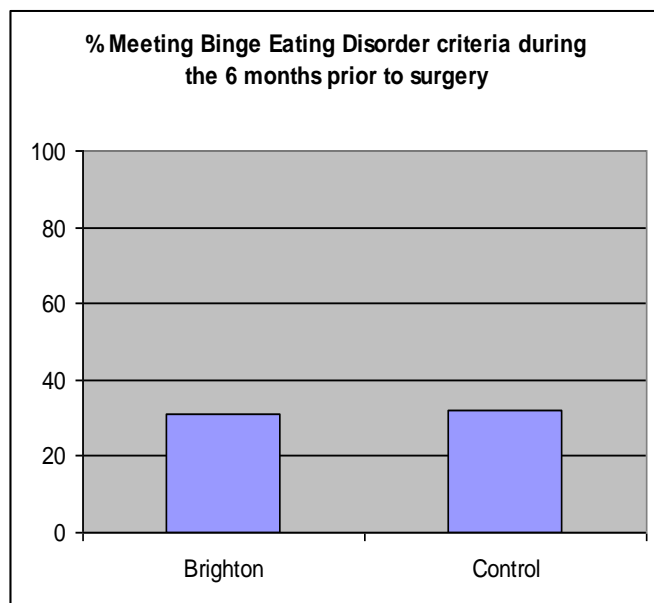


Figure 9. Prevalence of preoperative Binge Eating Disorder (BED). *ns*.

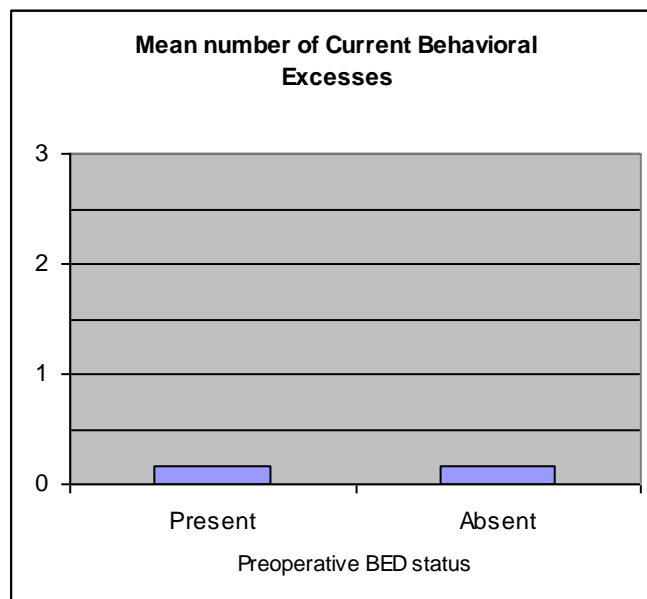


Figure 10. Number of current behavioral excesses by preoperative BED group. *ns*.

It was also hypothesized that individuals retrospectively endorsing preoperative BED would endorse a greater number and severity of maladaptive behavioral excesses. Few behavioral excesses were endorsed by either group. The number of behavioral excesses in preoperative BED ($M = .160, SD = .374$) and non- preoperative BED ($M = .167, SD = .466$) participants were compared using an Independent-Samples Mann-Whitney U-test, which revealed no significant differences in the distribution of Number of Behavioral Excesses across the preoperative BED ($Mdn = 0.0$) and non- preoperative BED ($Mdn = 0.0$) categories, $U = 256.0, p = .601$. A comparison of the severity of behavioral excesses could not be completed as planned due to reasons described in the Hypothesis 5 Results section above.

Results of Additional Analyses

Exploratory analyses in areas of interest not essential to the present study's hypotheses are presented below.

Prevalence of pre- and postoperative SUDs in those recruited for consideration for inclusion into the control group. The rates of preoperative SUDs and postoperative SUDs in the participants recruited for consideration for the post-bariatric control group were examined. Postoperative SUDs was operationalized in the same manner as was preoperative SUDs in Hypothesis 4: All 39 participants ($M = 7.07$, $SD = 2.93$ years postsurgery) recruited for consideration for inclusion into the post-bariatric control group were divided into a postoperative SUDs group and non- postoperative SUDs group. The postoperative SUDs group was defined as participants with 1 or more substances that met Moderate or High risk criteria according to the ASSIST-SSI scores. The non- postoperative SUDs group was defined as participants with 0 substances that met Moderate or High risk criteria according to the ASSIST-SSI scores (i.e., for each substance queried, participants either did not endorse any use of the substance after surgery or they endorsed use of the substance but their usage was classified as Low Risk).

The present study found that 7 out of 39 (17.9%) of participants recruited for consideration for the post-bariatric control group met criteria for preoperative SUDs. Among those with preoperative SUDs ($n = 7$), 42.9% ($n = 3$) relapsed to SUDs in the postoperative period. Among those without preoperative SUDs ($n = 32$), 12.5% ($n = 4$) developed postoperative SUDs.

Seven out of the 39 participants recruited for consideration for the post-bariatric control group (17.9%) met criteria for postoperative SUDs. Among those with postoperative SUDs ($n = 7$), 4 individuals (57.1%) were new onset (i.e., did not meet criteria for preoperative SUDs) and 3 (42.9%) were relapsers (i.e., met criteria for preoperative SUDs). Among those without

postoperative SUDs ($n = 32$), 12.5% ($n = 4$) reported a history of preoperative SUDs. See Table 4 for more information.

Table 4

Percent Excess Weight Loss by Combined Pre- and Postoperative SUDs Status among Participants Recruited for Consideration for Inclusion into the Control Group (n = 39)

	Never SUDs (neither pre- nor post-operative SUDs)	New Onset (post- but no pre-operative SUDs)	Relapse (pre- and post-operative SUDs)	Recovery (pre- but no post-operative SUDs)
Prevalence	28 (71.8)	4 (10.3)	3 (7.7)	4 (10.3)
%EWL	67.4 (27.7)	73.0 (9.7)	77.7 (39.3)	91.3 (27.1)

Note. Prevalence data are presented as *n* (%). %EWL data are presented as *M* (*SD*).

Weight Loss by combined pre- and post- operative SUDs status in those recruited for consideration for inclusion into the control group. Hypothesis 4 considered weight loss by preoperative SUD status, without taking into account postoperative SUDs status. Participants recruited for consideration for inclusion into the control group ($n=39$) were divided into the following four categories, as depicted in Table 4: 1) Never SUDs, 2) New Onset, 3) Relapsers, and 4) Recovery. An ANOVA revealed no significant effect of combined pre- and post- SUDs group membership on %EWL, $F(3, 35) = .973, p = .416$.

Weight Loss by postoperative SUD type in those recruited for consideration for inclusion into the control group. Participants recruited for consideration for inclusion into the control group who had a SUD in the postoperative period ($n=7$) were divided into the following two categories: 1) Alcohol or Mixed Drug and Alcohol diagnoses and 2) Drug only diagnoses. An independent samples t -test failed to reveal a significant difference in % EWL for the Alcohol or mixed diagnoses group ($M = 76.7, SD = 32.1$) and the Drug only diagnoses group ($M = 72.8, SD = 11.8$), $t(5) = .195, p = .853$.

Family history of SUD in those recruited for consideration for inclusion into the control group. Recent research has suggested that a family history of SUD may predict postoperative SUD (Ivezaj, 2011; Reslan, 2012). To test whether the present study's data supports this idea, groups were defined as Family History of SUD and No Family History of SUD. A Fisher's exact test revealed a trend toward significance in difference in frequency of postoperative SUD between groups, $p = .058$, with participants with a family history of SUD being more likely to have postoperative SUD than participants without a family history of SUD.

Unlike previous research, however, the present study did not find the presence of family history of SUD to be associated with decreased postsurgical excess weight loss (Broermann,

Ivezaj, Saules, Schuh, & Pulcini, 2011). Percent EWL was not significantly different between the Family History of SUD and No Family History of SUD groups ($M = 72.3$, $SD = 26.0$ vs. $M = 68.7.4$, $SD = 30.3$, respectively), $t(37) = -.383$, $p = .704$.

BED at time of surgery and current BED in those recruited for consideration for inclusion into the control group. An exploratory analysis was performed to assess the prevalence of BED at time of surgery and current BED in those recruited for consideration for inclusion into the control group. This analysis could not be performed in the Brighton group because data on current BED was not collected. One control group participant was missing data on preoperative BED status. Fourteen out of the 38 individuals recruited for consideration into the control group with complete data (36.8%) met criteria for BED at time of surgery, while four out of 39 (10.3%) met criteria for current BED. See Figure 11.

The relationship between BED at time of surgery and current BED was also explored. A Fisher's exact test failed to indicate a statistically significant relationship between these two variables, $p = .132$.

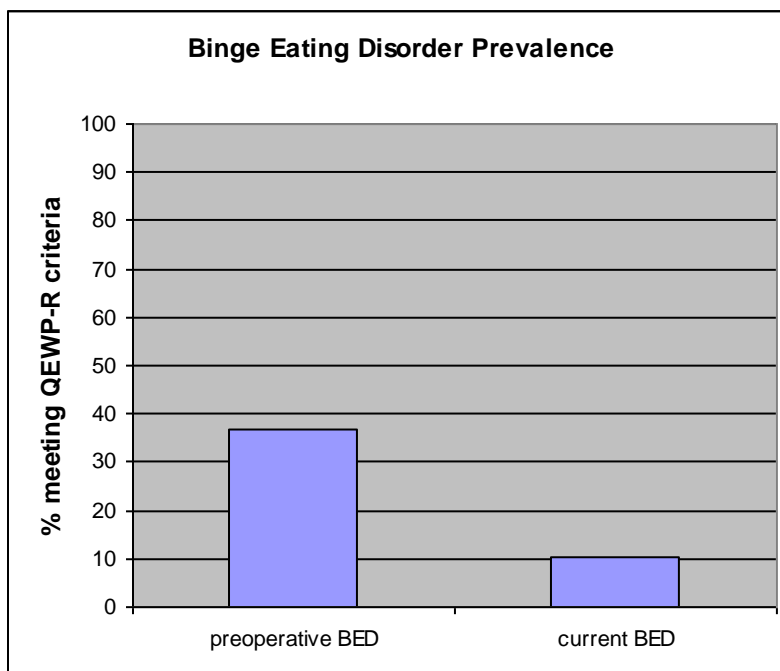


Figure 11. Percent of participants recruited for consideration for inclusion into the control group who met QEWP-R criteria for probable Binge Eating Disorder (BED).

Discussion

This investigation was prompted by recent evidence suggesting that post-RYGB surgery patients are at an increased risk for developing SUDs. If this is the case, it is important to understand how the weight loss and psychosocial outcomes of post-RYGB patients with SUDs differ from their post-RYGB counterparts without SUDs. It was hypothesized that weight loss outcomes of the two study groups would not be significantly different, but that the SUD group would exhibit poorer quality of life, higher levels of depression, more non-substance related behavioral excesses, and a higher rate of preoperative Binge Eating Disorder. Based on recent literature (e.g., Clark et al., 2003; Heinberg & Ashton, 2010), it was also hypothesized that individuals endorsing preoperative SUDs would demonstrate more favorable postoperative weight loss outcomes than those denying preoperative SUDs.

Hypothesis 1 Discussion

It was hypothesized that post-RYGB patients in treatment for SUDs would demonstrate levels of weight loss that were at least as successful as the post-RYGB controls. This hypothesis was based on a related study in which %EWL in post-RYGB patients being treated for a current SUD at Brighton Hospital was judged to be roughly comparable to the %EWL rates in the general RYGB literature (Pulcini, Saules, Wiedemann, & Ivezaj, 2011). The present study had a strength over the previous study in that it used post-bariatric controls (i.e., those without any indication of a postoperative substance use disorder) matched on variables that have been linked to weight loss outcome in bariatric surgery patients (e.g., age and time since surgery) in order to facilitate closer group comparison. To my knowledge, this is the first match-controlled study designed to examine differences in weight loss outcomes of bariatric surgery patients with and without a history of postoperative SUDs.

The hypothesis that post-RYGB patients in treatment for SUDs would demonstrate levels of weight loss that were at least as successful as the post-RYGB controls was supported by the data. The post-bariatric patients in treatment for SUDs yielded more favorable weight loss outcomes than did the post-bariatric control group in terms of % total body weight loss, %EWL, and surgical failure status (failure defined as < 50% EWL), although only the difference in frequency of participants meeting surgical failure status reached statistical significance. In other words, post-RYGB patients in treatment for SUDs demonstrate levels of weight loss at least as favorable as post-RYGB patients without a postoperative history of SUDs and are significantly less likely to meet surgical failure criteria.

Results have implications for the definition of surgical “success” and the reporting of RYGB outcomes. The traditional surgical success criterion used in post-bariatric literature has

been defined as $\geq 50\%$ EWL. However, results support the idea that certain RYGB patients do very well on this outcome but poorly on another serious, but less often reported outcome (i.e., development of a SUD requiring inpatient treatment). Therefore, if risk for SUD is elevated in the post-RYGB period as preliminary evidence suggests, it may be misleading to classify a post-RYGB patient who loses a satisfactory amount of weight but develops a SUD in the postoperative period as a “success.”

Contrary to the present study’s finding, a recent study of a community sample of 141 bariatric surgery patients (mean of 6.13 ± 2.69 (*SD*) years post-surgery) showed that the presence of postoperative SUDs predicted poorer weight loss and that this effect persisted after controlling for eating-related variables (Reslan, Saules, & Schuh, 2012). It is important to recognize that the SUDs of individuals in a community sample are likely to be less severe than the SUDs of inpatients in the present study. The relationship between the presence of a postoperative SUD and postoperative weight loss may, therefore, be mediated by the severity of the SUD. One possible reason for this could be that appetite suppression is a side effect of chronic use of many substances; for example, one study found that more than half of female cocaine abusers reported using cocaine or alcohol to control appetite or weight (Cochrane, Malcolm, & Brewerton, 1998). Perhaps heavy substance use (as would warrant hospitalization) led to increased appetite suppression and increased weight loss in the inpatient SUD population relative to the community-dwelling SUD population. Alternatively, the relationship between the presence of a postoperative SUD and postoperative weight loss may be mediated by some other factor related to substance abuse help seeking behavior.

Hypothesis 2 Discussion

The hypothesis that the post-bariatric patients in treatment for SUDs would report poorer quality of life than the post-bariatric controls was largely supported by the data. Compared with the post-bariatric controls, the post-bariatric patients in treatment for SUDs yielded significantly less favorable scores on the WHOQOL-BREF's global rating item 1 (i.e., "How would you rate your quality of life?"), the Physical domain, and the Psychological domain. The post-bariatric patients in treatment for SUDs also yielded less favorable scores in the global rating item 2 (i.e., "How satisfied are you with your health?") and the Social and Environmental domains, but the differences between the groups were not significant after controlling for alpha inflation.

It is important to consider, however, that the Bonferroni correction used in this analysis is a conservative approach to preventing alpha inflation. While it holds steady the probability of finding false positives, it also increases the likelihood of receiving false negatives. Therefore, while the alpha levels of the differences in global rating item 2 ($p = .023$) and the Social domain ($p = .010$) between groups did not meet significance criteria based on the Bonferroni corrected alpha level of .008, we cannot rule out the possibility of true group differences in these variables.

No significant differences in the Environment domain would have been found between groups even without controlling for alpha inflation. This may partly be explained by the fact that the post-bariatric patients in treatment for SUDs were living in an inpatient treatment facility when they completed the WHOQOL-BREF questionnaire. Therefore, questions such as "How healthy is your physical environment?" may have been answered more favorably than they would have been answered if participants completed the questionnaire at home.

It is well-established that patients in treatment for SUDs tend to report poorer quality of life than those in the general population (Morgan, Morgenstern, Blanchard, Labouvie, & Bux, 2003). The finding that post-RYGB patients in treatment for SUDs report poorer quality of life

than the post-RYGB controls was, therefore, not surprising since it seems to be a specific case of this more general finding. Problematic substance use, as seen in SUDs, can negatively impact matters that affect quality of life, including health, employment, finances, and interpersonal relationships.

Quality of life is a topic that is especially relevant to bariatric surgery candidates and post-bariatric patients. Improvement in quality of life is one of the most established benefits of surgically induced weight loss. For many bariatric surgery candidates, expectation of this benefit is an important factor in his or her decision to seek bariatric surgery. For example, Munoz and colleagues (2007) coded bariatric surgery candidate responses to the open-ended questionnaire item, “Why are you seeking weight loss surgery?,” and found that 4% of the bariatric surgery candidates cited desire for improvement in quality of life (defined in activity and social domains) as their primary reason for seeking surgery, while 28% reported it as their secondary reason. An additional 5% of participants cited reasons pertaining to health-related quality of life (e.g. “I want to decrease the pain I am having with my back, hips, and knees.”) as their secondary reason for seeking surgery. Given the substantial influence of expected improvements in quality of life on many bariatric surgery candidates’ decisions to pursue surgery, it is important to identify factors that could undermine quality of life improvement in the postoperative period. Bariatric surgery candidates should be educated on conditions that compromise postoperative quality of life, as well as the risk factors for, and likelihood of, developing these conditions. If risk for SUD is elevated in the postoperative period, as preliminary research suggests, bariatric surgery candidates should be apprised of this information as well as the relationship between SUD and reduced quality of life.

Hypothesis 3 Discussion

The hypothesis that the post-bariatric patients in treatment for SUDs would report greater symptoms of depression than the post-bariatric controls and that a greater number of post-bariatric patients in treatment for SUDs would meet or exceed the PHQ-9's 10 point cutoff for probable MDD was supported by the data. In other words, post-bariatric patients in treatment for SUDs are statistically more likely to have greater symptoms of depression and meet criteria for probable MDD than post-bariatric patients without a history of substance abuse in the postoperative period. This finding is not surprising given the body of literature reporting greater prevalence rates of MDD in individuals who reported seeking treatment for an alcohol or drug use disorder within the past year compared with rates in the general population (Grant et al., 2004; Kessler, Chiu, Demler, Merikangas, & Walters, 2005). This study provided evidence for the applicability of this general finding to the post-bariatric population, a group of people who have already been found to be at increased risk for depression relative to a nonobese reference population (Karlsson et al., 2007).

In addition to statistical differences, the presence of clinically significant mean differences between groups regarding current depressive symptomatology may also be inferred from the data. The mean PHQ-9 score of the postoperative SUDs group ($M = 14.5$) fell between the PHQ-9's Major depression, *mild* and Major depression, *moderately severe* classification ranges, while that of the non- postoperative SUDs group ($M = 7.0$) fell within the Minimal Symptoms range. Typical recommendations for Major depression include psychotherapy and/or antidepressant drugs, while recommendations for minimal symptoms of depression are more conservative and include monitoring symptoms. Combined with the finding that prevalence rates of probable MDD were much higher in postoperative SUD group (84.6%) than in the non-postoperative SUD group (19.2%), these data suggest that there is a great need for depression

treatment in post-bariatric patients with current SUDs and that this need is higher than that of post-bariatric patients without current SUDs.

This should not be taken to imply that the rate of depression in the post-bariatric control group is insignificant. Data from the 2005-2006 National Health and Nutrition Examination Survey (NHANES) suggest the rate of current depression, as defined by ≥ 10 points on the PHQ-9, to be 5.4% for Americans aged 12 and over (Pratt & Brody, 2008). The post-bariatric patients in the present study had a much higher rate of probable depression (19.2%), which is similar to those found in outpatients with certain chronic health problems. For example, the probable MDD prevalence rate in the post-bariatric control group is comparable to reported depression rates in a multiple sclerosis population (19%; Ferrando et al., 2007), a type 2 diabetic population (22.6%; Reddy, Philpot, Ford, & Dunbar, 2010), and a spinal cord injured population one year post-injury (22.0%; Bombardier, Richards, Krause, Tulskey, & Tate, 2004); each of these rates were calculated using the same PHQ-9 criterion to define probable MDD as the present study. Given the apparent elevation in depression rates in post-bariatric surgery patients relative to the general population, it may be advisable to incorporate depression screening into routine post-bariatric care.

The vast majority of studies report a mean reduction in depressive symptoms and depression prevalence relative to baseline during the eighteen months following bariatric surgery (e.g., Brancatisano, Wahlroos, & Brancatisano, 2008; Mamplekou et al., 2005; Thonney, Pataky, Badel, Bobbioni-Harsch, & Golay, 2010). Reports on longer term changes, however, are mixed. For example, Karlsson et al., 2007 found a 27% decrease in depression prevalence at ten years postsurgery, but Kruseman and colleagues (2010) failed to find significant change in HADS depression scores at eight years postsurgery. It is not possible to analyze the extent to which the

present study's participants' ($M = 7.2$ yrs postsurgery) probable current MDD rates are different from their probable MDD baseline rates because preoperative depression data were not collected. A recent study of bariatric surgery candidates that used the same PHQ-9 criterion to define probable MDD as did the present study, however, reported a probable MDD prevalence rate of 52.2% (Cassin et al., 2012). Similarly, another recent study administered the PHQ-9 or BDI-II to bariatric surgery candidates and found a 57% prevalence rate of probable depression using the standard cut-off scores of each of these measures (Sockalingam, Hawa, Wnuk, Jackson, & Okrainec, 2011). It, therefore, may be the case that the prevalence of probable MDD increased in the postoperative SUDs group relative to baseline and decreased in the non-postoperative SUDs group relative to baseline, but there is insufficient evidence to make this conclusion. It may have been the case that the postoperative SUD group began with a higher baseline rate of major depression than did the control group.

Hypothesis 4 Discussion

A relationship between preoperative history of SUD and increased postsurgical weight loss has been reported up to 2 years post-surgery (Clark et al., 2003; Heinberg & Ashton, 2010). To my knowledge, the present study is the first to examine this relationship beyond 2 years post-surgery (M time lapse since surgery = 7.2 years).

Control group. Within those recruited for consideration into the control group, the hypothesis that the post-bariatric patients with preoperative history of SUDs would exhibit a greater percentage of total body weight loss and EWL than the post-bariatric patients without preoperative history of SUD was partially supported by the data. There was a large mean difference in %EWL achieved by the preoperative SUD group ($M = 85.4$) and the non-preoperative SUD group ($M = 68.1$), but this difference did not reach statistical significance.

When viewed separately by gender, it was found that female post-bariatric patients with a preoperative history of SUD demonstrated a significantly greater %EWL than female post-bariatric patients without a preoperative history of SUD. Surprisingly, the opposite relationship was found among men, although this difference did not reach significance. These results suggest that community-dwelling women with preoperative history of SUD may demonstrate more favorable postoperative weight loss outcomes than do community-dwelling women without preoperative history of SUD.

It is unclear as to why the relationship between preoperative SUD and postoperative %EWL may be different for men and women. Potential confounds mediating this relationship are difficult to analyze given the small sample sizes of men ($n=3$) and women ($n=4$) with preoperative SUD in this control group. One possibility is that women, who are more likely than men to seek mental health services for an existing SUD, attended therapy during the preoperative period to overcome substance addiction and, in doing so, acquired behavioral and self-regulatory skills that contributed to their ability to maintain weight loss in the postoperative period.

It is also worth noting that the large mean difference between the Never SUDs (i.e., those with no preoperative SUDs and no postoperative SUDs) group and the Recovery group (i.e., those with preoperative SUDs but no postoperative SUDs) group might suggest that, in post-bariatric patients without postoperative SUDs, a history of a preoperative SUD might be a predictor of greater weight loss. Results were not statistically significant, but the analysis lacked power due to low sample size of the Recovery group ($n = 4$). Combined with the above findings on gender differences, it seems that it may be the case that women with preoperative SUDs but no postoperative SUDs fare particularly well in long term weight loss and maintenance following

RYGB surgery. Future studies with larger sample sizes are needed to investigate the veracity of this new hypothesis.

Postoperative SUD group. No evidence was found that would support preoperative SUD as an independent predictor of weight loss after RYGB surgery within SUD treatment inpatients of either gender. It was noted, however, that women were more successful in weight loss than men within this group. One possible explanation for this is a higher intake of calorically dense alcoholic beverages in men. However, gender differences in prevalence of AUD and daily alcoholic beverage intake within those with AUDs were not statistically significant.

Hypothesis 5 Discussion

The hypothesis that the post-bariatric patients in treatment for SUDs would endorse a greater number of behavioral excesses in the past 4 weeks than would the post-bariatric controls was not supported by the data. Group differences were in the expected direction but were not statistically significant.

There are a number of possible reasons for this finding. True differences in behavioral excess frequency between post-bariatric patients with and without current SUDs may exist but may not have been detected in the present study for a number of reasons. First, it may be that the Behavioral Excess Questionnaire was not appropriate for the present task. This measure had been selected for the present study due to practical considerations; namely, it was the only measure pertaining to behavioral excesses that the Brighton group had completed. One way in which this questionnaire might have been inappropriate for the present study is that the number of response options may have been inadequate to capture low frequency behavior (e.g., It is not clear if a participant who shoplifts once per week would select “Not at all” or “Several days per

week”). Furthermore, since psychometric properties of this questionnaire have not been established, firm conclusions based on data gathered using this questionnaire should not be drawn. Second, it could be that detection of significant differences in behavioral excess frequency between post-bariatric patients with and without current SUDs was difficult in the present study due to a low base rate of behavioral excesses in the post-bariatric population. In this case, a larger sample size would allow for such differences to be detected.

On the other hand, it may be that there are not true differences in behavioral excess frequency between post-bariatric patients with and without current SUDs, and the idea that individuals with pharmacological addictions are more likely to have concurrent behavioral excesses is not supported. It is well-established that individuals with one pharmacological addiction are at an elevated risk for a second pharmacological addiction (Kessler, Chiu, Demler, Merikangas, & Walters, 2005). The hypothesis that individuals with pharmacological addictions are more likely to have concurrent behavioral excesses was based on the idea that behavioral excesses share an underlying biopsychological process with pharmacological addictions and could be conceptualized as “behavioral addictions.” It may be the case that some, but not all, behavioral excesses should be conceptualized as “behavioral addictions.” For example, impairment in self-control is an integral part of traditional addiction conceptualization but was not assessed with the Behavioral Excess Questionnaire.

Hypothesis 6 Discussion

The hypothesis that more post-bariatric patients in treatment for SUDs would retrospectively report preoperative BED than would post-bariatric patients without a history of postoperative SUDs was not supported by the data. This finding may be interpreted as evidence against the conceptualization of binge eating as an addictive behavior and the idea that

postoperative “addiction transfer” occurs in some individuals. Postoperative “addiction transfer” would have assumed that individuals with BED at the time of surgery would have been unable to binge eat after surgery and would have subsequently “transferred” their addiction to a pharmacological substance or other reward-seeking maladaptive behavioral excess.

On the other hand, failure to find predicted results may be due to the QEWP-R being an inadequate measure of preoperative BED in this study. The QEWP-R was designed to assess presence of current BED and it, therefore, queries eating habits in the past 6-months. Participants in this study, however, were asked to recall the 6-month period of time just before having bariatric surgery (which occurred 7.2 years ago on average). The QEWP-R has not been validated for this type of retrospective use, and it may be the case that participants had poor recall for their eating habits during the six-month period prior to surgery.

Another possible explanation for the findings is that post-RYGB patients may be able to binge eat after several years post-surgery, so we would not necessarily expect to find these individuals in inpatient substance abuse treatment programs at that point (since old reward-seeking behavior (i.e., overeating) could be resumed). Few long term studies have reported rates of binge eating in post-bariatric patients, but the limited data available indicate that post-bariatric patients are able to binge eat after a period of time postsurgery. The present study found that 10.3% of recruited post-RYGB patients met BED criteria at an average of over seven years postsurgery. Another study reported that the mean rate of number of days of objective binge-eating episodes per month in RYGB and AGB patients who screened positive for BED at the time of their presurgical psychiatric evaluation increased to approximately 2 at 12 months postsurgery after having dropped from approximately 13 at baseline to nearly 0 at 2 and 6

months postsurgery. Rates of those who were free of binge-eating episodes at baseline, however, remained close to 0 during all timepoints (Wadden et al., 2011).

The hypothesis that individuals retrospectively endorsing preoperative BED would endorse a greater number of maladaptive behavioral excesses was also not supported by the data. This finding may be due to a number of possibilities, including weaknesses in methodology used to determine preoperative BED and current maladaptive behavioral excesses, low base rate of maladaptive behavioral excesses in the post-bariatric population, and increased ability to binge eat as time progresses after surgery, as described above.

Additional Comments

The importance of this study rests partially on the idea that post-RYGB patients may be at an increased risk for SUDs in the postoperative period relative to the general population. While this study did not focus on establishing a prevalence estimate of SUDs in the post-RYGB population, it was possible to do so with the data collected. The rate of postoperative SUDs found in those recruited for consideration for inclusion into the control group (17.9% at 7.07 ± 2.93 years post-surgery) is similar to rates found by Reslan, Saules, and Schuh (2012; 17.7% at 6.13 ± 2.69 years post-surgery) and Ivezaj (2011; 18.8% at 2.70 ± 2.33 years post-surgery).

It is difficult to compare these rates of SUDs in the post-bariatric population (which reflect the presence of SUDs in a 2-8 year period) to rates in the general population because general population prevalence estimates are usually reported for point prevalence, 12-months, or lifetime. Furthermore, there are inconsistencies in reported rates of SUD in the general U.S. adult population. The postoperative SUD rate found in the present study (17.9%) appears elevated compared to a 1.7% point prevalence estimate of SUD in bariatric surgery candidates, elevated compared to a 3.8% 12-month prevalence estimate of any SUD in U.S. adults, elevated

compared to a 8.5% 12-month prevalence estimate of any AUD in U.S. adults, similar to a 14.6% lifetime prevalence estimate of any SUD in U.S. adults, and low compared to a 30.3% lifetime prevalence estimate of any AUD in U.S. adults (Hasin, Stinson, Ogburn, & Grant, 2007; Kalarchian et al., 2007; Kessler, Chiu, Demler, Merikangas, & Walters, 2005; Kessler, Berglund, Demler, Jin, & Merikangas, 2007).

In regard to the rate of new onset SUD, the present study found that 12.5% of those recruited for consideration for inclusion into the control group who did not have SUD at any time in the preoperative period developed postoperative SUD. It remains unclear as to how these rates compare to similar age- and sex- matched individuals over the same period of time. Future studies should focus on identifying an appropriate control group with which to compare post-RYGB patients on SUD prevalence and new onset SUD rates.

Limitations of the Present Study

The present study had several limitations. Differing methods of assessment between post-bariatric patients in treatment for SUD and post-bariatric controls were used due to practical considerations. Namely, the control participants completed an online survey, whereas data from the post-bariatric patients in treatment for SUDs were primarily collected from pencil-and-paper questionnaires (in addition to chart review and interview). It is possible that these differing methods of data collection could have introduced systematic bias in responses between groups. Reliance on self-report for height, presurgical weight, and history of substance use, among other variables, represents another limitation of the study.

Individuals recruited for consideration into the control group were not recruited at random from the post-RYGB population; rather each one was recruited based on his or her matching the following characteristics with a post-RYGB patient in treatment for SUD: age, sex, and time

lapse since surgery. For this reason, the study results may have yielded a biased estimate of SUD in post-RYGB patients. This concern is somewhat mitigated by the finding that the age range and sex ratio of the group of recruited participants is similar to that typically seen in RYGB patient populations.

Some of the questionnaires used in the present study were selected due to practical concerns and were not ideal. As discussed above, the psychometric properties of the Behavioral Excess Questionnaire have not been evaluated and the QEWP-R has not been validated for retrospective use beyond 6 months. Presently, however, there are no BED instruments validated for the type of extensive retrospective use required by this study. Results of analyses using data gathered with these questionnaires should be interpreted with great caution. Likewise, the WHO-ASSIST, which was used to determine pre- and post-operative SUDs status, was modified slightly in order to meet the needs of the present study, and psychometric properties of this modified version have not been explored.

Conclusions and Recommendations for Future Research

Results of the present study suggest that post-RYGB individuals receiving inpatient treatment for SUD demonstrate levels of weight loss outcomes at least as favorable as post-RYGB patients without a postoperative history of SUDs, but experience poorer psychosocial outcomes. Weight loss findings are contrary to a recent community sample study that found that the presence of postoperative SUD predicted poorer weight loss (Reslan, Saules, & Schuh, 2012). Future research should seek to determine if the relationship between weight loss and the presence of a postoperative SUD may be mediated by the severity of the SUD or some other factor relating to help seeking behavior.

Current SUD requiring inpatient treatment is associated with poorer quality of life and greater symptoms of depression within the post-RYGB population. For many obese individuals, expectation of improvement in quality of life and mood are important factors in the decision to seek bariatric surgery. It is, therefore, important that bariatric surgery candidates be educated on conditions for which they are at risk that may compromise postoperative quality of life and mood. If risk for SUD is elevated in the postoperative period, as preliminary research suggests, bariatric surgery candidates should be informed of this risk. Future research should focus on determining whether post-RYGB patients are truly at an increased risk of SUD. If so, research should then focus on exploring ways in which to lower this risk and identifying the unique treatment needs of the post-RYGB SUD population.

Preoperative history of SUD was also examined as a predictor of postsurgical weight loss within those recruited from the community, given recent reports that it may be a positive prognostic factor. Results of the present study did not support preoperative history of SUD as a positive prognostic factor of postsurgical weight loss on the whole, but did suggest a more specific relationship in which women with a history of preoperative SUD fare particularly well in long term weight loss and maintenance following RYGB surgery (especially if they do not relapse to SUD in the postoperative period). Future studies with larger sample sizes are needed to investigate the veracity of this new hypothesis and well as the processes involved with increased weight loss in this group.

Results of the present study did not support addiction transfer theory in the post-RYGB population, but flaws in methodology limit interpretation of the results. Future research should address these methodological issues. Specifically, prospective studies that carefully define

maladaptive reward seeking behavioral excesses and assess these excesses, binge-eating episodes, and substance use both pre- and post-surgically are needed.

References

- Abu-Abeid, S., Wishnitzer, N., Szold, A., Liebergall, M., & Manor, O. (2005). The influence of surgically-induced weight loss on the knee joint. *Obesity surgery, 15*(10), 1437-42. doi: 10.1381/096089205774859281.
- Adams, T. D., Gress, R.E., Smith, S.C., Halverson, R.C., Simper, S.C., Rosamond, W.D. (2007). Long-Term Mortality after Gastric Bypass Surgery. *N Engl J Med, 357*, 753-61.
- Adams, T. D., Pendleton, R. C., Strong, M. B., Kolotkin, R. L., M, J., Litwin, S. E., et al. (2010). Health Outcomes of Gastric Bypass Patients Compared to Nonsurgical, Nonintervened Severely Obese. *Obesity, 18*(1), 121-130. doi: 10.1038/oby.2009.178.Health.
- Adams, T. D., Stroup, A.M., Gress, R.E., Adams, K.F., Calle, E.E., Smith, S.C., et al. (2009). Cancer incidence and mortality after gastric bypass surgery. *Obesity, 17*(4), 796-802.
- Alvarez-Blasco, F., Luque-Ramírez, M., & Escobar-Morreale, H. F. (2010). Obesity impairs general health-related quality of life (HR-QoL) in premenopausal women to a greater extent than polycystic ovary syndrome (PCOS). *Clinical endocrinology, 73*(5), 595-601. doi: 10.1111/j.1365-2265.2010.03842.x.
- American Psychiatric Association. (2000). Diagnostic and statistical manual of mental disorders: DSM-IV-TR. Washington, DC: Author.
- American Psychiatric Association. (2011). Binge Eating Disorder. Retrieved March 15, 2011, from <http://www.dsm5.org/ProposedRevisions/Pages/proposedrevision.aspx?rid=372>.
- Anandacoomarasamy, A., Caterson, I. D., Leibman, S., Smith, G. S., Sambrook, P. N., Fransen, M., et al. (2009). Influence of BMI on health-related quality of life: comparison between an

- obese adult cohort and age-matched population norms. *Obesity*, *17*, 2114-2118. doi: 10.1036/oby.2009.121.
- Applegate, K. L., & Friedman, K. E. (2008). The impact of weight loss surgery on romantic relationships. *Bariatric Nursing*, *3*(2), 135-141. doi: 10.1089/bar.2008.9976,
- Arif, A. A., Rohrer, J. E., & Delclos, G. L. (2005). A population-based study of asthma, quality of life, and occupation among elderly Hispanic and non-Hispanic whites: a cross-sectional investigation. *BMC public health*, *5*, 97. doi: 10.1186/1471-2458-5-97.
- Arterburn, D., Schauer, D. P., Wise, R. E., Gersin, K. S., Fischer, D. R., Selwyn, C. a, et al. (2009). Change in predicted 10-year cardiovascular risk following laparoscopic Roux-en-Y gastric bypass surgery. *Obesity surgery*, *19*(2), 184-9. doi: 10.1007/s11695-008-9534-7.
- Avena, N. M., Rada, P., & Hoebel, B. G. (2008). Evidence for sugar addiction: behavioral and neurochemical effects of intermittent, excessive sugar intake. *Neuroscience and biobehavioral reviews*, *32*(1), 20-39. doi: 10.1016/j.neubiorev.2007.04.019.
- Barros da Silva Lima, A. F., Fleck, M., Pechansky, F., Boni, R. de, & Sukop, P. (2005). Psychometric properties of the World Health Organization quality of life instrument (WHOQoL-BREF) in alcoholic males: a pilot study. *Quality of life research : an international journal of quality of life aspects of treatment, care and rehabilitation*, *14*(2), 473-8. Retrieved from <http://www.ncbi.nlm.nih.gov/pubmed/15892436>.
- Barry, D., Clarke, M., & Petry, N. M. (2009). Obesity and its relationship to addictions: is overeating a form of addictive behavior? *The American journal on addictions / American Academy of Psychiatrists in Alcoholism and Addictions*, *18*(6), 439-51. doi: 10.3109/10550490903205579.

- Barry, D., & Petry, N. M. (2009). Associations between body mass index and substance use disorders differ by gender: results from the National Epidemiologic Survey on Alcohol and Related Conditions. *Addictive behaviors, 34*(1), 51-60. Elsevier Ltd. doi: 10.1016/j.addbeh.2008.08.008.
- Bello, N. T., & Hajnal, A. (2010). Dopamine and binge eating behaviors. *Pharmacology, biochemistry, and behavior, 97*(1), 25-33. Elsevier Inc. doi: 10.1016/j.pbb.2010.04.016.
- Bennett, J.C., Wang, H., Schirmer, B.D., & Northup, C.J. (2007). Quality of life and resolution of co-morbidities in super-obese patients remaining morbidly obese after Roux-en-Y gastric bypass. *Surgery for obesity and related diseases, 3*(3), 387-391.
- Black, D. W., Belsare, G., & Schlosser, S. (1999). Clinical features, psychiatric comorbidity, and health-related quality of life in persons reporting compulsive computer use behavior. *The Journal of Clinical Psychiatry, 60*(12), 839-845.
- Black, D. W., Goldstein, R. B., & Mason, E. E. (1992). Prevalence of mental disorder in 88 morbidly obese bariatric clinic patients. *The American journal of psychiatry, 149*(2), 227-34. Retrieved from <http://www.ncbi.nlm.nih.gov/pubmed/1734744>.
- Bocchieri-Ricciardi, L. E., Chen, E. Y., Munoz, D., Fischer, S., Dymek-Valentine, M., Alverdy, J. C., et al. (2006). Pre-surgery binge eating status: effect on eating behavior and weight outcome after gastric bypass. *Obesity surgery, 16*(9), 1198-204. doi: 10.1381/096089206778392194.
- Bond, D. S., Phelan, S., Wolfe, L. G., Evans, R. K., Meador, J. G., Kellum, J. M., et al. (2009). Becoming physically active after bariatric surgery is associated with improved weight loss and health-related quality of life. *Obesity, 17*(1), 78-83. doi: 10.1038/oby.2008.501.

- Brancatisano, B., Wahlroos, S., & Brancatisano, R. (2008). Improvement in comorbid illness after placement of the Swedish Adjustable Gastric Band.pdf. *Surgery for obesity and related diseases, 4*, S39-S46. doi: 10.1016/j.soard.2008.04.006.
- Brewer, C.J., & Balen A.H. (2010). The adverse effects of obesity on conception and implantation. *Reproduction, 140*(3), 347-364.
- Broermann, C., Ivezaj, V., Saules, K., Schuh, L., & Pulcini, M. (October, 2011). *Family History of Substance Abuse Predicts Percent Excess Weight Loss in Bariatric Patients*. Poster session presented at The 6th Annual Obesity Summit: Science and Practice of Obesity Management, Cleveland, OH.
- Burkhauser, R. V., & Cawley, J. (2008). Beyond BMI: the value of more accurate measures of fatness and obesity in social science research. *Journal of health economics, 27*(2), 519-529. doi: 10.1016/j.jhealeco.2007.05.005.
- Busetto, L., Mirabelli, D., Petroni, M.L., Mazza, M., Favretti, F., Segato, G., Chiusolo, M., Merletti, F., Balzola, F., & Enzi, G. (2007). Comparative long-term mortality after laparoscopic adjustable gastric banding versus nonsurgical controls. *Surgery for obesity and related diseases, 3*(5), 496-502.
- Cameron, I. M., Crawford, J. R., Lawton, K., & Reid, I. C. (2008). Psychometric comparison of PHQ-9 and HADS for measuring depression severity in primary care. *The British journal of general practice : the journal of the Royal College of General Practitioners, 58*(546), 32-6. doi: 10.3399/bjgp08X263794.
- Carels, R. A, Wott, C. B., Young, K. M., Gumble, a, Koball, a, & Oehlhof, M. W. (2010). Implicit, explicit, and internalized weight bias and psychosocial maladjustment among

treatment-seeking adults. *Eating behaviors*, 11(3), 180-5. Elsevier Ltd. doi: 10.1016/j.eatbeh.2010.03.002.

Carlin, A. M., O'Connor, E. A., Genaw, J. A., & Kavar, S. (2007). Preoperative weight loss is not a predictor of postoperative weight loss after laparoscopic Roux-en-Y gastric bypass. *Surgery for obesity and related diseases*, 4, 481-485. doi: 10.1016/j.soard.2007.09.010.

Carson, J.L., Ruddy, M.E., Duff, A.E., Holmes, N.J., Cody, R.P., & Brolin, R.E. (1994). The effect of gastric bypass surgery on hypertension in morbidly obese patients. *Archives of Internal Medicine*, 154(2), 193-200.

Cassin, S., Sockalingam, S., Hawa, R., Wnuk, S., Royal, S., Taube-Schiff, M., et al. (2012, September). Improving depression assessment in bariatric surgery candidates: the role of self-report inventories. *Canadian Psychiatric Association's Annual Conference*, Abstract retrieved from http://ww1.cpa-apc.org/abstracts/viewabstract.asp?Abstract_id=1126&Presentation_Type=9&presnum=7.

Castres, L., Folope, V., Dechelotte, P., Tourny-Chollet, C., & Lemaitre, F. (2010). Quality of life and obesity class relationships. *International journal of sports medicine*, 31, 773-778. doi: 10.1055/s-0030-1262830.

Celio, A. A., Wilfley, D. E., Crow, Scott J, Mitchell, J., & Walsh, B. T. (2004). A comparison of the binge eating scale, questionnaire for eating and weight patterns-revised, and eating disorder examination questionnaire with instructions with the eating disorder examination in the assessment of binge eating disorder and its symptoms. *The International journal of eating disorders*, 36(4), 434-44. doi: 10.1002/eat.20057.

- Chang, C.-Y., Huang, C.-K., Chang, Y.-Y., Tai, C.-M., Lin, J.-T., & Wang, J.-D. (2010). Prospective study of health-related quality of life after Roux-en-Y bypass surgery for morbid obesity. *The British journal of surgery*, *97*(10), 1541-6. doi: 10.1002/bjs.7179.
- Chen, E. Y., McCloskey, M. S., Doyle, P., Roehrig, J., Berona, J., Alverdy, J., et al. (2009). Body mass index as a predictor of 1-year outcome in gastric bypass surgery. *Obesity surgery*, *19*(9), 1240-2. doi: 10.1007/s11695-008-9724-3.
- Christenson, G. A., Faber, R. J., Zwaan, M. de, Raymond, N. C., Specker, S. M., Ekern, M. D., et al. (1994). Compulsive buying, descriptive characteristics and psychiatric comorbidity. *Journal of clinical psychiatry*, *55*(1), 5-11.
- Christou, N. V. (2009). Impact of obesity and bariatric surgery on survival. *World journal of surgery*, *33*(10), 2022-7. doi: 10.1007/s00268-009-0050-2.
- Christou, N. V., Lieberman, M., Sampalis, F., & Sampalis, J. S. (2008). Bariatric surgery reduces cancer risk in morbidly obese patients. *Surgery for obesity and related diseases*, *4*, 691-697.
- Christou, N. V., Look, D., & MacLean, L. D. (2006). Weight gain after short- and long-limb gastric bypass in patients followed for longer than 10 years. *Annals of surgery*, *244*(5), 734-40. doi: 10.1097/01.sla.0000217592.04061.d5.
- Clark, M. M., Balsiger, B. M., Sletten, C. D., Dahlman, K. L., Ames, G., Williams, D. E., et al. (2003). Psychosocial factors and 2-year outcome following bariatric surgery for weight loss. *Obesity surgery*, *13*(5), 739-45. doi: 10.1381/096089203322509318.
- Corica, F., Corsonello, A., Apolone, G., Lucchetti, M., Melchionda, N., Marchesini, G., et al. (2006). Construct validity of the short form-36 health survey and its relationship with BMI in obese outpatients. *Obesity*, *14*(8), 1429-1437.

- Cottam, D. R., Atkinson, J., Anderson, A., Grace, B., & Fisher, B. (2006). A case-controlled matched-pair cohort study of laparoscopic Roux-en-Y gastric bypass and Lap-Band patients in a single US center with three-year follow-up. *Obesity surgery, 16*(5), 534-40. doi: 10.1381/096089206776944913.
- Crémieux, P.-Y., Ledoux, S., Clerici, C., Crémieux, F., & Buessing, M. (2010). The impact of bariatric surgery on comorbidities and medication use among obese patients. *Obesity surgery, 20*(7), 861-70. doi: 10.1007/s11695-010-0163-6.
- Dallal, R. M., Quebbemann, B. B., Hunt, L. H., & Braitman, L. E. (2009). Analysis of weight loss after bariatric surgery using mixed-effects linear modeling. *Obesity surgery, 19*(6), 732-7. doi: 10.1007/s11695-009-9816-8.
- Davis, C., & Carter, J. C. (2009). Compulsive overeating as an addiction disorder. A review of theory and evidence. *Appetite, 53*(1), 1-8. doi: 10.1016/j.appet.2009.05.018.
- de la Cruz-Muñoz, N., Messiah, S.E., Cabrera, J.C., Torres, C., Cuesta, M., Lopez-Mitnik, G., & Arheart, K.L. (2010). Four-year weight outcomes of laparoscopic gastric bypass surgery and adjustable gastric banding among multiethnic adolescents. *Surgery for obesity and related diseases, 6*(5), 542-7.
- DeMaria, E. J., Pate, V., Warthen, M., & Winegar, D. (2010). Baseline data from American Society for Matabolic and Bariatric Surgery-designated Bariatric Surgery Centers of Excellence using the Bariatric Outcomes Lognitudinal Database. *Surgery for obesity and related diseases, 6*, 347-355.
- de Onis, M., Blossner, M., & Borghi, E. (2010). Global prevalence and trends of overweight and obesity among preschool children 1–4. *American Journal of Clinical Nutrition, 92*, 1257-1264. doi: 10.3945/ajcn.2010.29786.1.

- de Wit, L. M., Fokkema, M., Straten, A. van, Lamers, F., Cuijpers, P., & Penninx, B. W. J. H. (2010). Depressive and anxiety disorders and the association with obesity, physical, and social activities. *Depression and anxiety*, 27(11), 1057-65. doi: 10.1002/da.20738.
- Dixon, J. B., Dixon, M. E., & O'Brien, P. E. (2002). Body image: appearance orientation and evaluation in the severely obese. Changes with weight loss. *Obesity surgery*, 12(1), 65-71. doi: 10.1381/096089202321144612.
- Dowsey, M., Liew, D., Stoney, J., & Choong, P. (2010). The impact of obesity on weight change and outcomes at 12 months in patients undergoing total hip arthroplasty. *Medical Journal of Australia*, 193(1), 17-21.
- Drewnowski, A., Krahn, D., Demitrack, M., Nairn, K., & Gosnell, B. (1995). Naloxone, an opiate blocker, reduces the consumption of sweet high-fat foods in obese and lean female binge eaters. *The American journal of clinical nutrition*, 61(6), 1206-12. Retrieved from <http://www.ncbi.nlm.nih.gov/pubmed/7762518>.
- Eid, G. M., Cottam, D. R., Velcu, L. M., Mattar, S. G., Korytkowski, M. T., Gosman, G., et al. (2005). Effective treatment of polycystic ovarian syndrome with Roux-en-Y gastric bypass. *Surgery for obesity and related diseases*, 1(2), 77-80. doi: 10.1016/j.soard.2005.02.008.
- el-Guebaly, N., Patten, S. B., Currie, S., Williams, J. V. a, Beck, C. a, Maxwell, C. J., et al. (2006). Epidemiological associations between gambling behavior, substance use & mood and anxiety disorders. *Journal of gambling studies / co-sponsored by the National Council on Problem Gambling and Institute for the Study of Gambling and Commercial Gaming*, 22(3), 275-87. doi: 10.1007/s10899-006-9016-6.
- Elder, K. A., Grilo, C. M., Masheb, R. M., Rothschild, B. S., Burke-Martindale, C. H., & Brody, M. L. (2006). Comparison of two self-report instruments for assessing binge eating in

bariatric surgery candidates. *Behaviour research and therapy*, 44(4), 545-60. doi:
10.1016/j.brat.2005.04.003.

Ertelt, T.W., Mitchell, J.E., Lancaster, K., Crosby, R.D., Steffen, K.J., & Marino, J.M. (2008). Alcohol abuse and dependence before and after bariatric surgery: a review of the literature and report of a new data set. *Surgery for obesity and related diseases*. 4(5), 647-650. doi:10.1016/j.soard.2008.01.004.

Ferrando, S.J., Samton, J., Mor, N., Nicora, S., Findler, M & Apatoff, B. (2007). Patient Health Questionnaire-9 to Screen for Depression in Outpatients With Multiple Sclerosis. *International Journal of MS Care: Fall 2007*, 9(3), 99-103. doi: <http://dx.doi.org/10.7224/1537-2073-9.3.99>.

Flegal, K. M., Carroll, M. D., Ogden, C. L., & Curtin, L. R. (2010). Prevalence and trends in obesity among US adults, 1999-2008. *JAMA : the journal of the American Medical Association*, 303(3), 235-41. doi: 10.1001/jama.2009.2014.

Frezza, E. E., Wei, C., & Wachtel, M. S. (2009). Is surgery the next answer to treat obesity-related hypertension?. *Journal of clinical hypertension (Greenwich, Conn.)*, 11(5), 284-8. doi: 10.1111/j.1751-7176.2009.00123.x.

Friedman, K.E., Ashmore, J.A., & Applegate, K.L. (2008). Recent experiences of weight-based stigmatization in a weight loss surgery population: psychological and behavioral correlates. *Obesity*, 16(suppl2), S69-S74. doi: 10.1038/oby.2008.457

Gandhi, R., Razak, F., Davey, J. R., & Mahomed, N. N. (2010). Metabolic syndrome and the functional outcomes of hip and knee arthroplasty. *The Journal of Rheumatology*, 37(9), 1917-1922. doi: 10.3899/jrheum.091242.

- Gariepy, G., Nitka, D., & Schmitz, N. (2010). The association between obesity and anxiety disorders in the population: a systematic review and meta-analysis. *International journal of obesity*, 34(3), 407-419.
- Goble, L.K., Rand, C.S., & Kulda, J.M. (1986). Understanding marital relationships following obesity surgery. *Family Therapy*, 13(2), 195-202.
- Goodman, A. (2008). Neurobiology of addiction: An integrative review. *Biochemical pharmacology*, 75(1), 266-322. doi: 10.1016/j.bcp.2007.07.030.
- Grant, B. F., Stinson, F. S., Dawson, D. A., Chou, S. P., Dufour, M. C., Compton, W., et al. (2004). Prevalence and co-occurrence of substance use disorders and independent mood and anxiety disorders: results from the National Epidemiologic Survey on Alcohol and Related Conditions. *Archives of general psychiatry*, 61(8), 807-16. doi: 10.1001/archpsyc.61.8.807.
- Grant, J. E., Potenza, M. N., Weinstein, A., & Gorelick, D. A. (2010). Introduction to behavioral addictions. *The American journal of drug and alcohol abuse*, 36, 233-41. doi: 10.3109/00952990.2010.491884.
- Greenburg, D. L., Lettieri, C. J., & Eliasson, A. H. (2009). Effects of surgical weight loss on measures of obstructive sleep apnea: a meta-analysis. *The American journal of medicine*, 122(6), 535-42. Elsevier Inc. doi: 10.1016/j.amjmed.2008.10.037.
- Grusser, S.M., Poppelreuter, S., Heinz, A., Albrecht, U. & Sass, H. (2007). Behavioural addiction: an independent diagnostic category? *Nervenarzt*. 78(9), 997-1002.
- Gumbs, A., Duffy, A., & Bell, R. (2006). Incidence and management of marginal ulceration after Roux-en-Y gastric bypass. *Surgery for obesity and related diseases*, 2, 460-463. doi: 10.1016/j.soard.2006.04.233.

- Hansson, M., Chotai, J., Nordstom, A., & Bodlund, O. (2009). Comparison of two self-rating scales to detect depression: HADS and PHQ-9. *British Journal of General Practice*, (September), e283-e288. doi: 10.3399/bjgp09X454070.
- Harper, A. (1996). WHOQOL-BREF introduction, administration, scoring and generic version of the assessment. The WHOQOL Group., 1-18.
- Harper, A., & Power, M. (1998). Development of the World Health Organization WHOQOL-BREF quality of life assessment. The WHOQOL Group. *Psychological medicine*, 28(3), 551-8. Retrieved from <http://www.ncbi.nlm.nih.gov/pubmed/9626712>.
- Harrison, M., Morrell, J., & Hopman, W. (2004). Influence of obesity on outcome after knee arthroscopy. *The Journal of Arthroscopic and Related Surgery*, 20(7), 691-695. doi: 10.1016/j.arthro.2004.06.004.
- Harvin, G., DeLegge, M., & Garrow, D. a. (2008). The impact of race on weight loss after Roux-en-Y gastric bypass surgery. *Obesity surgery*, 18(1), 39-42. doi: 10.1007/s11695-007-9278-9.
- Heinberg, L. J., & Ashton, K. (2010). History of substance abuse relates to improved postbariatric body mass index outcomes. *Surgery for obesity and related diseases*, 6, 417-422. doi: 10.1016/j.soard.2010.04.001.
- Hepner, K. A., Hunter, S. B., Edelen, M. O., Zhou, A. J., & Watkins, K. (2009). A comparison of two depressive symptomatology measures in residential substance abuse treatment clients. *Journal of substance abuse treatment*, 37(3), 318-25. Elsevier Inc. doi: 10.1016/j.jsat.2009.03.005.
- Herpertz, S., Burgmer, R., Stang, A., Zwaan, M. de, Wolf, A. M., Chen-Stute, A., et al. (2006). Prevalence of mental disorders in normal-weight and obese individuals with and without

- weight loss treatment in a German urban population. *Journal of psychosomatic research*, 61(1), 95-103. doi: 10.1016/j.jpsychores.2005.10.003.
- Hofsø, D., Nordstrand, N., Johnson, L. K., Karlsen, T. I., Hager, H., Jenssen, T., et al. (2010). Obesity-related cardiovascular risk factors after weight loss: a clinical trial comparing gastric bypass surgery and intensive lifestyle intervention. *European Journal of Endocrinology*, 163, 735-745. doi: 10.1530/EJE-10-0514.
- Ivezaj, V. (2011). *An examination of psychological risk factors for the development of substance abuse among post-bariatric surgery patients*. (Unpublished doctoral dissertation). Eastern Michigan University, Ypsilanti, MI.
- Ivezaj, V., Saules, K. K., Wiedemann, Wood, D., Hopper, J. A., Foster-Hartsfield, J., & Eshelman, A. (2010, June). *Why are post-bariatric patients in substance abuse treatment? Patients' perceptions of etiology and future recommendations*. Poster presented at the 27th Annual Meeting of the American Society for Metabolic and Bariatric Surgery, Las Vegas, Nevada.
- Jeong, J.-J. (2008). Chronic gastrointestinal symptoms and quality of life in the Korean population. *World Journal of Gastroenterology*, 14(41), 6388. doi: 10.3748/wjg.14.6388.
- Johnson, P. M., & Kenny, P. J. (2010). Dopamine D2 receptors in addiction-like reward dysfunction and compulsive eating in obese rats. *Nature Neuroscience*, 13(5), 635-643.
- Johnson, W. G., Grieve, F. G., Adams, C. D., & Sandy, J. (1999). Measuring binge eating in adolescents: adolescent and parent versions of the questionnaire of eating and weight patterns. *The International journal of eating disorders*, 26(3), 301-14. Retrieved from <http://www.ncbi.nlm.nih.gov/pubmed/10441246>.

- Jonas, E., Marsk, R., Rasmussen, F., & Freedman, J. (2010). Incidence of postoperative gallstone disease after antiobesity surgery: population-based study from Sweden. *Surgery for obesity and related diseases*, 6(1), 54-58.
- Jones-Corneille, L., Wadden, T.A., Faulconbridge, L., Sarwer, D.B., Fabricatore, A.N., & Pulcini, M. (2009). Effects of binge eating disorder on outcome of bariatric surgery: Results at 1 year. *Obesity* 2009;17(Suppl. 2):881-P.
- Jones-Corneille, L.J., Wadden, T.A., Sarwer, D.B., Faulconbridge, L.F., Fabricatore, A.N., Stack, R., ... Williams, N. (2010). Axis I psychopathology in bariatric surgery candidates with and without binge eating disorder: results of structured clinical interviews. *Obesity Surgery*. doi: 10.1007/s11695-010-0322-9
- Kagawa, M., Uenishi, K., Kuroiwa, C., Mori, M., & Binns, C. (2006). Kagawa et al Is the BMI cut-off level for Japanese females for obesity set too high.pdf. *Asia Pacific Journal of Clinical Nutrition*, 15(4), 502-507.
- Kalarchian, M. A., Marcus, M. D., Levine, M. D., Courcoulas, A. P., Pilkonis, P. A., Ringham, R. M., et al. (2007). Psychiatric disorders among bariatric surgery candidates: relationship to obesity and functional health status. *The American journal of psychiatry*, 164(2), 328-34; quiz 374. doi: 10.1176/appi.ajp.164.2.328.
- Karlsson, J., Taft, C., Rydén, a, Sjöström, L., & Sullivan, M. (2007). Ten-year trends in health-related quality of life after surgical and conventional treatment for severe obesity: the SOS intervention study. *International journal of obesity (2005)*, 31(8), 1248-61. doi: 10.1038/sj.ijo.0803573.
- Kessler, R. C., Berglund, P., Demler, O., Jin, R., & Merikangas, K. R. (2007). Lifetime prevalence and age-of-onset distributions of mental disorders in the World Health

- Organization's World Mental Health Survey Initiative. *World psychiatry : official journal of the World Psychiatric Association (WPA)*, 6(3), 168-76. Retrieved from <http://www.pubmedcentral.nih.gov/articlerender.fcgi?artid=2174588&tool=pmcentrez&rendertype=abstract>.
- Kessler, R. C., Chiu, W. T., Demler, O., Merikangas, K. R., & Walters, E. E. (2005). Prevalence, severity, and comorbidity of 12-month DSM-IV disorders in the National Comorbidity Survey Replication. *Archives of general psychiatry*, 62(6), 617-27. doi: 10.1001/archpsyc.62.6.617.
- King, W.C., Chen, J., Mitchell, J.E., Kalarchian, M.A., Steffen, K.J., Engel, S.G., et al. (2012). Prevalence of Alcohol Use Disorders Before and After Bariatric Surgery. *JAMA*. 307(23), 2516-25. Published online June 18, 2012. doi:10.1001/jama.2012.6147.
- Kligman, M. D., Dexter, D. J., Omer, S., & Park, A. E. (2008). Shrinking cardiovascular risk through bariatric surgery: application of Framingham risk score in gastric bypass. *Surgery*, 143(4), 533-8. doi: 10.1016/j.surg.2007.10.021.
- Klockhoff, H., Näslund, I., & Jones, A. W. (2002). Faster absorption of ethanol and higher peak concentration in women after gastric bypass surgery. *British journal of clinical pharmacology*, 54(6), 587-91. Retrieved from <http://www.pubmedcentral.nih.gov/articlerender.fcgi?artid=1874483&tool=pmcentrez&rendertype=abstract>.
- Koffman, B. M., Greenfield, L. J., Ali, I. I., & Pirzada, N. a. (2006). Neurologic complications after surgery for obesity. *Muscle & nerve*, 33(2), 166-76. doi: 10.1002/mus.20394.

- Kofman, M. D., Lent, M. R., & Swencionis, C. (2010). Maladaptive Eating Patterns, Quality of Life, and Weight Outcomes Following Gastric Bypass: Results of an Internet Survey. *Obesity, 18*(10), 1938-1943. doi: 10.1038/oby.2010.27.
- Kolotkin, R.L., Crosby, R.D., Gress, R.E., Hunt, S.C., & Adams, T.D. (2009). Two-year changes in health-related quality of life in gastric bypass patients compared with severely obese controls. *Surgery for obesity and related diseases, 5*(2), 250-256.
- Kriwanek, S., Schermann, M., Abdullah, S. A., & Roka, R. (2005). Band slippage--a potentially life-threatening complication after laparoscopic adjustable gastric banding. *Obesity surgery, 15*(1), 133-6. Retrieved from <http://www.ncbi.nlm.nih.gov/pubmed/15760512>.
- Kroenke, K., Spitzer, R. L., & Williams, J. B. (2001). The PHQ-9: validity of a brief depression severity measure. *Journal of general internal medicine, 16*(9), 606-13. Retrieved from <http://www.pubmedcentral.nih.gov/articlerender.fcgi?artid=1495268&tool=pmcentrez&rendertype=abstract>.
- Kruseman, M., Leimgruber, A., Zumbach, F., & Golay, A. (2010). Dietary, weight, and psychological changes among patients with obesity, 8 years after gastric bypass. *Journal of the American Dietetic Association, 110*(4), 527-34. Elsevier Inc. doi: 10.1016/j.jada.2009.12.028.
- Ladd, G. T., & Petry, N. M. (2003). A comparison of pathological gamblers with and without substance abuse treatment histories. *Experimental and Clinical Psychopharmacology, 11*(3), 202-209. doi: 10.1037/1064-1297.11.3.202.
- Lanthaler, M., Aigner, F., Kinzl, J., Sieb, M., Cakar-Beck, F., & Nehoda, H. (2010). Long-Term Results and Complications Following Adjustable Gastric Banding. *Obesity surgery, 1078-1085*. doi: 10.1007/s11695-010-0190-3.

- Larsen, J. K., Ramshorst, B. van, Geenen, R., Brand, N., Stroebe, W., & Doornen, L. J. P. van. (2004). Binge eating and its relationship to outcome after laparoscopic adjustable gastric banding. *Obesity surgery, 14*(8), 1111-7. doi: 10.1381/0960892041975587.
- Lejoyeux, M., Haberman, N., Solomon, J., & Adès, J. (1999). Comparison of buying behavior in depressed patients presenting with or without compulsive buying. *Comprehensive psychiatry, 40*(1), 51-6. Retrieved from <http://www.ncbi.nlm.nih.gov/pubmed/9924878>.
- Lejoyeux, M., Mc Loughlin, M., & Adès, J. (2000). Epidemiology of behavioral dependence: literature review and results of original studies. *European psychiatry : the journal of the Association of European Psychiatrists, 15*(2), 129-34. Retrieved from <http://www.ncbi.nlm.nih.gov/pubmed/10881210>.
- Lementowski, P. W., & Zelicof, S. B. (2008). Obesity and Osteoarthritis. *The American journal of orthopedics, 37*(3), 148-151.
- Liu, T., Maciejewski, P. K., & Potenza, M. N. (2009). The relationship between recreational gambling and substance abuse/dependence: data from a nationally representative sample. *Drug and alcohol dependence, 100*(1-2), 164-8. doi: 10.1016/j.drugalcdep.2008.09.011.
- Löwe, B., Unützer, J., Callahan, C. M., Perkins, A. J., & Kroenke, K. (2011). Monitoring depression treatment outcomes with the Patient Health Questionnaire-9. *Medical Care, 42*(12), 1194-1201.
- Luppino, F.S., de Wit, L.M., Bouvy, P.F., Stijnen, T., Cuijpers, P., Pennix, B.W., & Zitman, F.G. (2010). Overweight, obesity, and depression: a systematic review and meta-analysis of longitudinal studies. *Archives of general psychiatry, 67*(3), 220-229.

- Lutfi, R., Torquati, a, Sekhar, N., & Richards, W. O. (2006). Predictors of success after laparoscopic gastric bypass: a multivariate analysis of socioeconomic factors. *Surgical endoscopy*, 20(6), 864-7. doi: 10.1007/s00464-005-0115-8.
- Macías, J. A. G., Leal, F. J. V., López-ibor, J. J., Rubio, M. A., & Caballero, M. G. (2004). Marital Status in Morbidly Obese Patients After Bariatric Surgery. *German Journal of Psychiatry*, 7(3), 22-27.
- Madan, A. K., Beech, B. M., & Tichansky, D. S. (2008). Bariatric Surgery. *Surgical Innovation*, 15(1), 32-37.
- Mamplekou, E., Komesidou, V., Bissias, C., Papakonstantinou, A., & Melissas, J. (2005). Psychological Condition and Quality of Life in Surgical Weight Loss. *Obesity*, 15, 1177-1184.
- Maniscalco, M., Zedda, A., Faraone, S., Cerbone, M. R., Cristiano, S., Giardiello, C., et al. (2008). Weight loss and asthma control in severely obese asthmatic females. *Respiratory medicine*, 102(1), 102-8. doi: 10.1016/j.rmed.2007.07.029.
- Marcus, D. A. (2004). Obesity and the impact of chronic pain. *Clinical Journal of Pain*, 20(3), 186-191.
- Mathus-Vliegen, E. M. H. (2007). Long-term health and psychosocial outcomes from surgically induced weight loss: results obtained in patients not attending protocolled follow-up visits. *International journal of obesity (2005)*, 31(2), 299-307. doi: 10.1038/sj.ijo.0803404.
- McCarthy, L. H., Bigal, M. E., Katz, M., Derby, C., & Lipton, R. B. (2009). Chronic pain and obesity in elderly people: results from the Einstein aging study. *Journal of the American Geriatrics Society*, 57(1), 115-9. doi: 10.1111/j.1532-5415.2008.02089.x.

- McCloskey, C. A., Ramani, G. V., Mathier, M. A., Schauer, P. R., Eid, G. M., Mattar, S. G., et al. (2007). Bariatric surgery improves cardiac function in morbidly obese patients with severe cardiomyopathy. *Surgery for obesity and related diseases*, *3*, 503-507. doi: 10.1016/j.soard.2007.05.006.
- McFadden, K. M. (2010). Cross-addiction: From morbid obesity to substance abuse. *Bariatric Nursing*, *5*(2), 145-178. doi: 10.1089/bar.2010.9922.
- Mendis, S. (2010). The contribution of the Framingham Heart Study to the prevention of cardiovascular disease: a global perspective. *Progress in cardiovascular diseases*, *53*(1), 10-4. Elsevier Inc. doi: 10.1016/j.pcad.2010.01.001.
- Morgan, T.J., Morgenstern, J., Blanchard, K.A., Labouvie, E., & Bux, D.A. (2003). Health-related quality of life for adults participating in outpatient substance abuse treatment. *American journal on addictions*, *12*(3), 198-210.
- Moyad, M. A. (2001). Current methods used for defining, measuring, and treating obesity. *Seminars in Urologic Oncology*, *19*(4), 247-256.
- Must, A., Spadano, J., Coakley, E. H., Field, A. E., Colditz, G., & Dietz, W. H. (1999). The disease burden associated with overweight and obesity. *JAMA : the journal of the American Medical Association*, *282*(16), 1523-9. Retrieved from <http://www.ncbi.nlm.nih.gov/pubmed/10546691>.
- Nangle, D.W., Johnson, W.G., Carr-Nangle, R.E., & Engler, L.B. (1994). Binge eating disorder and the proposed DSM-IV criteria: psychometric analysis of the Questionnaire of Eating and Weight Patterns. *The international journal of eating disorders*, *16*(2), 147-57.
- Napolitano, M.A., & Himes, S. (2010). Race, weight, and correlates of binge eating in female college students. *Eating Behavior*. doi: 10.1016/j.eatbeh.2010.09.003.

National Institutes of Health (2010). *Assessing Your Weight and Health Risk*. Retrieved from

http://www.nhlbi.nih.gov/health/public/heart/obesity/lose_wt/risk.htm#limitations

National Institutes of Health (2009). *Bariatric surgery for severe obesity*. Retrieved from

<http://www.win.niddk.nih.gov/publications/PDFs/gasurg12.04bw.pdf>

Neill, J. R., Marshall, J. R., & Yale, C. E. (1978). Marital Changes After Intestinal Bypass Surgery. *JAMA: The Journal of the American Medical Association*, 240(5), 447-450.

Nguyen, N. T., Goldman, C., Rosenquist, C. J., Arango, a, Cole, C. J., Lee, S. J., et al. (2001).

Laparoscopic versus open gastric bypass: a randomized study of outcomes, quality of life, and costs. *Annals of surgery*, 234(3), 279-89; discussion 289-91. Retrieved from

<http://www.pubmedcentral.nih.gov/articlerender.fcgi?artid=1422019&tool=pmcentrez&rendertype=abstract>.

Núñez, M., Lozano, L., Núñez, E., Segur, J. M., Sastre, S., Maculé, F., et al. (2009). Total knee replacement and health-related quality of life: factors influencing long-term outcomes.

Arthritis and rheumatism, 61(8), 1062-9. doi: 10.1002/art.24644.

O'Brien, P. E., Dixon, J. B., Laurie, C., Skinner, S., Proietto, J., Mcneil, J., et al. (2006).

Treatment of mild to moderate obesity with laparoscopic adjustable gastric banding or an intensive medical program: A randomized trial. *Annals of Internal Medicine*, 625-634.

Odlaug, B.L. & Grant, J.E. (2010). Pathologic skin picking. *The American journal of drug and alcohol abuse*, 36(5): 296-303.

Padoin, A. V., Galvão Neto, M., Moretto, M., Barancelli, F., Schroer, C. E., & Mottin, C. C.

(2009). Obese patients with type 2 diabetes submitted to banded gastric bypass: greater

incidence of dumping syndrome. *Obesity surgery*, 19(11), 1481-4. doi: 10.1007/s11695-009-9943-2.

Padwal, R., Li, S. K., & Lau, D. C. W. (2003). Long-term pharmacotherapy for overweight and obesity: a systematic review and meta-analysis of randomized controlled trials. *International journal of obesity and related metabolic disorders : journal of the International Association for the Study of Obesity*, 27(12), 1437-46. doi: 10.1038/sj.ijo.0802475.

Pecori, L., Serra Cervetti, G. G., Marinari, G. M., Migliori, F., & Adami, G. F. (2007). Attitudes of morbidly obese patients to weight loss and body image following bariatric surgery and body contouring. *Obesity surgery*, 17(1), 68-73. Retrieved from <http://www.ncbi.nlm.nih.gov/pubmed/17355771>.

Peeters, A., Barendregt, J. J., Willekens, F., Mackenbach, J. P., Mamun, A. A., & Bonneux, L. (2003). Obesity in adulthood and its consequences for life expectancy: A life-table analysis. *Annals of Internal Medicine*, 138, 24-32.

Pelchat, M. L. (2002). Of human bondage: food craving, obsession, compulsion, and addiction. *Physiology & behavior*, 76(3), 347-52. Retrieved from <http://www.ncbi.nlm.nih.gov/pubmed/12117571>.

Pories, W. J., Swanson, M. S., MacDonald, K. G., Long, S. B., Morris, P. G., Brown, B. M., et al. (1995). Who would have thought it? An operation proves to be the most effective therapy for adult-onset diabetes mellitus. *Annals of surgery*, 222(3), 339-50. Retrieved from <http://www.pubmedcentral.nih.gov/articlerender.fcgi?artid=1234815&tool=pmcentrez&rendertype=abstract>.

- Pournaras, D. J., Osborne, A., Hawkins, S. C., Vincent, R. P., Mahon, D., Ewings, P., et al. (2010). Remission of type 2 diabetes after gastric bypass and banding: mechanisms and 2 year outcomes. *Annals of surgery*, 252(6), 966-71. doi: 10.1097/SLA.0b013e3181efc49a.
- Pratt, G. M., Learn, C. A., Hughes, G. D., Clark, B. L., Warthen, M., & Pories, W. (2009). Demographics and outcomes at American Society for Metabolic and Bariatric Surgery Centers of Excellence. *Surgical endoscopy*, 23(4), 795-9. doi: 10.1007/s00464-008-0077-8.
- Pratt, L.A., & Brody, D.J. (2008). Depression in the United States household population, 2005-2006. NCHS Data Brief / National Center for Health Statistics, 7, 1-8.
- Puhl, R., & Brownell, K. D. (2001). Bias, discrimination, and obesity. *Obesity Research*, 9(12), 788-805.
- Pulcini, M.E., Saules, K.K., Wiedemann, A.A., & Ivezaj, V. (2011, April). *Is substance use disorder subsequent to bariatric surgery related to weight loss outcome?* Poster session presented at The Society of Behavioral Medicine's 32nd Annual Meeting & Scientific Sessions, Washington, D.C.
- Rahman, M., & Berenson, A.B. (2010). Accuracy of current body mass index obesity classification for white, black, and Hispanic reproductive-age women. *Obstetrics & Gynecology*, 115(5), 982-988.
- Reddy, P., Philpot, B., Ford, D., & Dunbar, J.A. (2010). Identification of depression in diabetes the efficacy of PHQ-9 and HADS-D. *Br J Gen Pract*. 60(575): e239–e245. doi: 10.3399/bjgp10X502128.
- Reslan, S. (2012). Relationships between food reinforcement and eating behaviors to bariatric surgery weight loss and substance abuse outcomes. (Unpublished doctoral dissertation). Eastern Michigan University, Ypsilanti, MI.

- Reslan, S., Saules, K., & Schuh, S. (2012, September) *Post-surgical substance abuse by gastric bypass patients predicts poor weight loss beyond that predicted by eating-related variables*. Poster session presented at The Obesity Society's 30th Annual Scientific Meeting, San Antonio, TX.
- Roddy, E., Zhang, W., & Doherty, M. (2007). Is gout associated with reduced quality of life? A case-control study. *Rheumatology (Oxford, England)*, 46(9), 1441-4. doi: 10.1093/rheumatology/kem150.
- Rubino, F., Gagner, M., Gentileschi, P., Kini, S., Fukuyama, S., Feng, J., et al. (2004). The early effect of the roux-en-Y gastric bypass on hormones involved in body weight regulation and glucose metabolism. *Annals of Surgery*, 240(2), 236-242. doi: 10.1097/01.sla.0000133117.12646.48.
- Sarwer, D. B., Fabricatore, A. N., Eisenberg, M., Sywulak, L., & Wadden, T.A. (2008). Self-reported stigmatization among candidates for bariatric surgery. *Obesity*, 12(2), S75-S79.
- Sarwer, D.B., Wadden, T.A., Moore, R.H., Eisenberg, M.H., Raper, S.E., & Williams, N.N. (2010). Changes in quality of life and body image after gastric bypass surgery. *Surgery for Obesity and Related Diseases*, 6(6), 608-614.
- Sassi, F., Devaux, M., Cecchini, M., & Rusticelli, E. (2009). OECD Health Working Papers No. 45 The Obesity Epidemic: Analysis of Past and Projected Future Trends in Selected OECD Countries. *Labour*.
- Saules, K. K., Wiedemann, A. A., Ivezaj, V., Hopper, J. A., Foster-Hartsfield, J., & Schwarz, D. (2010). Bariatric surgery history among substance abuse treatment patients: Prevalence and associated features. *Surgery for Obesity and Related Disease*, 6, 615-621.

- Scholtz, S., Bidlake, L., Morgan, J., Fiennes, A., El-Etar, A., Lacey, J. H., et al. (2007). Long-term outcomes following laparoscopic adjustable gastric banding: postoperative psychological sequelae predict outcome at 5-year follow-up. *Obesity surgery*, *17*(9), 1220-5. Retrieved from <http://www.ncbi.nlm.nih.gov/pubmed/18074498>.
- Sellinger, J. J., Clark, E. a, Shulman, M., Rosenberger, P. H., Heapy, A. A, & Kerns, R. D. (2010). The moderating effect of obesity on cognitive-behavioral pain treatment outcomes. *Pain medicine (Malden, Mass.)*, *11*(9), 1381-90. doi: 10.1111/j.1526-4637.2010.00935.x.
- Shapira, N. A., Goldsmith, T. D., Keck, P. E., Khosla, U. M., & McElroy, S. L. (2000). Psychiatric features of individuals with problematic internet use. *Journal of affective disorders*, *57*(1-3), 267-72. Retrieved from <http://www.ncbi.nlm.nih.gov/pubmed/10708842>.
- Shen, R., Dugay, G., Rajaram, K., Cabrera, I., Siegel, N., & Ren, C. J. (2004). Impact of patient follow-up on weight loss after bariatric surgery. *Obesity surgery*, *14*(4), 514-9. doi: 10.1381/096089204323013523.
- Shinohara, M., Mizushima, H., Hirano, M., Shioe, K., Nakazawa, M., Hiejima, Y., et al. (2004). Eating disorders with binge-eating behaviour are associated with the s allele of the 3'-UTR VNTR polymorphism of the dopamine transporter gene. *Journal of psychiatry & neuroscience : JPN*, *29*(2), 134-7. Retrieved from <http://www.pubmedcentral.nih.gov/articlerender.fcgi?artid=383345&tool=pmcentrez&render type=abstract>.
- Sjöström, L., Gummesson, A., Sjöström, C., Narbro, K., Peltonen, M., Wedel, H., et al. (2009). Effects of bariatric surgery on cancer incidence in obese patients in Sweden (Swedish Obese Subjects Study): a prospective, controlled intervention trial. *Lancet Oncology*, *10*(7), 653-662. Elsevier Ltd. doi: 10.1016/S1470-2045(09)70159-7.

Sjöström, L., Lindroos, A., Peltonen, M., Torgerson, J., Bouchard, C., Carlsson, B., et al. (2004).

Lifestyle, Diabetes, and Cardiovascular Risk Factors 10 Years after Bariatric Surgery. *The New England Journal of Medicine*, 351(26), 2683-2693.

Sjöström, L., Narbro, K.C., Sjöström, D., Karason, K., Larsson, B., Wedel, H., ... Carlsson, J.

(2007). Effects of Bariatric Surgery on Mortality in Swedish Obese Subjects. *The New England Journal of Medicine*, 357(8), 741-52. Retrieved April 24, 2011, from ProQuest Nursing & Allied Health Source. (Document ID: 1324343981).

Skevington, S. M., Lotfy, M., & O'Connell, K. A. (2004). The World Health Organization's

WHOQOL-BREF quality of life assessment: Psychometric properties and results of the international field trial. A Report from the WHOQOL Group. *Quality of Life Research*, 13(2), 299-310. doi: 10.1023/B:QURE.0000018486.91360.00.

Skroubis, G., Sakellaropoulos, G., Pougouras, K., Mead, N., Nikiforidis, G., & Kalfarentzos, F.

(2002). Comparison of nutritional deficiencies after Roux-en-Y gastric bypass and after biliopancreatic diversion with Roux-en-Y gastric bypass. *Obesity surgery*, 12(4), 551-8. doi: 10.1381/096089202762252334.

Sockalingam, S., Hawa, R., Wnuk, S., Jackson, T., & Okrainec, A. (2011, August). Supporting

bariatric surgeons: the rationale for an integrated psychosocial model in a bariatric surgery program. *Can J Surg*, 54(Suppl), S59-S60.

Sogg, S. (2010). Comment on: History of substance abuse relates to improved postbariatric body

mass index outcomes. *Surgery for obesity and related diseases*, 6, 421-2. doi: 10.1016/j.soard.2010.04.006.

- Steffen, R., Biertho, L., Ricklin, T., Piec, G., & Horber, F. F. (2003). Laparoscopic Swedish adjustable gastric banding: a five-year prospective study. *Obesity surgery, 13*(3), 404-11. doi: 10.1381/096089203765887741.
- Strain, G.W., Faulconbridge, L., Crosby, R.D., Kolotkin, R.L., Heacock, L., Gagner, M., Dakin, G., & Pomp, A. (2010). Health-related quality of life does not vary among patients seeking different surgical procedures to assist with weight loss. *Surgery for Obesity and Related Diseases, 6*(5), 521-525.
- Striegel-Moore, R. H., Wilson, G. T., Wilfley, D. E., Elder, K. A., & Brownell, K. D. (1998). Binge eating in an obese community sample. *The International journal of eating disorders, 23*(1), 27-37. Retrieved from <http://www.ncbi.nlm.nih.gov/pubmed/9429916>.
- Suddenly Skinny. (October 24, 2006). Retrieved March 15, 2011, from <http://www.oprah.com/oprahshow/Suddenly-Skinny/4>
- Sugerman, H. J., Sugerman, E. L., DeMaria, E. J., Kellum, J. M., Kennedy, C., Mowery, Y., et al. (2003). Bariatric surgery for severely obese adolescents. *Journal of gastrointestinal surgery : official journal of the Society for Surgery of the Alimentary Tract, 7*(1), 102-7; discussion 107-8. Retrieved from <http://www.ncbi.nlm.nih.gov/pubmed/12559191>.
- SurveyMonkey.com, LLC. (June 23, 2010). Privacy Policy. Retrieved April 24, 2011, from <http://www.surveymonkey.com/privacypolicy.aspx>.
- Suter, M., Calmes, J. M., Paroz, A., & Giusti, V. (2006). A 10-year experience with laparoscopic gastric banding for morbid obesity: high long-term complication and failure rates. *Obesity surgery, 16*(7), 829-35. doi: 10.1381/096089206777822359.
- Suzuki, J., Haimovici, F., & Chang, G. (2012). Alcohol Use Disorders After Bariatric Surgery. *Obesity Surgery, 22*, 201-207. doi:10.1007/s11695-010-0346-1.

- Swami, V., Pietschnig, J., Stieger, S., Tovée, M. J., & Voracek, M. (2010). An investigation of weight bias against women and its associations with individual difference factors. *Body image*, 7(3), 194-9. doi: 10.1016/j.bodyim.2010.03.003.
- Tavares, H., Zilberman, M. L., & el-Guebaly, N. (2003). Are there cognitive and behavioural approaches specific to the treatment of pathological gambling? *Canadian journal of psychiatry. Revue canadienne de psychiatrie*, 48(1), 22-7. Retrieved from <http://www.ncbi.nlm.nih.gov/pubmed/12635560>.
- Thalheimer, A., Bueter, M., Wierlemann, A., Lager, C., Jurowich, C., Germer, C.T., & Fein, M. (2009). Predictability of outcome in laparoscopic gastric banding. *Obesity facts*, 2, 27-30.
- Thonney, B., Pataky, Z., Badel, S., Bobbioni-Harsch, E., & Golay, A. (2010). The relationship between weight loss and psychosocial functioning among bariatric surgery patients. *American journal of surgery*, 199(2), 183-8. Elsevier Inc. doi: 10.1016/j.amjsurg.2008.12.028.
- Tice, J. A, Karliner, L., Walsh, J., Petersen, A. J., & Feldman, M. D. (2008). Gastric banding or bypass? A systematic review comparing the two most popular bariatric procedures. *The American journal of medicine*, 121(10), 885-93. doi: 10.1016/j.amjmed.2008.05.036.
- Tincello, D., Sculpher, M., Tunn, R., Quail, D., Vaart, H. van der, Falconer, C., et al. (2010). Patient characteristics impacting health state index scores, measured by the EQ-5D of females with stress urinary incontinence symptoms. *Value in health : the journal of the International Society for Pharmacoeconomics and Outcomes Research*, 13(1), 112-8. doi: 10.1111/j.1524-4733.2009.00599.x.

- Tindle, H. A., Omalu, B., Courcoulas, A., Marcus, M., Hammers, J., & Kuller, L. H. (2010). Risk of suicide after long-term follow-up from bariatric surgery. *The American journal of medicine*, *123*(11), 1036-42. Elsevier Inc. doi: 10.1016/j.amjmed.2010.06.016.
- Trus, T. L., Pope, G. D., & Finlayson, S. R. G. (2005). National trends in utilization and outcomes of bariatric surgery. *Surgical endoscopy*, *19*(5), 616-20. doi: 10.1007/s00464-004-8827-8.
- Tsai, W. S., Inge, T. H., & Burd, R. S. (2007, March). Bariatric surgery in adolescents: recent national trends in use and in-hospital outcome. *Archives of pediatrics & adolescent medicine*. doi: 10.1001/archpedi.161.3.217.
- Urbanoski, K. A., Cairney, J., Adlaf, E., & Rush, B. (2007). Substance abuse and quality of life among severely mentally ill consumers: a longitudinal modelling analysis. *Social psychiatry and psychiatric epidemiology*, *42*(10), 810-8. doi: 10.1007/s00127-007-0236-6.
- Valezi, A. C., Junior, J. M., de Menezes, M. A., de Brito, E. M., & de Souza, S. A. F. (2010). Weight loss outcome after silastic ring Roux-en-Y gastric bypass: 8 years of follow-up. *Obesity surgery*, *20*(11), 1491-5. doi: 10.1007/s11695-010-0264-2.
- van Hout, G., Fortuin, F., Pelle, A., & van Heck, G. (2008). Psychosocial functioning, personality, and body image following vertical banded gastroplasty. *Obesity surgery*, *18*(1), 115-20. doi: 10.1007/s11695-007-9309-6.
- Vargas-Ruiz, A. G., Hernández-Rivera, G., & Herrera, M. F. (2008). Prevalence of iron, folate, and vitamin B12 deficiency anemia after laparoscopic Roux-en-Y gastric bypass. *Obesity surgery*, *18*(3), 288-93. doi: 10.1007/s11695-007-9310-0.
- Wadden, T. A., Butryn, M. L., Sarwer, D. B., Fabricatore, A. N., Crerand, C. E., Lipschutz, P. E., et al. (2006). Comparison of psychosocial status in treatment-seeking women with class

III vs. class I-II obesity. *Surgery for obesity and related diseases*. doi:
10.1016/j.soard.2006.03.016.

Wadden, T. A., Faulconbridge, L.F., Jones-Corneille, L.R., Sarwer, D.B., Fabricatore, A.N., Thomas, J.G., et al. (2011). Binge eating disorder and the outcome of bariatric surgery at one year: a prospective, observational study. *Obesity (Silver Spring, Md.)* 19(6), 1220-8. doi: 10.1038/oby.2010.336.

Wang, G. J., Volkow, N. D., Logan, J., Pappas, N. R., Wong, C. T., Zhu, W., et al. (2001). Brain dopamine and obesity. *Lancet*, 357(9253), 354-7. Retrieved from <http://www.ncbi.nlm.nih.gov/pubmed/11210998>.

Wareham, J. D., & Potenza, M. N. (2010). Pathological gambling and substance use disorders. *The American journal of drug and alcohol abuse*, 36, 242-247. doi: 10.3109/00952991003721118.

Weinstein, A. (2010). Computer and video game addiction-A comparison between game users and non-game users. *The American journal of drug and alcohol abuse*, 36, 268-76. doi: 10.3109/00952990.2010.491879.

Welsh, J. A., Buchsbaum, D. G., & Kaplan, C. B. (1993). Quality of life of alcoholics and non-alcoholics: does excessive drinking make a difference in the urban setting? *Quality of life research: an international journal of quality of life aspects of treatment, care and rehabilitation*, 2(5), 335-40. Retrieved from <http://www.ncbi.nlm.nih.gov/pubmed/8136798>.

Wenzel, H. G., Bakken, I. J., Johansson, A., Gotestam, K. G., & Oren, A. (2009). Excessive computer game playing among Norwegian adults: self-reported consequences of playing and association with mental health problems. *Psychological reports*, 3, 1237-1247. doi: 10.2466/PRO.105.F.1237-1247.

- Wiedemann, A., Saules, K.K, Ivezaj, V., Reslan, S., Wood, D., & Skilton, L (in preparation). An Examination of Post-Bariatric Patients who develop Problematic Substance Use after Surgery: New Onset Users Compared to Controls.
- Wilson, A.C., Samuelson, B., Palermo, T.M. (2010). Obesity in children and adolescents with chronic pain: associations with pain and activity limitations. *The Clinical Journal of Pain*, 26(8), 705-711.
- Wilson, P. W., D'Agostino, R. B., Levy, D., Belanger, A. M., Silbershatz, H., & Kannel, W. B. (1998). Prediction of coronary heart disease using risk factor categories. *Circulation*, 97(18), 1837-47. Retrieved from <http://www.ncbi.nlm.nih.gov/pubmed/9603539>.
- Wolfe, B. L., & Terry, M. L. (2006). Expectations and outcomes with gastric bypass surgery. *Obesity surgery*, 16(12), 1622-9. doi: 10.1381/096089206779319473.
- Wonderlich, S. A., Gordon, K. H., Mitchell, J. E., Crosby, R. D., & Engel, S. G. (2009). The validity and clinical utility of binge eating disorder. *The International journal of eating disorders*, 42(8), 687-705. doi: 10.1002/eat.20719.
- Woodard, G. A., Downey, J., Hernandez-Boussard, T., & Morton, J. M. (2010). Impaired Alcohol Metabolism after Gastric Bypass Surgery: A Case-Crossover Trial. *Journal of the American College of Surgeons*, 1-6. American College of Surgeons. doi: 10.1016/j.jamcollsurg.2010.09.020.
- World Health Organization (2010, May 12). *BMI Classification*. Retrieved from http://apps.who.int/bmi/index.jsp?introPage=intro_3.html
- World Health Organization (2009). *Global health risks: Mortality and burden of disease attributable to selected major risks*. Retrieved from http://www.who.int/healthinfo/global_burden_disease/GlobalHealthRisks_report_full.pdf

- World Health Organization (2003). *The world health report 2003: Shaping the future*. Retrieved from http://www.who.int/whr/2003/en/whr03_en.pdf
- Xanthakos, S. A. (2009). Nutritional deficiencies in obesity and after bariatric surgery. *Pediatric clinics of North America*, *56*(5), 1105-21. Elsevier Ltd. doi: 10.1016/j.pcl.2009.07.002.
- Yildiz, N., Topuz, O., Gungen, G. O., Deniz, S., Alkan, H., & Ardic, F. (2010). Health-related quality of life (Nottingham Health Profile) in knee osteoarthritis: correlation with clinical variables and self-reported disability. *Rheumatology international*, *30*(12), 1595-600. doi: 10.1007/s00296-009-1195-x.
- Zagorski, S. M., Papa, N. N., & Chung, M. H. (2005). The effect of weight loss after gastric bypass on C-reactive protein levels. *Surgery for obesity and related diseases*, 81-85. doi: 10.1016/soard.2005.01.001.
- Zeller, M., Modi, A., Noll, J., Long, J., & Inge, T. (2009). Psychosocial functioning improves following adolescent bariatric surgery. *Obesity*, *17*(5), 985-990.

Appendix A
Informed consent form for Brighton study participants



St. John Health/Providence Hospital and Medical Centers
CONSENT TO PARTICIPATE IN A RESEARCH STUDY

AND

**AUTHORIZATION TO USE OR DISCLOSE PROTECTED HEALTH INFORMATION
FOR RESEARCH**

**TO BE CONDUCTED
AT
PROVIDENCE HOSPITAL AND MEDICAL CENTERS**

Title: Prevalence and quality of life among post gastric bypass patients
in a substance abuse treatment program

Principal Investigators: Karen K. Saules, Ph.D., & Denise Bertin-Epp, R.N.

Office Phone: Saules 734.487.4988; Bertin-Epp 810.225.2572

Sub-Investigators and/or Study Staff: Ashley Wiedemann, Valentina Ivezaj,
Summar Reslan, & Dan Wood

This form contains information about a research study. You understand that you are being asked to participate in a research study being conducted through an unfunded collaboration between Brighton Hospital and Eastern Michigan University. If you choose to participate in this research study, you should clearly understand all information contained in this consent before you agree to participate by signing your name to the last page. One of the investigators or a research assistant will explain the study to you, answer any questions you may have, and witness your signature to this consent form. After you sign the form, you will be given a copy, and an additional copy will remain in your medical chart.

You understand that this is a research study. You have been asked to participate because you are a patient who has reported having had some form of weight-loss (“bariatric”) surgery in the past, meet study requirements, and are being seen at Brighton Hospital and Medical Center. If you have never had weight loss surgery, you are being asked to participate as a comparison, or “control”, participant, so that we can compare the experiences of those who have had the surgery with those who have not.

All subjects participating in research must volunteer, and be informed about the purpose, risks, benefits if any, and alternatives. If you have any questions about this research or the document, please ask.

Background and Purpose

The purpose of this research study is to gain a better understanding of how common it is for individuals who have had weight loss (“bariatric” or “gastric bypass”) surgery to experience problems with substance abuse and dependence. We also aim to better understand the factors which might contribute to some weight-loss surgery patients being more likely to experience substance abuse or dependence.

Total participation time will be approximately two to three hours, which will include completing some questionnaires and an interview. You can choose to do either or both parts of the study (the interview and/or the survey), but we hope you will consider doing both. Both parts are expected to take less than one hour each to complete.

Check here if you are volunteering to participate in the SURVEY portion of the study.

Check here if you are volunteering to participate in the INTERVIEW portion of the study.

Control Participant, Interview not applicable (**NOTE:** Control participants are not eligible for the INTERVIEW part of the study, simply because the interview will be asking about experiences directly related to the weight loss surgery itself, which Control participants will not have experienced.)

Study Description, Location, And Duration

This study is designed to help us to better understand why some weight-loss surgery patients encounter problems with alcohol or other drugs.

You will be asked to complete a survey that will include items about your history of substance abuse, weight problems, weight control efforts (including surgery, if applicable), quality of life, mood, anxiety, personality, identity, and your physical health. We estimate that it might take up to one hour to complete the survey, but some people may take considerably less time.

We will gather data from your medical record regarding your diagnoses and progress in treatment at Brighton, but this information will be de-identified so that the privacy of your health information will be protected. By this we mean that we will not use information about you that could be linked back to your identity. Once your information leaves Brighton Hospital, there will be no way for anyone to figure out who provided it.

To help with this process, throughout the study, the researchers ask that you **DO NOT** put your name on any of the study materials, so that your confidentiality can be protected. We will assign

a confidential participant identification number to your materials so that we can link them together for data analysis purposes.

If you have ever had bariatric surgery, you will also be asked to participate in an interview about the factors that you feel may have contributed to your substance abuse problems and reasons for seeking treatment. The antecedents, functions, and consequences of eating and substance use behaviors will be assessed during these interviews. This interview will also take about one hour, although we are happy to hear what you have to say if you wish to talk longer.

We would like to audiotape these interviews so that the information you share can be transcribed accurately, but you do not have to agree to taping in order to participate. If you do not wish to be taped, the interviewer will simply take notes. If you agree to be audiotaped, there is a separate place for you to sign, giving us permission to do so, at the end of this form.

We hope to recruit up to 100 men and women in this study. However, part of the purpose of this study is to understand how common it is for weight-loss surgery patients to encounter substance use problems. Because we do not know this, it is difficult to determine how many people will be eligible for the study, and how long it might take to enroll them.

Possible Risks And Discomforts

Risks are minimal, aside from the potential for breach of confidentiality. To minimize this risk, information which leaves the premises of Brighton Hospital will not include your name, but will instead be labeled with a unique study participation code.

While risks are anticipated to be minimal, you might still experience some emotional discomfort in talking or thinking about the problems you have experienced in both managing your weight and controlling substance use. Upon your request, Dr. Saules can inform Brighton Hospital Staff of any distress or concerns you might have so that they can be addressed within the treatment program by qualified staff.

For Women of Childbearing Potential. Because this study only involves talking and filling out forms, there are no anticipated risks for your child. Therefore, even if you are pregnant or breast feeding, you may participate in this study.

Benefits

There may be no direct benefit to you in participating in the study. It is possible, however, that you might find it interesting to reflect upon your experiences as you answer questions about your efforts to control your weight and manage your use of alcohol and/or other drugs. Participating in the study might spark ideas about recovery that you could follow up on with your treatment providers at Brighton Hospital. However, no direct benefits can be guaranteed. Nonetheless, the information you provide is likely to be of benefit to others who might encounter struggles managing weight and addictions in the future. It is hoped that the information we learn from this study will help us to better identify pre-weight-loss-surgery candidates who are at risk for

developing substance abuse problems and inform efforts to prevent post-surgical problems with substance abuse or other addictions.

Alternative Treatments

This study does not involve any form of treatment, so there are no alternatives that would be appropriate to suggest. You should not regard the interviews as a form of therapy, although it might feel good to have a chance to talk about the problems you have experienced. As noted above, if you wish us to release information you tell us to your Brighton Hospital treatment staff, we can do that with your permission. You do not have to participate in this study to continue to receive services at Brighton Hospital.

Voluntary Participation

You understand that your participation in this study is voluntary and that your refusal to participate will cause no penalty or loss of benefits that you would otherwise receive. If you decide to participate, you may change your mind about being in the study, and may quit at any time without penalty or loss of benefits regarding your future care. If new information becomes available during the study that may affect your willingness to continue in the study, your doctor and/or his/her associate will discuss this information with you. Also, your doctor may stop your participation at any time if he/she feels that is in your best interest.

Compensation

No funds have been set aside for injured research subjects. While medical care is available should an injury occur, the cost will be billed to you or your insurer in the ordinary manner. You will be compensated, however, for taking the time to participate in this study. If you decide to complete the questionnaire packet, you will be given a \$10 Target gift card. If you decide to also do the interview, we will give you a second \$10 gift card. You can do either or both of these aspects of the study. We hope that you will consider doing both, so that we can obtain complete information about your experiences.

There are no costs to you for participating in this study.

Confidentiality Of Records

The principal investigators will have access to your medical records and your test results. While absolute confidentiality cannot be guaranteed, you understand that all medical records and research material that could identify you will be kept as confidential as possible within state and federal laws. You also understand that your medical records could be examined by the Institutional Review Board (a group of medical and lay people at this hospital charged with protecting human subjects' rights) or government agencies in order to verify the data collected during this research study. If the results of this study are presented in any public forum, you will not be identified by name.

All responses and personally identifiable information will be kept confidential by being stored in separate locked secure cabinets and password protected computer files. You will be given an identification number to use throughout the study to protect your confidentiality. However, to

ensure that you are using the same number throughout the study, the principal investigator will keep a log of personally identifiable information and identification numbers. Only the investigators will have access to this log, and we will store it in a secure locked cabinet separate from your individual responses. Once all data has been collected, this log will be destroyed. Information from this study may be reported or published in aggregated form, but you will not be identified in any publications or presentations.

The information you provide strictly for purposes of this research project will NOT be shared with Brighton Hospital staff unless you specifically request that we do so, in writing, using Brighton Hospital's standard release of information form. We are happy to share this information with your treatment staff, however, if you wish us to do so and authorize release of information.

Findings from this study may be published in scientific journals and may also be presented at professional conferences. You will not be identified in any of these presentations or publications, even if you allow us to quote some of what you tell us. Instead, we will either present information in aggregate (group) form, or we will use an alias (fake name or ID number) for you.

Questions Regarding this Study

If you have any questions about your rights as a subject in this clinical research study, you may contact the IRB (Institutional Review Board) office at 248 849-8889 at Providence Hospital and Medical Center.

If you have any questions regarding the study procedures, your role as a participant, or any injury or distress that you feel might be due to study participation, you may contact Dr. Karen Saules (734.487.4987 or ksauls@emich.edu) or Denise Bertin-Epp (810.225.2572 or depp@brightonhospital.org).

Authorization to Use and Disclose Protected Health Information (PHI)

Your participation in this study will require the use and disclosure of certain medical and other information about you. You will not be able to participate if you do not agree to the use and disclosure of your information.

The protected health information (PHI) that may be used or disclosed includes:

- All information collected during the research study as described in this form,
- The information that is contained in any medical record that is created during your participation in this research, and
- Other information in your medical record that may be considered related to your participation in this research, which may include: your medical history, physical examination results, laboratory test results or other test results (like an x-ray, scan, biopsy, EKG).

Who may see, use, or disclose your PHI:

- The researchers and members of the research team
- Other health care providers or employees of St. John Health who provide services to you for this study
- Representatives of the Institutional Review Board, the FDA (Food and Drug Administration), or other governmental agencies involved in research monitoring
- Members of the safety monitoring board
- Other agencies as required by law

- The sponsor, _____
- A clinical research organization, or other agent of the sponsor
- A laboratory outside of St. John Health System

What This Authorization Means

You understand that we cannot guarantee that your protected health information shared or disclosed under this Authorization could not be additionally shared or disclosed by the individual or organization that receives the information, and the privacy of your PHI may no longer be protected by the law.

You have the right to not agree to disclose your PHI. However, if you do not agree by signing this Authorization, you will not be able to participate in this research study.

If you do sign below, you have the right to withdraw your permission at any time, but you must do so in writing. You may send the written withdrawal to:

Karen K. Saules, Ph.D.
Eastern Michigan University
Psychology Clinic
611 W. Cross St.
Ypsilanti, MI 48197

You may no longer be allowed to participate in the research if you withdraw your permission. Also, you understand that any information collected before written notice of withdrawal is received will be shared as you have agreed.

You have the right to review your PHI. However, if you agree to participate in the research study and sign below, you will not be able to look at your research information until the research study is completed.

You will receive a copy of this document, the Consent to Participate in a Clinical Research Study and Authorization to Use or Disclose Protected Health Information for Research.

Expiration Date

Your authorization (permission) to use and disclose your health information will continue indefinitely, subject to the procedures and limits described in this form. Your health information will only be used for the purposes defined within this consent and authorization form.

Other Considerations

You have fully discussed and understand the purpose of this clinical research study and how it will be carried out. You have been allowed to ask questions about the study and all of your questions have been answered. You have read this consent form or had the complete form read to you and understand it. You know that your participation in this study is fully voluntary and you may withdraw at any time. If you refuse to participate or later withdraw from the study, it will not affect your care in any way. You also understand that by consenting to participate in this study, you are not waiving any other legal rights you may have because you are a subject in this study or as a patient at Providence Hospital & Medical Center.

Your signature below acknowledges that you voluntarily agree to participate in this clinical research study, and you will receive a signed copy of this form.

Signature of Research Participant

Date

Printed Name of Research Participant

*Signature of Witness

Date

Signature of Person Obtaining Consent

Date

Printed Name of Person Obtaining Consent

Permission to audiotape: By signing below, you consent to having your study interview audiotaped. You understand that the tape will not be associated with your name or other identifying information, and that it will be erased after the information has been transcribed.

Participant Signature

Date

Permission to quote audiotaped material: By signing below, you consent to having the investigators quote material from you in presentations or publications. You understand that these quotes will not be associated with your name or other identifying information. Instead, the investigator will make up an alias (a fake name or number) to associate with your comments.

Participant Signature

Date

***Witness**

*Use when participant has had this consent form read to them (i.e., illiterate, legally blind, translated into foreign language).

Appendix B

Recruitment letter to be mailed to potential control participants

Dear Mr./Ms. _____,

I am writing about a research study being conducted by St. Vincent Carmel Hospital's Bariatric Center of Excellence, in collaboration with Eastern Michigan University. We are contacting you because you have received bariatric surgery at St. Vincent and are eligible for the current study.

The purpose of the study is to learn more about outcomes of individuals who have had bariatric surgery. To be in the study, you will complete a brief online survey, which should take about 15-20 minutes to complete. You will receive a \$10 Amazon gift card for participation in this study.

If you might be interested in participating, please first review the enclosed informed consent information sheet. If you have read and understood the informed consent information sheet and agree to its terms, you may participate in the study by going to the survey website and entering your identification code:

<p><insert Survey monkey URL> ID code: #####</p>

If you have any questions regarding the study or content of enclosed forms, please contact Melissa Pulcini (734.487.4987 or mpulcini@emich.edu) or Dr. Karen Saules (734.487.4987 or ksaules@emich.edu) at Eastern Michigan University. You may also contact Dr. Leslie Schuh (317.582.8210 or lmschuh@stvincent.org) at St. Vincent Carmel Hospital.

Our colleague at Eastern Michigan University (Melissa Pulcini) would like to contact you by phone to answer any questions you have about the study and assist you in filling out the

survey, if you desire. After you have read the enclosed consent form and privacy information, if you agree that we may transfer your contact information to Ms. Pulcini, please sign the attached consent and either fax it to us at 317-582-8042 or mail in the enclosed, postage paid envelope.

We will be contacting you by phone within the next few days to confirm that you received this packet. You may also decline participation at this time. If you do not wish to be called within the next few days regarding this study, please contact Dr. Leslie Schuh (317.582.8210 or lmshuh@stvincent.org) immediately to let her know, and we will not contact you.

Sincerely,

Leslie Schuh, PhD
Research Scientist
Bariatric Center of Excellence
St. Vincent Carmel Hospital

Melissa Pulcini, Doctoral Fellow
Eastern Michigan University

Appendix C
Informed consent information sheet for control participants*

* Note that this information sheet will be enclosed in the initial packet sent to potential control participants during recruitment. Informed consent, however, will be officially obtained by indication of agreement to study terms on the first page of the Internet survey. The study terms presented on the first page of the Internet survey will be identical to those in this informed consent information sheet.

**St. Vincent Bariatric Center of Excellence and Eastern Michigan University
Research Study Informed Consent Information Sheet
PLEASE READ CAREFULLY AND KEEP FOR YOUR RECORDS**

PROTOCOL TITLE: Obesity and Outcomes of Bariatric Surgery: A Comparison of Patients With and Without Post-Operative Substance Use Disorders

PRINCIPAL INVESTIGATOR: Leslie Schuh, PhD

SUB-INVESTIGATORS: Melissa Pulcini; Karen Saules, PhD; & David Creel, PhD, RD, CDE

R2011-

SPONSOR: none

PROTOCOL VERSION DATE: July 6, 2011

Who is conducting this study and why am I being asked to participate?

- You are being asked to participate in a research study being conducted by St. Vincent Bariatric Center of Excellence, in collaboration with Eastern Michigan University.
- You are being asked to participate because you have had weight-loss (“bariatric”) surgery in the past.

What is the purpose of this study?

- The purpose of the study is to learn more about outcomes of individuals who have undergone bariatric surgery.

How many people will take part in the study?

- If you agree to participate, you will be one of approximately 112 subjects who will be participating in this research (56 locally and 56 in Michigan)

What would I be asked to do?

- Participants will be asked to complete an Internet survey, which is expected to take 15-20 minutes to complete.

Do I have to participate?

- No, this research study is completely voluntary. You can choose whether or not to participate.
- Your choice of whether or not to participate will not result in any penalty or loss of benefits to which you are otherwise entitled.

What are the risks?

- Participation in this study is expected to present minimal risk.
- Some of the questions in the survey may be of a personal nature. You may discontinue the survey at any time. Discontinuing the survey will not result in any penalty or loss of benefits to which you are otherwise entitled.

Are there any benefits?

- There is no direct benefit to you for participating in this study.
- Your participation could help us understand more about outcomes of bariatric surgery.

Will I be compensated for my time?

- A \$10 Amazon gift card is offered as compensation for your participation in this study.

How will my data be used and stored?

- Findings from this study may be published in scientific journals and may also be presented at professional conferences. You will not be identified in any of these presentations or publications. Instead, we will either display your information under a fake name or ID number, or present your information as part of a group.
- Although you may discontinue the survey at any time with no penalty or loss of benefits, any information collected before you stop the interview may be used as you have agreed.

- The research team will make every effort to keep your identity strictly confidential. All data will be stored such that no identifying information will be linked to responses.

Who can I contact if I have questions about the study?

- You may contact Melissa Pulcini (734.487.4987 or mpulcini@emich.edu), Dr. Karen Saules (734.487.4987 or ksaules@emich.edu), or Dr. Leslie Schuh (317.582.8210 or lmschuh@stvincent.org) if you have any questions regarding the study procedures, your role as a participant, or any distress that you believe may be due to study participation.

What else should I know?

- This research protocol and informed consent document has been reviewed and approved by the St. Vincent Hospital Institutional Review Board and Eastern Michigan University Human Subjects Review Committee for use from _____ to _____. If you have any questions regarding your rights as a research patient or the approval process, you may contact the St. Vincent Hospital Institutional Review Board at (317) 338-2194 or Dr. Deb de Laski-Smith of Eastern Michigan University Human Subjects Review Committee (734.487.0042, Interim Dean of the Graduate School and Administrative Co-chair of UHSRC, human.subjects@emich.edu).

How do I make my decision about completing the survey?

- If you have read all of the above and would like to take part in this study, click the NEXT button below. By doing so, you are giving informed consent for us to use your responses in this study.
- If you do not wish to take part in this study, just close this window.

**ST. VINCENT
AUTHORIZATION TO USE AND DISCLOSE PROTECTED HEALTH
INFORMATION FOR RESEARCH PURPOSES**

A new privacy rule has been issued to protect the privacy rights of patients. This rule is issued under a law called the Health Insurance Portability and Accountability Act of 1996 (HIPAA). The Privacy Rule is designed to protect the confidentiality of your health information. This document explains how your health information will be used and disclosed for the purposes of conducting, monitoring, and auditing this study and describes your rights with respect to that information.

Your personal health information is information about you that could be used to identify you, such as your name, address, telephone number, photograph, date of birth, social security number, new and existing medical records, blood or DNA samples, or the types, dates and results of various tests and procedures. This may include information in your medical and hospital records, as well as information created or collected during the study.

By completing the survey, you authorize the study physicians (Researchers), St. Vincent Hospital, and employees (Researchers) to use and disclose the following information about you to each other, the study sponsor and its representatives, the St. Vincent Hospital Institutional Review Board, and government agencies responsible for the oversight of this study, including the Food and Drug Administration and any foreign agencies as necessary; personal health information in your medical and hospital record including medical/surgical history, past and current medications, vital signs, physical examinations and laboratory results, other assessments, and samples and analyses of blood. Your personal health information will be used to conduct the research study as described in the Informed Consent.

If results of this study are published or reported in medical journals or at meetings, your name will not be included.

St. Vincent Hospital will not condition treatment or payment on whether or not you participate in this study.

You may revoke your participation in this study at any time by writing to the St. Vincent Hospital Research Department at 8402 Harcourt Road, Suite 208, Indianapolis, IN 46260. You

understand that if St. Vincent Hospital has already taken action in reliance on your authorization, they do not have to undo that action. Once your authorization has been revoked, you will no longer be able to participate in the study.

Once information is disclosed, it can no longer be controlled by the study physician, St. Vincent Hospital, or by you and may be re-disclosed by the recipient. Thus, your information would no longer be protected by the Privacy Rule.

Your authorization to disclose your personal health information as described in this section will expire at the end of the study, after all study related data have been transferred to the sponsor.

You will not be allowed to review the information collected for the Study until after the study is completed. When the study is over, you will have access to the information again.

By clicking the NEXT button below, you acknowledge that you have read and understand this Authorization. Further, you authorize Researcher to use and disclose your health information in accordance with the terms of this Authorization.

By signing this document, you acknowledge that you have read and understand the Authorization. Further, you authorize Researcher to use or disclose your health information in accordance with the terms of this Authorization, including the release to researchers at Eastern Michigan University to allow them to contact you. Please return this signed page to Dr. Leslie Schuh by fax (317-582-8042) or mail in the enclosed postage-paid envelope (St. Vincent Carmel Hospital, P.O. Box 1903, Carmel IN 46082-8411).

Title of Study: Obesity and Outcomes of Bariatric Surgery: A Comparison of Patients With and Without Post-Operative Substance Use Disorders

Printed name of subject

R2011-_____
R-number of study

Signature of subject/authorized legal representative

Date

Relationship of authorized legal representative to subject

Appendix D

Socio-demographics Questionnaire

1. Please check the box(es) below which correspond to the racial/ethnic groups you belong to:

- Black or African-American
- White or Caucasian
- Hispanic or Latino/a
- Native American
- Asian or Asian American
- Middle Eastern
- Other (Please Specify: _____)

2. How many years of education have you completed? _____ years
(NOTE: Completing High School or its equivalent = 12 years)

3. What is your current relationship status?

- Married
- Living with partner (same sex)
- Living with partner (opposite sex)
- Single (never married, not living with partner)
- Divorced
- Remarried
- Widowed
- Separated
- Other (Please Specify: _____)

4. What is your current employment status?

- Working full time (>35 hours/week)
- Working part-time, regular hours
- Working part-time, irregular hours
- Unemployed - student
- Unemployed - homemaker
- Unemployed – other
- Retired
- Disability
- Military

5. What is the economic status of your current household?

- We have barely enough to get by
- We have enough to get by, but no more
- We are solidly middle class
- We have plenty of “extras”
- We have plenty of “luxuries”

Don't know/unsure/prefer not to say

6. What is your annual household income?

>\$150,000

\$100,000-\$149,000

\$75,000-\$99,000

\$50,000-\$74,000

\$25,000-\$49,000

\$10,000-\$24,000

<\$9,000

Don't know/unsure/prefer not to say

7. Have you smoked cigarettes at all in the past 30 days?

No Yes

7a. If yes, how many days per week have you been smoking? _____ days
(Check here if not applicable)

7b. And, on average, on days when you smoke at all, about
How many cigarettes per day would you smoke? _____ cigarettes
(Check here if not applicable)

8. Did/do you smoke more frequently during the first hours after waking than during the rest of the day?

No Yes

9. How soon after you wake do you smoke your first cigarette?

≤ 5 minutes

6 - 30 minutes

31 - 60 minutes

> 60 minutes

10. To your best knowledge, have any of your following biological relatives ever had problems with drugs or alcohol? If "yes", please indicate how many of that type of relative have ever had such problems. Please answer Not Applicable (N/A) if you do not have any of that type of relative. For example, if you do not have any sisters, please check "N/A" next to "sister."

Mother

Father

Sister

Brother

Half-sister

Half-brother

Aunt

Uncle

Niece
Nephew
Cousin

No

Yes

N/A

Appendix E
World Health Organization Quality of Life—BREF (WHOQOL-BREF)

The following questions ask how you feel about your quality of life, health, or other areas of your life. **Please choose the answer that appears most appropriate.** If you are unsure about which response to give to a question, the first response you think of is often the best one. Please keep in mind your standards, hopes, pleasures and concerns. We ask that you think about your life **in the last four weeks.**

		Very poor	Poor	Neither poor nor good	Good	Very good
1.	How would you rate your quality of life?	1	2	3	4	5

		Very dissatisfied	Dissatisfied	Neither satisfied nor dissatisfied	Satisfied	Very satisfied
2.	How satisfied are you with your health?	1	2	3	4	5

The following questions ask about **how much** you have experienced certain things in the **last four weeks.**

		Not at all	A little	A moderate amount	Very much	An extreme amount
3. *	To what extent do you feel that (physical) pain prevents you from doing what you need to do?	1	2	3	4	5
4. *	How much do you need any medical treatment to function in your daily life?	1	2	3	4	5
5. **	How much do you enjoy life?	1	2	3	4	5
6. **	To what extent do you feel your life to be meaningful?	1	2	3	4	5

		Not at all	A little	A moderate amount	Very much	Extremely
7. **	How well are you able to concentrate?	1	2	3	4	5
8. ** **	How safe do you feel in your daily life?	1	2	3	4	5
9. ** **	How healthy is your physical environment?	1	2	3	4	5

The following questions ask about how completely you experienced or were able to do certain things **in the last four weeks**.

		Not at all	A little	Moderately	Mostly	Completely
10. *	Do you have enough energy for your everyday life?	1	2	3	4	5
11. **	Are you able to accept your bodily appearance?	1	2	3	4	5
12. ** **	Do you have enough money to meet your needs?	1	2	3	4	5
13. ** **	How available to you is the information that you need in your day-to-day life?	1	2	3	4	5
14. ** **	To what extent do you have the opportunity to do leisure activities?	1	2	3	4	5

		Very poor	Poor	Neither poor nor good	Good	Very good
15. *	How well are you able to get around, physically?	1	2	3	4	5

		Very dissatisfied	Dissatisfied	Neither satisfied nor dissatisfied	Satisfied	Very satisfied
16. *	How satisfied are you with your sleep?	1	2	3	4	5
17. *	How satisfied are you with your ability to perform your activities of daily living?	1	2	3	4	5
18. *	How satisfied are you with your capacity to work?	1	2	3	4	5
19. **	How satisfied are you with yourself?	1	2	3	4	5
20. ** *	How satisfied are you with your personal relationships?	1	2	3	4	5
21. ** *	How satisfied are you with your sex life?	1	2	3	4	5
22. ** *	How satisfied are you with the support you get from your friends?	1	2	3	4	5
23. ** **	How satisfied are you with the conditions of your usual living place?	1	2	3	4	5
24. ** **	How satisfied are you with your access to health services?	1	2	3	4	5
25. ** **	How satisfied are you with availability of transportation?	1	2	3	4	5

The following question refers to how often you have felt or experienced certain things in the last four weeks.

		Never	Rarely	Quite Often	Very often	Always
26. **	How often do you have negative feelings such as blue mood, despair, anxiety, or depression?	1	2	3	4	5

Appendix F
Patient Health Questionnaire-9 (PHQ-9)

Over the <u>last 2 weeks</u>, how often have you been bothered by the following problems?	Not at all	Several days	More than half the days	Nearly every day
1. Little interest or pleasure in doing things	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. Feeling down, depressed, or hopeless	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. Trouble falling or staying asleep, or sleeping too much	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4. Feeling tired or having little energy	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5. Poor appetite or overeating	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6. Feeling bad about yourself — or that you are a failure or have let yourself or your family down	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7. Trouble concentrating on things, such as reading the newspaper or watching television	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8. Moving or speaking so slowly that other people could have noticed? Or the opposite — being so fidgety or restless that you have been moving around a lot more than usual	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9. Thoughts that you would be better off dead or of hurting yourself in some way	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

If you checked off any problems above, how difficult have these problems made it for you to do your work, take care of things at home, or get along with other people?

**Not difficult
at all**

**Somewhat
difficult**

**Very
difficult**

**Extremely
difficult**

From the Primary Care Evaluation of Mental Disorders Patient Health Questionnaire (PRIME-MD PHQ). The PHQ was developed by Drs. Robert L. Spitzer, Janet B.W. Williams, Kurt Kroenke and colleagues. For research information, contact Dr. Spitzer at rls8@columbia.edu. PRIME-MD® is a trademark of Pfizer Inc. Copyright© 1999 Pfizer Inc. All rights reserved. Reproduced with permission.

Appendix G
Behavioral Excess Questionnaire- Brighton participants

During **the four weeks before you came to Brighton**, how often were you participating in each of the following activities:

	Not at all	Several days a week	More than half the days	Nearly every day
Surfing the Internet for more than two hours (not for work purposes)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Gambling (any type)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Videogame playing	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Sexual behavior outside of a committed relationship	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Eating sweets in amounts that most people would consider excessive	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Eating carbohydrates in amounts that most people would consider excessive	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Eating large amounts of food very late at night? If yes: <ul style="list-style-type: none"> • Check here <input type="checkbox"/> if you would wake up and eat after you had already gone to bed. • Check here <input type="checkbox"/> if you would typically do this before you went to bed? 	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Appendix H
Behavioral Excess Questionnaire- Control participants

During **the past four weeks**, how often have you been participating in each of the following activities:

	Not at all	Several days a week	More than half the days	Nearly every day
Surfing the Internet for more than two hours (not for work purposes)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Gambling (any type)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Videogame playing	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Sexual behavior outside of a committed relationship	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Eating sweets in amounts that most people would consider excessive	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Eating carbohydrates in amounts that most people would consider excessive	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Eating large amounts of food very late at night? If yes: <ul style="list-style-type: none"> • Check here <input type="checkbox"/> if you would wake up and eat after you had already gone to bed. • Check here <input type="checkbox"/> if you would typically do this before you went to bed? 	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Shopping (for personal items)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Shoplifting	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Appendix I

Questionnaire on Eating and Weight Patterns- Revised (QEWP-R) and Scoring Rubric
Robert L. Spitzer, Susan Z. Yanovski, Marsha D. Marcus

Thank you for completing this questionnaire. Please circle the appropriate number or response, or write in information where asked. You may skip any question you do not understand or do not wish to answer.

1. Age ____ years
2. Sex: 1 Male 2 Female
3. What is your ethnic/racial background?
 - 1 Black (not Hispanic)
 - 2 Hispanic
 - 3 White (not Hispanic)
 - 4 Asian
 - 5 Other (please specify) _____
4. How far did you get in school?
 - 1 Grammar school, junior high school or less
 - 2 Some high school
 - 3 High school graduate or equivalency (GED)
 - 4 Some college or associate degree
 - 5 Completed college
5. How tall are you?
____ feet ____ in
6. How much do you weigh now?
_____ lbs
7. What has been your highest weight ever (when not pregnant)?
_____ lbs

8. Have you ever been overweight by at least 10 lbs as a child or 15 lbs as an adult (when not pregnant)?
 - 1 Yes 2 No or not sure

IF YES: How old were you when you were first overweight (at least 10 lbs as a child or 15 lbs as an adult?) If you are not sure, what is your best guess?
_____ years
9. How many times (approximately) have you lost 20 lbs or more – when you weren't sick -- and then gained it back?
 - 1 Never
 - 2 Once or twice
 - 3 Three or four times
 - 4 Five times or more
10. During the past six months, did you often eat within any two hour period what most people would regard as an unusually large amount of food?
 - 1 Yes 2 No

IF NO: SKIP TO QUESTION 15
11. During the times when you ate this way, did you often feel you couldn't stop eating or control what or how much you were eating?
 - 1 Yes 2 No

IF NO: SKIP TO QUESTION 15

15. In general, during the past **six** months, how upset were you by overeating (eating more than you think is best for you)?
- 1 Not at all
 - 2 Slightly
 - 3 Moderately
 - 4 Greatly
 - 5 Extremely
16. In general, during the past **six** months, how upset were you by the feeling that you couldn't stop eating or control what or how much you were eating?
- 1 Not at all
 - 2 Slightly
 - 3 Moderately
 - 4 Greatly
 - 5 Extremely
17. During the past **six** months, how important has your weight or shape been in how you feel about or evaluate yourself as a person-- as compared to other aspects of your life, such as how you do at work, as a parent, or how you get along with other people?
- 1 Weight and shape were **not very important**
 - 2 Weight and shape **played a part** in how you felt about yourself
 - 3 Weight and shape **were among the main things** that affected how you felt about yourself
 - 4 Weight and shape **were the most important things** that affected how you felt about yourself.
18. During the past **three** months, did you ever make yourself vomit in order to avoid gaining weight after binge eating?
- 1 Yes
 - 2 No

IF YES: How often, on average, was that?

- 1 Less than once a week
- 2 Once a week
- 3 Two or three times a week
- 4 Four or five times a week
- 5 More than five times a week

19. During the past **three** months, did you ever take more than twice the recommended dose of laxatives in order to avoid gaining weight after binge eating?

1 Yes 2 No

IF YES: How often, on average, was that?

- 1 Less than once a week
- 2 Once a week
- 3 Two or three times a week
- 4 Four or five times a week
- 5 More than five times a week

20. During the past **three** months, did you ever take more than twice the recommended dose of diuretics (water pills) in order to avoid gaining weight after binge eating?

1 Yes 2 No

IF YES: How often, on average, was that?

- 1 Less than once a week
- 2 Once a week
- 3 Two or three times a week
- 4 Four or five times a week
- 5 More than five times a week

21. During the past **three** months, did you ever fast -- not eat anything at all for at least 24 hours -- in order to avoid gaining weight after binge eating?

1 Yes 2 No

IF YES: How often, on average, was that?

- 1 Less than one day a week
- 2 One day a week
- 3 Two or three days a week
- 4 Four or five days a week
- 5 Nearly every day

DECISION RULES FOR DIAGNOSING BINGE EATING DISORDER USING THE QUESTIONNAIRE
ON EATING AND WEIGHT PATTERNS, Revised

(FOR EXAMINER'S USE ONLY)

DIAGNOSIS OF BED

QUESTION NUMBER	RESPONSE
<i>Q EWP - binge</i> 10 AND 11	1 (BINGE EATING)
<i>Q EWP - freq</i> 12	3, 4, OR 5 (AT LEAST 2 DAYS PER WEEK FOR SIX MONTHS)
<i>Q EWP - assoc</i> 13 a through e	3 OR MORE ITEMS MARKED "YES" (AT LEAST 3 ASSOCIATED SYMPTOMS DURING BINGE EATING EPISODES)
<i>Q EWP - distress</i> 15 OR 16	4 OR 5 (MARKED DISTRESS REGARDING BINGE EATING)

DIAGNOSIS OF BED REQUIRES ALL OF THE ABOVE ALONG WITH THE ABSENCE
OF PURGING OR NON-PURGING BULIMIA NERVOSA, AS DEFINED BELOW.

DIAGNOSIS OF PURGING BULIMIA NERVOSA

<i>Q EWP - binge</i> 10 AND 11	1 (SAME AS BED)
<i>Q EWP - freq</i> 12	3,4, OR 5 (AT LEAST 2 DAYS PER WEEK FOR SIX MONTHS) Note: This is an approximation of the DSM-IV criterion of at least 2 episodes/week for three months).
<i>Q EWP - shape</i> 17 18, 19. OR 20	3 OR 4 (OVERVALUATION OF WEIGHT/SHAPE)
<i>Q EWP - purge</i>	ANY RESPONSE 3,4, OR 5 (PURGING AT LEAST 2 TIMES PER WEEK FOR THREE MONTHS)

vomit = 1 and vomit time ≥ 3
lax = 1 and lax time ≥ 3
diuretic = 1 and diuretic time ≥ 3

eat large = 1 2 } Q EWP - binge
eat stop = 1

times binge ≥ 3, Q EWP - freq =

1 = eat rapid, eat full, eat hung, eat alone, eat dep

upset over eat = 4 or 5
upset no con = 4 or 5

shape conc = 3 or 4

DIAGNOSIS OF NON-PURGING BULIMIA NERVOSA

- 10,11,12,17 SAME AS PURGING BULIMIA NERVOSA
- 18, 19, **AND** 20 **NO** RESPONSE 3,4, OR 5 (NO FREQUENT COMPENSATORY PURGING)
- 21,22, **OR** 23 **ANY** RESPONSE 3, 4, OR 5 (COMPENSATORY NON-PURGING BEHAVIOR AT LEAST TWO TIMES PER WEEK FOR THREE MONTHS)
-

QUESTION FOR RESEARCH PURPOSES ONLY
(NOT TO BE USED FOR DIAGNOSIS OF BED OR BULIMIA NERVOSA, PURGING OR NON-PURGING TYPE)

- 14 a through d EXAMINER'S JUDGMENT THAT AMOUNT OF FOOD DESCRIBED IS UNUSUALLY LARGE GIVEN CIRCUMSTANCES (I.E., TIME OF DAY, HOURS SINCE PREVIOUS MEAL)

YES___ NO___ UNSURE___

Spitzer RL, Yanovski SZ, Marcus MD. (HaPI Record). 1994; Pittsburgh PA: Behavioral Measurement Database Services (Producer). McLean, VA: BRS Search Service (Vendor).

The following individuals contributed to the development of previous versions of the QEWP. Stewart Agras, Michael Devlin, Deborah Hasin, James Mitchell, Cathy Nonas, Albert Stunkard, Thomas Wadden, B. Timothy Walsh, Rena Wing

Silhouettes from: Stunkard AJ, Sorensen T, Schulsinger F. Use of the Danish Adoption Register for the Study of Obesity and Thinness. In: Kety SS, Roland LP, Sidman RL, Matthysse S.W., eds. The Genetics of Neurological and Psychiatric Disorders. Raven Press: New York. 1983:119. Used by permission.

Reprinted by permission of the author, Susan Yanovski, M.D.

Appendix J

Questionnaire on Eating and Weight Patterns- Revised (QEWP-R) adapted for Brighton study
(questions are numbered 11-27 on Brighton survey)

11. During the **six months before your surgery**, did you often eat within any 2 hour period what most people would regard as an unusually large amount of food? Sometimes people refer to this as “binge eating”. Did you tend to do that often?

No Yes

IF NO: SKIP TO QUESTION 17

12. During the times when you ate this way, did you often feel you couldn't stop eating or couldn't control what or how much you were eating?

No Yes

IF NO: SKIP TO QUESTION 17

13. How old were you when you first had times when you ate large amounts of food and felt that your eating was out of control? If you are not sure, what is your best guess? ____ years old.

14. During the **six months before your surgery**, how often, on average, did you have times when you ate this way – that is, large amounts of food **plus** the feeling that your eating was out of control? (There may have been some weeks when it was not present – just average those in.)

- Less than one day a week
 One day a week
 Two or three days a week
 Four or five days a week
 Nearly every day

15. Did you **usually** have any of the following experiences during those occasions?

- a. Eating much more rapidly than usual?.....No Yes
b. Eating until you felt uncomfortably full?.....No Yes
c. Eating large amounts of food when you didn't
feel physically hungry?.....No Yes
d. Eating alone because you were embarrassed
by how much you were eating?.....No Yes
e. Feeling disgusted with yourself, depressed,
or very guilty after overeating?.....No Yes

16. Think about a typical time when you ate this way – that is, large amounts of food **plus** the feeling that your eating was out of control.

a. What time of day did the episode start?

- Morning (8am- 12 Noon)
 Early afternoon (12 Noon – 4pm)
 Late afternoon (4pm – 7pm)
 Evening (7pm-10pm)
 Night (After 10pm)

b. About how long did a typical episode of eating like this last, from the time you started to eat until when you stopped and didn't eat again for at least two hours?
 _____ hours _____ minutes

c1. As best you can remember, please list everything you might have eaten or drank during a typical episode. If you ate for more than two hours, describe the food eaten and liquids drunk during the two hours when you ate the most. Please be specific – include brand names where possible, and amounts as best you can estimate (For example, 7 ounces Ruffles potato chips; 1 cup Breyer's chocolate ice cream with 2 teaspoons hot fudge; 2 8-ounce glasses of Coca-cola; 1 ½ ham and cheese sandwiches with mustard).

c2. What would you say were your top three “preferred” foods during the times when you were overeating and felt out of control?

d. At the time an episode like this would have started, how long would it probably have been since you had previously finished eating a meal or snack?
 _____ hours _____ minutes

17. In general, during the **six months before your surgery**, how upset were you by overeating (eating more than you think is best for you)?

- Not at all
- Slightly
- Moderately
- Greatly
- Extremely

18. In general, during the **six months before your surgery**, how upset were you by the feeling that you couldn't stop eating or control what or how much you were eating?

- Not at all
- Slightly

- Moderately
- Greatly
- Extremely

19a. **During the six months before your surgery**, how important to you was your weight or shape in terms of how you felt about or evaluated yourself as a person – as compared to other aspects of your life, such as how you were doing at work/school, as a parent/partner/friend, or how you got along with people?

- Weight and shape were **not very important**
- Weight and shape **played a part** in how you felt about yourself
- Weight and shape **were among the main things** that affected how you felt about yourself
- Weight and shape **were the most important things** that affected how you felt about yourself

19b. During the **PAST SIX MONTHS**, how important to you has your weight or shape been in terms of how you have been feeling about or evaluating yourself as a person – as compared to other aspects of your life, such as how you are doing at work/school, as a parent/partner/friend, or how you got along with people?

- Weight and shape are **not very important**
- Weight and shape **play a part** in how you felt about yourself
- Weight and shape **are among the main things** that affect how you feel about yourself
- Weight and shape **are the most important things** that affect how you feel about yourself

20a. **During the six months before your surgery**, did you ever make yourself vomit to avoid gaining weight after binge eating?

No Yes

20b. **IF YES:** How often, **on average**, was that?

- Less than once a week
- Once a week
- Two or three times a week
- Four or five times a week
- More than five times a week

21a. **During the six months before your surgery**, did you ever take more than twice the recommended dose of laxatives to avoid gaining weight after binge eating?

No Yes

21b. **IF YES:** How often, **on average**, was that?

- Less than once a week
- Once a week
- Two or three times a week
- Four or five times a week

More than five times a week

22a. **During the six months before your surgery**, did you ever take more than twice the recommended dose of diuretics (water pills) to avoid gaining weight after binge eating?.

No Yes

22b. **IF YES:** How often, **on average**, was that?

- Less than once a week
- Once a week
- Two or three times a week
- Four or five times a week
- More than five times a week

23. **During the six months before your surgery**, did you ever fast – not eat anything at all for at least 24 hours -- to avoid gaining weight after binge eating?

No Yes

23b. **IF YES:** How often, **on average**, was that?

- Less than once a week
- Once a week
- Two or three times a week
- Four or five times a week
- More than five times a week

24a. **During the six months before your surgery**, did you ever exercise for more than an hour **specifically** to avoid gaining weight after binge eating?

No Yes

24b. **IF YES:** How often, **on average**, was that?

- Less than once a week
- Once a week
- Two or three times a week
- Four or five times a week
- More than five times a week

25a. **During the six months before your surgery**, did you ever take more than twice the recommended dose of a diet pill to avoid gaining weight after binge eating?

No Yes

25b. **IF YES:** How often, **on average**, was that?

- Less than once a week
- Once a week
- Two or three times a week
- Four or five times a week
- More than five times a week

26a. **During the six months before your surgery**, did you go to any meetings of an organized weight control program? (like Weight Watchers, Optifast, Nutrisystem, Curves) or a self-help group (like TOPS, Overeaters Anonymous, etc.)?

No Yes

IF YES: Name of program: _____

26b. **During THE PAST SIX MONTHS**, have you gone to any meetings of an organized weight control program? (like Weight Watchers, Optifast, Nutrisystem, Curves) or a self-help group (like TOPS, Overeaters Anonymous, etc.)?

No Yes

IF YES: Name of program: _____

27. Since you have been an adult – 18 years old – how much of the time have you been on a diet, been trying to follow a diet, or in some way been limiting how much you were eating to lose weight or to keep from regaining weight you had lost?

- None or hardly any of the time
- About a quarter of the time
- About half the time
- About three-quarters of the time
- Nearly all of the time

Appendix K
WHO – ASSIST V 3.0

Please answer the following set of questions as they pertained to you BEFORE YOUR BARIATRIC SURGERY:

Question 1

Prior to surgery, which of the following substances had you ever used? (*NON-MEDICAL USE ONLY*)

- b. Alcoholic beverages (beer, wine, spirits, etc.) No Yes
- c. Cannabis (marijuana, pot, grass, hash, etc.) No Yes
- d. Cocaine (coke, crack, etc.) No Yes
- e. Amphetamine type stimulants (Adderall, Ritalin, speed, ecstasy, etc.) No Yes
- f. Inhalants (nitrous, glue, petrol, paint thinner, etc.) No Yes
- g. Sedatives or Sleeping Pills (Valium, Xanax, Serepax, Rohypnol, etc.) No Yes
- h. Hallucinogens (LSD, acid, mushrooms, PCP, Special K, etc.) No Yes
- i. Opioids in pill form (oxycontin, Vicodin, Percocet, codeine, etc.) No Yes
- j. Injected Opioids (heroin, morphine, etc.) No Yes
- k. Other - specify: No Yes

If "No" to all items, stop BEFORE SURGERY interview.

Ask Questions 2-7 for all substances ever used (i.e. those endorsed in Question 1)

Question 2

At the time you were using <insert substance name> most regularly prior to surgery, how often were you using it?

- Once or Twice
- Monthly
- Weekly
- Daily or Almost Daily

Question 3

At the time you were using <insert substance name> most regularly prior to surgery, how often had you had a strong desire or urge to use it?

- Never
- Once or Twice
- Monthly
- Weekly
- Daily or Almost Daily

Question 4

At the time you were using <insert substance name> most regularly prior to surgery, how often had your use of this substance led to health, social, legal or financial problems?

Never

Once or Twice

Monthly

Weekly

Daily or Almost Daily

Question 5

At the time you were using <insert substance name> most regularly prior to surgery, how often had you failed to do what was normally expected of you because of your use of this substance?

Never

Once or Twice

Monthly

Weekly

Daily or Almost Daily

Question 6

At the time you were using <insert substance name> most regularly prior to surgery, had a friend or relative or anyone else ever expressed concern about your use of <insert substance name>?

No

Yes

Question 7

At the time you were using <insert substance name> most regularly prior to surgery, had you ever tried and failed to control, cut down, or stop using <insert substance name>?

No

Yes

Please answer the following set of questions as they pertain to you AFTER YOUR BARIATRIC SURGERY:

Question 1

Since your surgery, which of the following substances had you ever used? (*NON-MEDICAL USE ONLY*)

b. Alcoholic beverages (beer, wine, spirits, etc.) No Yes

c. Cannabis (marijuana, pot, grass, hash, etc.) No Yes

d. Cocaine (coke, crack, etc.) No Yes

e. Amphetamine type stimulants (Adderall, Ritalin, speed, ecstasy, etc.) No Yes

f. Inhalants (nitrous, glue, petrol, paint thinner, etc.) No Yes

- g. Sedatives or Sleeping Pills (Valium, Xanax, Serepax, Rohypnol, etc.) No Yes
- h. Hallucinogens (LSD, acid, mushrooms, PCP, Special K, etc.) No Yes
- i. Opioids in pill form (oxycontin, Vicodin, Percocet, codeine, etc.) No Yes
- j. Injected Opioids (heroin, morphine, etc.) No Yes
- k. Other - specify: No Yes

If "No" to all items, stop AFTER SURGERY interview.

Question 2

At the time you were using <insert substance name> most regularly after surgery, how often were you using it?

Never

Once or Twice

Monthly

Weekly

Daily or Almost Daily

Question 3

At the time you were using <insert substance name> most regularly after surgery, how often had you had a strong desire or urge to use it?

Never

Once or Twice

Monthly

Weekly

Daily or Almost Daily

Question 4

At the time you were using <insert substance name> most regularly after surgery, how often had your use of this substance led to health, social, legal or financial problems?

Never

Once or Twice

Monthly

Weekly

Daily or Almost Daily

Question 5

At the time you were using <insert substance name> most regularly after surgery, how often had you failed to do what was normally expected of you because of your use of this substance?

Never

Once or Twice

Monthly

Weekly
Daily or Almost Daily

Question 6

At the time you were using <insert substance name> most regularly after surgery, had a friend or relative or anyone else ever expressed concern about your use of <insert substance name>?

No
Yes

Question 7

At the time you were using <insert substance name> most regularly after surgery, had you ever tried and failed to control, cut down, or stop using <insert substance name>?

No
Yes