HHS Public Access

Author manuscript

*Obes Surg*. Author manuscript; available in PMC 2018 June 01.

Published in final edited form as:

*Obes Surg*. 2017 June ; 27(6): 1529–1532. doi:10.1007/s11695-016-2514-4.

# Accuracy of Self-Reported Weight among Adolescent and Young Adults Following Bariatric Surgery

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## Abstract

**Purpose—**This study evaluates accuracy of self-reported weight in adolescent bariatric surgery patients.

**Materials and Methods—**During follow-up visits, participants self-reported weight and had weight measured. Differences between self-reported and measured weights were analyzed from 60 participants.

**Results—**Participants were 70% (n=42) female, 72% (n=43) white, mean age of 20.8 years and median body mass index of 36.6 kg/m$^2$. At an average 3.5 years following surgery, females underestimated weight (0.5kg, range: −18.7 to 5.6kg), while males overestimated (1.1kg, range: −7.8 to 15.2kg). Most (80%, n=48) reported within 5kg of measured weight. The majority of adolescents who previously underwent bariatric surgery reported reasonably accurate weights, but direction of misreporting varied by gender.

**Conclusion—**Self-reported weights could be utilized when measured values are unavailable without markedly biasing the interpretation of outcomes.

## Introduction

Self-reported body weights are frequently utilized in epidemiologic studies, since they are relatively low burden and inexpensive. Many investigators have cautioned against use of

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**Conflict of Interest Statement:** Todd M Jenkins, Tawny W Boyce, C Ralph Buncher, Meg H Zeller, Anita P Courcoulas, Mary Evans, and Thomas H Inge all declare that they have no conflicts of interest related to this article.

**Statement of Informed Consent:** Informed consent was obtained from all individual participants included in the study.

**Statement of Human Rights:** All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

self-reported weight estimates in obese populations due to underreporting bias[1–3], and indeed there is evidence to also suggest that underreporting in adolescent females may increase over time as they age into adulthood[4]. Similar underreporting relationships have also been observed within middle-aged bariatric cohorts[5, 6]. However, the literature currently lacks information regarding the accuracy of self-reported weight within adolescent bariatric populations. To address this gap in the literature, we sought to examine the accuracy of self-reported weight in adolescents who had undergone bariatric surgery.

## Methods

The Teen Longitudinal Assessment of Bariatric Surgery (Teen-LABS) study is an ongoing prospective, multi-center investigation of the safety and efficacy of bariatric surgery in adolescents ages 19 and younger[7, 8]. Analyses were restricted to participants who had completed a post-operative study visit between 6 months and 6 years, and for whom post-operative weight data included a (1) self-reported weight gathered during a visit scheduling phone call, and (2) a subsequent measured weight within 30 days, collected in-person using an electronic scale (Tanita Scale Model TBF310). For participants with self-reported and measured data across multiple study time points (n=10), a single time point was randomly selected, resulting in an analysis sample of 60 subjects.

Frequencies and percentages were calculated for categorical variables. Means and standard deviations or medians and interquartile ranges (IQR) were calculated for continuous variables. Fisher's exact, t-test, and Wilcoxon rank-sum tests were used to compare characteristics by sex. Difference in weight measurement, calculated as self-reported minus measured, was evaluated using Bland-Altman plots[9]. Median differences were plotted against the measured weight values, with the $5^{th}$ and $95^{th}$ percentiles of the difference utilized as the limits of agreement[9]. Wilcoxon signed rank tests were used to determine if median sex-specific difference in weight measurement values differed from zero. Gender-stratified robust linear regression models were used to evaluate the association between measured weight and the difference of weight values. Covariates considered for inclusion in the adjusted models included: age, race, study visit location (clinic, home), and time since surgery. Reported p-values are two-sided and considered statistically significant at $< 0.05$.

## Results

Sixty participants were evaluated, of which 42 were female (70%), 72% were white, and the majority underwent Roux-en-Y gastric bypass (67%) (Table 1). Mean age at baseline was 17.2 years (min: 13, max: 19) and median baseline BMI (measured weight) was 50.9 $kg/m^2$ (min: 41, max: 87). At the point of post-operative measurement (average of 3.5 years post bariatric surgery), mean age was 20.8 years and median BMI (measured weight) was 36.6 $kg/m^2$. Median self-reported body weights were 96.6kg for females and 115.2kg males, while the measured weight (on average, 15 days following self-report) was 98.5kg and 112.6kg for females and males, respectively. Overall, participants underestimated weight by 0.3 kg (min: −18.7kg, max: +15.2kg). Most (80%) participants reported weight values within 5kg of measured values, while 93% fell within ±10kg. Crude comparisons between subjects reporting within ± 5kg and beyond ± 5kg of true weight indicated the more accurate

reporters had a lower BMI at the post-operative measure (35.1 vs. 43.2 kg/m$^2$, p=0.03) (Table 2).

Females underestimated true weight by 0.5kg (p=0.0498), while males overestimated true weight by 1.1kg (p=0.65). Bland-Altman plots of difference in self-reported and measured weight by measured weight are presented by sex (Figure 1). These plots suggest females tend to increasingly underreport as measured weight increases, while no strong pattern is apparent among males. However, adjusted regression analyses indicate that the accuracy of self-reported weight did not vary as a function of measured weight in females (p=0.31) or males (p=0.52). No other characteristics, including time since surgery, were found to be significantly associated with self-reported weight accuracy.

## Discussion

Increasingly, adolescents are seeking weight loss procedures for management of severe obesity. Documenting outcomes of these procedures in adolescents is important, but one challenge is assessing weight longitudinally by direct measure in this increasingly mobile population. Conducting outcomes research using patient reported data collected remotely (e.g., by web-based or by telephonic data collection) is more feasible than performing in-person visits, especially for those participants who must travel large distances to reach the clinical center. Thus, it would be useful to better understand the potential error introduced by self-report estimates of weight. In this analysis, among adolescents who underwent weight loss surgery 6 months to 6 years prior to study, the accuracy of self-reported weights gathered by phone call was similar to that observed in an adult bariatric population[5]. Both males and females reported weights that were, on average, within 1kg of their weights as measured at a research visit within a month of the self-reported weight. However, in this sample males modestly overestimated their weight while females modestly underestimated their weights.

Prior studies have documented that obese adolescents provide more biased estimates of their weight than leaner peers[6]. Others have found a divergence in direction of error in self-reported estimates of weight by gender. Field and colleagues examined over four thousand participants in the National Longitudinal Study of Adolescent Health to assess predictors of discrepancy between weights based on self-reported vs. measured weights. They found obese males under-reported their weights by approximately 6 pounds (2.7kg) and females under-reported by 10 pounds (4.5kg)[10]. The reasons for the better accuracy of self-reported weight in our Teen-LABS sample are not clear, but it is possible that individuals who have undergone bariatric surgery have a greater awareness of factors associated with weight change or maintenance through exposure to a multidisciplinary clinical team[8], or may simply measure their weight more frequently.

Strengths of this study include use of standardized and scripted telephone interviews for collection of self-reported data, as well as uniform and protocol-driven weight measurements within a short period after telephone interview. Limitations include the fact that the study population was largely non-Hispanic, Caucasian and female, thus generalizability is limited. Findings are also limited due to small sample size, especially

among males (n=18). Also, we cannot assume from these data that the accuracy of self-report is maintained over longer term follow-up.

## Conclusion

In summary, this evidence suggests that for the majority of a post-operative bariatric sample of adolescents and young adults, self-reported weight reflects true weight reasonably well, and can thus be considered a valid surrogate when scale weight measurements are not available. However, additional research in larger, more racially and ethnically diverse populations is required to confirm our findings.

## Acknowledgments

**Grant Information:** The Teen-LABS consortium is funded by cooperative agreements with the National Institute of Diabetes and Digestive and Kidney Diseases (NIDDK), through grants: U01DK072493 (PI, Dr. Thomas Inge, CCHMC), UM1DK072493 (PI, Dr. Thomas Inge, CCHMC), and UM1DK095710 (PI, Dr. Ralph Buncher, University of Cincinnati). The study is also supported by grants UL1 TR000077-04 (Cincinnati Children's Hospital Medical Center), UL1RR025755 (Nationwide Children's Hospital), M01-RR00188 (Texas Children's Hospital/ Baylor College of Medicine), UL1 RR024153 and UL1TR000005 (University of Pittsburgh), UL1 TR000165 (University of Alabama, Birmingham).

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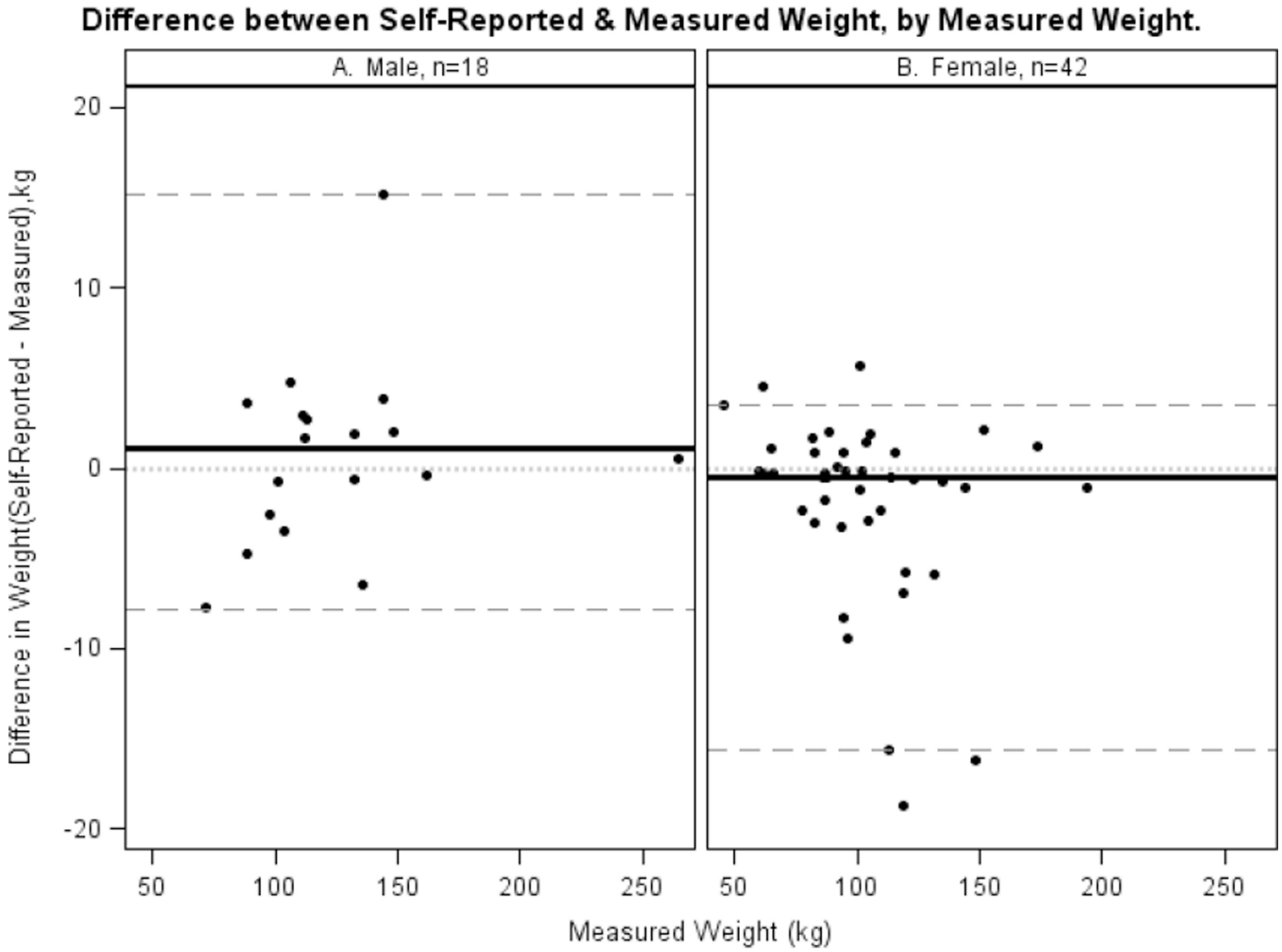


**Figure 1. Difference between Self-Reported & Measured Weight, by Measured Weight**

Panel A. Male, n=18.

Panel B. Female, n=42.

## Table 1

Subject characteristics by sex.

| | Total (N=60) | Female (n=42) | Male (n=18) | p-value* |
|---|---|---|---|---|
| **Age at Surgery (years), $\bar{x}$(*SD*)** | 17.3 (1.72) | 17.2 (1.67) | 17.4 (1.89) | 0.68 |
| **Age at Measurement (years), $\bar{x}$(*SD*)** | 20.8 (2.10) | 20.8 (2.04) | 20.7 (2.28) | 0.84 |
| **Race** | | | | 0.19 |
| White | 71.7% (43) | 66.7% (28) | 83.3% (15) | |
| Non-white | 28.3% (17) | 33.3% (14) | 16.7% (3) | |
| **Surgical Procedure, % (n)** | | | | 0.30 |
| Roux-en-Y Gastric Bypass | 66.7% (40) | 71.4% (30) | 55.6% (10) | |
| Gastric Band | 8.3% (5) | 9.5% (4) | 5.6% (1) | |
| Sleeve gastrectomy | 25.0% (15) | 19.1% (8) | 38.9% (7) | |
| **Years since surgery, $\bar{x}$(*SD*)** | 3.5 (1.42) | 3.6 (1.36) | 3.3 (1.58) | 0.42 |
| **Baseline Body Mass Index[a], median (IQR)** | 50.9 (45.4,58.4) | 50.1 (45.2,57.0) | 53.9 (48.7,60.8) | 0.18 |
| **Visit location, % (n)** | | | | 0.71 |
| Clinic | 51 (85.0%) | 35 (83.3%) | 16 (88.9%) | |
| Home | 9 (15.0%) | 7 (16.7%) | 2 (11.1%) | |
| **Body Mass Index[a] at measurement, median (IQR)** | 36.6 (30.7,43.9) | 36.6 (30.6,44.0) | 37.3 (33.1,43.8) | 0.87 |
| **Percent Weight change[b], $\bar{x}$(*SD*)** | −26.9 (16.04) | −26.3% (16.01) | −28.3% (16.49) | 0.67 |
| **Measured Weight (kg), median (IQR)** | 103.8 (88.0,127.4) | 98.5 (86.4,118.7) | 112.6 (100.8,143.9) | 0.03 |
| **Self-reported Weight (kg), median (IQR)** | 100.9 (86.1,124.1) | 96.6 (85.0,113.6) | 115.2 (100.0,147.7) | 0.01 |
| **Difference in weight[c], median (IQR)** | −0.3 (−2.7,1.6) | −0.5 (−2.9,0.9) | 1.1 (−2.5,2.9) | 0.12 |
| **Days between Report & Measured Weight, $\bar{x}$(*SD*)** | 15.4 (8.85) | 15.5 (8.27) | 15.1 (10.33) | 0.85 |

*Females compared to males.

[a]Using measured weight.

[b]Percent weight change from baseline measurement.

[c]Difference = (Self-report minus Measured).

SD = Standard Deviation.
IQR = Interquartile range.

**Table 2**

Select Characteristics by Level of Self-Report Accuracy (Within ±5kg, Beyond ±5kg).

| | Within ±5kg | Beyond ±5kg | p-value |
|---|---|---|---|
| N | 48 | 12 | |
| Age at Measurement (years), $\bar{x}$ (*SD*) | 33 (68.8%) | 9 (75.0%) | 0.99 |
| Females, n (%) | 37 (77.1%) | 6 (50.0%) | 0.08 |
| White, n (%) | 20.9 (2.19) | 20.4 (1.68) | 0.43 |
| Visit Location=Clinic, n (%) | 40 (83.3%) | 11 (91.7%) | 0.67 |
| Years since surgery, $\bar{x}$ (*SD*) | 3.4 (1.48) | 3.8 (1.18) | 0.38 |
| Body Mass Index at measurement, median (IQR) | 35.1 (29.0,42.2) | 43.2 (37.4,49.3) | 0.03 |