Self-Reported Weight and Height
Implications for Obesity Research

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Background: Self-reported weight and height are under- and over-reported, respectively, in epidemiologic studies. This tendency, which may adversely affect study operations, has not been evaluated among subjects being enrolled into a weight-loss program.

Methods: Self-reported weight, height, and body mass index (BMI) were compared to measured values in 97 overweight or obese (BMI>27.3) women being enrolled into a randomized, controlled trial of two behavioral interventions for weight loss. The effects of demographic factors, baseline weight, baseline height, and baseline BMI on weight and height reporting were assessed.

Results: There was a significant difference between measured and reported weight (mean difference=−3.75 lb, p=0.0001) and height (mean difference=+0.35 in., p=0.0007). The mean difference between measured and reported BMI was −1.14 kg/m^2 (p=0.0001). Unemployed, retired, or disabled women were more likely to under-report their BMI than employed women (p=0.001). Six percent of subjects who were initially considered eligible for the study on the basis of the self-report were eventually excluded from the study because they did not meet the inclusion criterion for BMI.

Conclusion: Obese women who seek weight-loss assistance tend to under-report their weight and over-report their height, suggesting that self-reported data are likely to be inaccurate. Misreporting is apparently influenced by employment and disability and has the potential to complicate recruitment of subjects for research studies.

Medical Subject Headings (MeSH): body mass index, body weight changes, weight perception, weight loss (Am J Prev Med 2001;20(4):294–298)

Introduction

Obesity is a public health threat throughout the developed world and the subject of extensive investigation.[1] Many studies use self-reported weight and height, which, although more convenient than objective measurement, may be inaccurate[1]; individuals tend to under-report weight and over-report height.[2–9]

Two prior studies examined self-reporting among participants in weight-loss programs and reached similar conclusions,[10,11] but they looked only at the validity of self-reporting 1 to 3 years after the weight-loss intervention. In most studies to date, subjects were uninformed about undergoing objective measurements. Clinical trials that recruit subjects on the basis of body mass index (BMI) may experience reduced efficiency, increased cost, and delays because of distorted self-reporting. No published studies address this issue. We, therefore, evaluated the validity of self-reported weight and height among obese women during recruitment into a randomized trial for weight loss.

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Methods

Data Collection

Self-reported and measured weight and height data were collected during screening for a 2-year weight-management study for obese women that compared two behavioral interventions for sustained weight loss. The study was conducted by the Yale Prevention Research Center (Derby, Connecticut). Women from a primarily middle-class community located in southwestern Connecticut were invited to participate. Women were required to be 30–65 years old, the primary household member who purchased groceries and prepared meals, and have a BMI 27.3≥40. Self-reported weight and height were collected through a telephone screening survey. Subjects responded to the following questions: "What is your current weight?" and "What is your current height?" Subjects who qualified on the basis of the telephone

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Table 1. Clinical characteristics of participants by obesity classification, based on measured body mass index

Variable	Overweight[a] (25 ≤ BMI < 30) (*n*=11)	Class I obesity (30 ≤ BMI ≤ 35) (*n*=31)	Class II obesity (35 < BMI ≤ 40) (*n*=26)	Class III obesity (BMI > 40) (*n*=27)
Age (yr)	53.0 (SD=10)	48 (SD=10.50)	48 (SD=9.00)	45.8 (SD=9.03)
Waist/hip ratio	0.82 (SD=0.05)	0.84 (SD=0.11)	0.85 (SD=0.06)	0.85 (SD=0.05)
Systolic blood pressure	124.00 (SD=10.80)	123.50 (SD=15.30)	123.90 (SD=12.5)	127.40 (SD=13.80)
Reported weight (lb)	166.91 (SD[b]=13.39)	187.20 (SD=15.80)	217.70 (SD=19.70)	251.70 (SD=25.10)
Measured weight (lb)	167.18 (SD=10.11)	188.70 (SD=14.00)	223.6 (SD=19.30)	257.80 (SD=25.90)
Weight error[b] (lb)	−0.27 (SD=4.60)	−1.56 (SD=5.68)	−6.52 (SD=0.20)	−5.20 (SD=10.10)
Reported height (in.)	64.09 (SD=2.02)	64.29 (SD=2.12)	64.80 (SD=2.19)	65.32 (SD=2.63)
Measured height (in.)	63.95 (SD=1.87)	64.31 (SD=2.14)	64.40 (SD=2.06)	64.40 (SD=2.89)
Height error[b] (in.)	0.14 (SD=0.41)	−0.02 (SD=0.93)	0.33 (SD=1.04)	0.94 (SD=0.92)
Reported BMI (kg/m^2)	28.54 (SD=1.08)	31.82 (SD=1.88)	36.40 (SD=2.30)	41.40 (SD=2.45)
Measured BMI (kg/m^2)	28.77 (SD=0.69)	32.12 (SD=1.34)	37.90 (SD=1.36)	43.80 (SD=2.75)
BMI error (kg/m^2)	−0.24 (SD=0.69)	−0.30 (SD=1.27)	−1.50 (SD=1.90)	−2.19 (SD=2.15)
BMI error (%)	−0.88 (SD=2.36)	−0.93 (SD=3.90)	−3.96 (SD=5.0)	−5.03 (SD=4.66)

[a]Based on classification developed by the International Obesity Task Force.
[b]Error = reported value − measured value.
BMI, body mass index; SD, standard deviation.

Table 2. Classification of mean weight discrepancies by BMI[a] and demographic variables (where weight discrepancy = reported weight − measured weight)

	Mean weight discrepancy		Mean height discrepancy		Mean BMI discrepancy	
Variable	*n*	Discrepancy ± SD (lb)	*n*	Discrepancy ± SD (in.)	*n*	Discrepancy ± SD
BMI						
Overweight (25 ≥ BMI > 30)	11	−0.27 ± 4.56	11	0.14 ± 0.41	11	−0.23 ± 0.69
Class I obese (30 ≤ BMI ≤ 35)	31	−1.56 ± 5.77	33	−0.02 ± 0.93	31	−0.30 ± 1.27
Class II obese (35 ≤ BMI ≤ 40)	26	−6.52 ± 10.23[b]	26	0.33 ± 1.04	27	−1.50 ± 1.88[b]
Class III obese (BMI > 40)	25	−5.15 ± 9.86	25	0.94 ± 0.92[b]	26	−2.19 ± 2.15[b]
Employment level						
Employed or self-employed	66	−2.73 ± 8.35	66	0.23 ± 0.64	67	−0.77 ± 1.54
Not employed (homemakers and retired)	21	−5.43 ± 9.15	21	0.69 ± 1.56	21	−1.91 ± 2.48
Unemployed or disabled	6	−9.21 ± 6.70	6	0.58 ± 1.35	6	−2.49 ± 1.01[c]
Education						
≤ High school degree	36	−3.74 ± 9.79	36	0.31 ± 0.96	36	−1.29 ± 1.61
≥ Some college	59	−3.77 ± 5.99	59	0.43 ± 1.02	59	−1.05 ± 1.99
Marital Status						
Married	60	−3.18 ± 8.2	60	0.30 ± 0.82	60	−0.93 ± 1.54
Divorced/separated	18	−3.01 ± 6.78	18	0.46 ± 1.47	18	−1.19 ± 2.29
Widow	6	−4.04 ± 3.12	6	0.21 ± 0.74	7	−1.79 ± 3.12
Never married/living arrangement	7	−8.18 ± 16.6	7	1.04 ± 0.77	6	−2.16 ± 1.66
Income						
<$26,000	16	−4.32 ± 6.62	16	0.39 ± 1.39	16	−1.38 ± 2.26
$26,000–50,000	26	−5.82 ± 9.64	26	0.73 ± 0.92	26	−1.93 ± 2.03[d]
$51,000–75,000	23	−0.16 ± 4.76	23	0.20 ± 0.98	23	−0.32 ± 1.15
>$75,000	22	−5.09 ± 11.22	22	0.15 ± 0.70	22	−1.06 ± 1.75
Refused to answer	6	−2.46 ± 5.57	6	0.00 ± 0.32	6	−0.45 ± 1.17
Age						
30–39	21	−3.51 ± 5.82	21	0.23 ± 1.15	21	0.93 ± 1.58
40–49	28	−3.48 ± 7.89	28	0.20 ± 0.66	28	−0.84 ± 1.34
Over 49	42	−3.70 ± 10.19	42	0.57 ± 1.05	42	−1.42 ± 2.26

[a]BMI, body mass index (kg/m^2).
[b]Significantly different from overweight women ($p<0.05$).
[c]$p < 0.05$ compared to employed/self-employed women.
[d]$p < 0.05$ compared to $51,000–75,000 income range.
SD, standard deviation.

Table 3. Classification of mean weight discrepancies by BMI[a] and demographic variables[b]

Variable	*n*	Mean weight discrepancy ± SD (lb)	Mean height discrepancy ± SD (in.)	Mean BMI discrepancy ± SD (kg/m^2)
BMI				
Overweight (25 ≥ BMI > 30)	11	−0.27 ± 4.56	0.14 ± 0.41	−0.23 ± 0.69
Class I obese (30 ≤ BMI ≤ 35)	31	−1.56 ± 5.77	−0.02 ± 0.93	−0.02 ± 1.27
Class II obese (35 ≤ BMI ≤ 40)	26	−6.52 ± 10.23[c]	0.33 ± 1.04	−1.50 ± 1.88
Class III obese (BMI > 40)	27	−5.15 ± 9.86	0.94 ± 0.92[c]	−2.19 ± 2.15[c]
Employment Level				
Employed or self-employed	66	−2.73 ± 8.35	0.23 ± 0.64	−0.77 ± 1.54
Not employed (homemakers and retired)	21	−5.43 ± 9.15	0.69 ± 1.56	−1.91 ± 2.48
Unemployed or disabled	6	−9.21 ± 6.70	0.58 ± 1.35	−2.49 ± 1.01[d]
Education				
≤High school degree	36	−3.74 ± 9.79	0.31 ± 0.96	−1.29 ± 1.61
≥Some college	59	−3.77 ± 5.99	0.43 ± 1.02	−1.05 ± 1.99
Marital Status				
Married	60	−3.18 ± 8.2	0.30 ± 0.82	−0.93 ± 1.54
Disvorced/separated	18	−3.01 ± 6.78	0.46 ± 1.47	−1.19 ± 2.29
Widow	6	−4.04 ± 3.12	0.21 ± 0.74	−1.79 ± 3.12
Never married/living arrangement	7	−8.18 ± 16.6	1.04 ± 0.77	−2.16 ± 1.66
Income				
<$26,000	16	−4.32 ± 6.62	0.39 ± 1.39	−1.38 ± 2.26
$26,000–50,000	26	−5.82 ± 9.64	0.73 ± 0.92	−1.93 ± 2.03[e]
$51,000–75,000	23	−0.16 ± 4.76	0.20 ± 0.98	−0.32 ± 1.15
>$75,000	22	−5.09 ± 11.22	0.15 ± 0.70	−1.06 ± 1.75
Refused to answer	6	−2.46 ± 5.57	0.00 ± 0.32	−0.45 ± 1.17
Age				
30–39	21	−3.51 ± 5.82	0.23 ± 1.15	0.93 ± 1.58
40–49	28	−3.48 ± 7.89	0.20 ± 0.66	−0.84 ± 1.34
Over 49	42	−3.70 ± 10.19	0.57 ± 1.05	−1.42 ± 2.26

[a]BMI, body mass index (kg/m^2).
[b]Discrepancy = reported − measured value.
[c]Significantly different from overweight women ($p < 0.05$).
[d]$p < 0.05$ compared to employed/self-employed women.
[e]$p < 0.05$ compared to $51,000–75,000 income range.
SD, standard deviation.

screening were scheduled for a physical examination within 2 weeks and were informed that they would be objectively measured. Physical examination included measurements of blood pressure, pulse rate, height, weight, and hip and waist circumferences. Weight and height were measured without shoes and with only undergarments, with subjects standing erect and facing the examiner. All measures were performed by trained members of the research team, using identical methods and calibrated equipment.

Analysis

Data were entered into a database (Microsoft Excel 1997, Microsoft Corporation, Redman, WA) by a data manager, rechecked for coding errors, and analyzed by using SAS (Statistical Analysis Software, Version 6.12, SAS Institute, Cary, NC). Obesity was based on the International Obesity Task Force guidelines.[12]

Self-reported and objective measures were compared, using paired *t* tests. One-way analysis of variance was conducted to assess the effect of demographic and clinical variables on discrepancies. Post-hoc comparisons of mean weight, height, and BMI differences by demographic and clinical variables were performed, using the Duncan multiple-range test with Bonferroni-corrected *p* values. The all-possible regressions procedure was used for model selection to assess which demographic and clinical variables were predictive of misreporting. The R^2 values of models with Mallow's C_p statistics close to p+1 (where p=number of parameters in the model) were used as the criteria for model selection. Alpha was two-tailed and set at 0.05.

Results

Of 254 women initially interviewed by telephone, 125 appeared eligible on the basis of self-reported weight and height. Ninety-seven (77.6%) chose to enroll, of whom 78 were truly eligible at examination. Of the 97 women, one was determined to be an extreme outlier (with a weight discrepancy of 93.5 lb), and one did not provide self-reported information. These data points were excluded from the analysis.

Demographic and clinical characteristics for the 95 women are presented in Table 1. Subjects under-

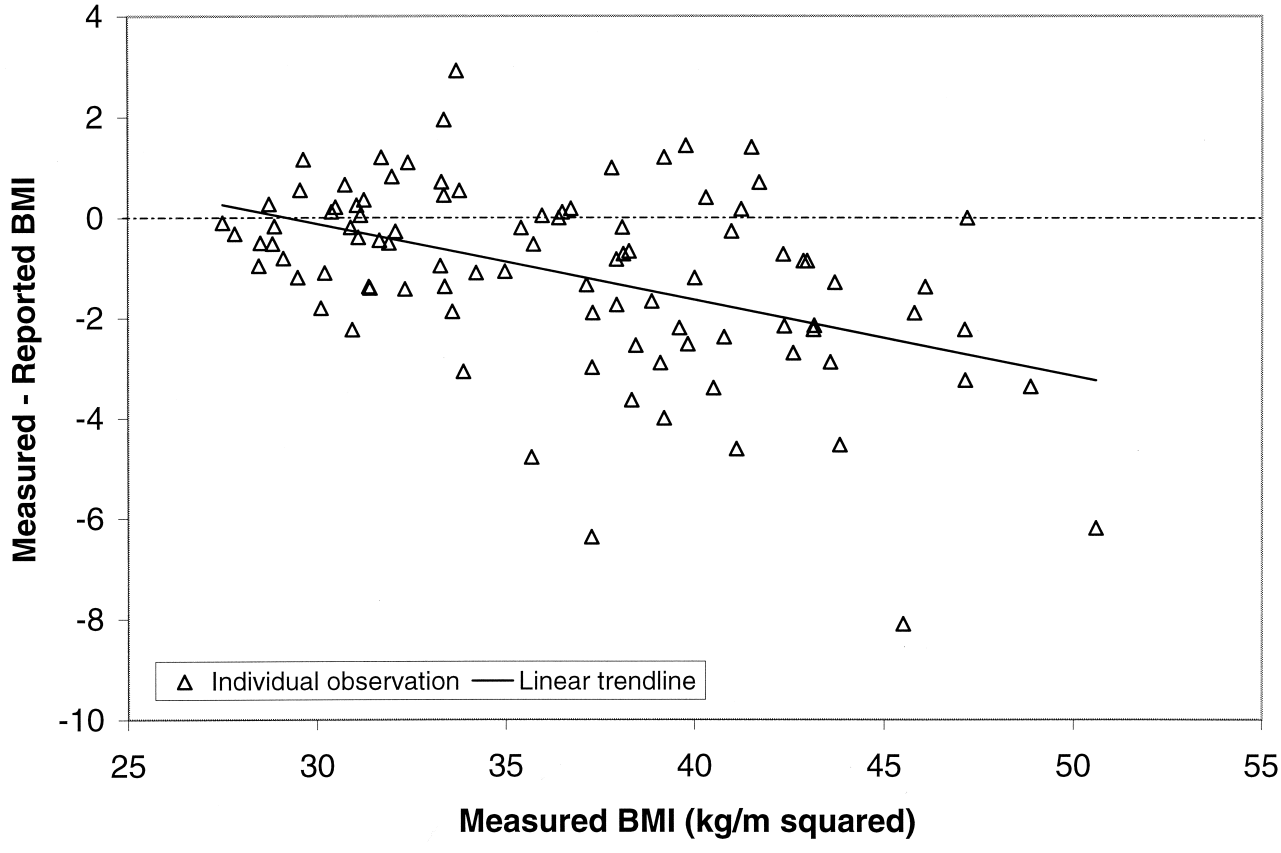

Figure 1. Plot of body mass index (BMI) discrepancy vs measured BMI.

reported weight by an average of 2.07% (−3.75 lb, 95% confidence interval [CI]=−5.78 to −2.04, p=0.0001) and their height by 0.56% (0.35 in., 95% CI=0.15 to 0.55, p=0.0007). Under-reporting of weight increased with increasing measured weight (r=−0.27, p=0.0079). There was no correlation between weight discrepancy and age or measured height.

Classifications of the mean weight differences by clinical and demographic factors are presented in Table 2. In multiple regression modeling, no association emerged between demographic and clinical factors and weight misreporting, with the overall (fully loaded) model explaining only 7% of the variation in weight discrepancy. In subgroup analysis, height discrepancy among women with Class III obesity was greater than that among less overweight women (p<0.01) (Table 3).

Mean difference between reported BMI and measured BMI was −1.14 kg/m^2 (p=0.0001, 95% CI=−0.77 to −1.51). Under-reporting of BMI increased with measured BMI (r=−0.49, p=0.0001; Figure 1). Women not employed (homemakers and retired) were more likely to under-report BMI (p<0.05), as were women with household income between $26,000 and $50,000 compared with income between $51,000 and $75,000 ($p$<0.05). There were no differences in BMI reporting according to age, marital status, income, or educational attainment. In multiple regression modeling, employment, measured BMI, and income explained 30% of the variation in BMI discrepancy.

Of subjects who had been deemed eligible through telephone screening, 6% were disqualified after their weight and height were measured. All of these disqualified subjects had a calculated BMI based on self-reported height and weight of <40 but were found to have a BMI >40 on examination.

Discussion

We report an average 2% (3.75 lb) and 0.56% (0.35 in.) discrepancy between reported and measured weight and height, respectively, among women at enrollment into a weight-loss study. Under-reporting of weight and over-reporting of height were greater among more-obese than less-obese women (p<0.05), consistent with studies that examined self-reported weight and height among former participants in weight-loss programs.[10,11] Weight, height, and BMI discrepancies related to employment status, but our study failed to find significant associations of misreporting with other demographic variables, perhaps because of a relatively small sample size and limited statistical power. Prior studies with larger samples have reported associations

with age, gender, income, and employment[2]; however, findings have not been consistent.[2–9]

Subjects may not have known their current weight or height, or they may have reported values measured some time before the telephone interview. However, nearly 90% of the women had attempted to lose weight at least five times in the past, and all the women were actively seeking weight-loss strategies at the time of recruitment. Interest in weight loss would suggest awareness of current weight. Previous studies have attempted to keep subjects unaware that their reported weight and height would be confirmed through measurement.[6,10,13] We informed subjects that they would be measured and weighed at their screening visit, which should have mitigated any willful misreporting.

Misreporting of BMI by a modest 1.14kg/m^2 on average may have limited clinical implications, but it has important implications for research studies that use specific BMI criteria for enrollment. Six percent of our sample was disqualified because of misreporting, whereas subjects that fell below the eligible BMI range by self-report may have been qualified if measured. This situation could have compensated for the loss of subjects at the higher end of the eligibility range.

Limitations of this study include restriction to overweight or obese women. We did not determine when subjects had last measured weight or height. We did not ask subjects whether reported weight and height were self-measured with the use of a bathroom scale or at a physician's office. Commonly used home scales may have under-measured weight, especially in overweight subjects. We could only measure the effect of misreporting on recruitment among subjects with BMI at the upper limit. Subjects disqualified because they reported a BMI slightly less than 27.3 (our lower limit of eligibility) may have been eligible if they had undergone objective measurements, but this is speculative.

In summary, this study provides useful data regarding the degree of under-reporting of BMI among overweight women and its correlation with degree of obesity. Evidence that subjects informed they will be objectively measured nonetheless under-report BMI is novel. Our findings suggest that during recruitment of subjects on the basis of BMI, the eligibility range for self-reported measures should be truncated at the upper end, and extended slightly at the lower end, to maximize enrollment of eligible subjects and to reduce time and expense in evaluating ineligible subjects.

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