Misreporting Weight and Height Among Mexican and Puerto Rican Men

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Abstract

Most obesity prevalence data rely on self-report, which typically differs when compared to objectively measured height, weight, and body mass index (BMI). Given that Latino men have high rates of obesity in the United States and demonstrate greater misreporting compared to Caucasian men, examining the factors that contribute to misreporting among Latino men is warranted. This study examined BMI, Latino ethnic background (Mexican or Puerto Rican), and social desirability in relation to misreporting of BMI, as defined as the discrepancy between self-reported and measured height and weight, in Latino men. Participants were 203 adult Mexican and Puerto Rican men, average age 39.41 years, who participated in a larger study. Participants self-reported their weight and height, had their weight and height objectively measured, and completed a measure of social desirability. Measured BMI was the strongest predictor of misreporting BMI, such that the greater the participants' BMI, the greater the discrepancy in BMI ($p < .001$). Misreporting of BMI did not vary based on ethnic background, and measured BMI did not moderate the relationship between social desirability and misreporting of BMI. When normative error was distinguished from misreporting in post-hoc analyses, results showed that only 34.5% of participants demonstrated misreporting. Findings highlight the importance of identifying normative error when examining misreporting in order to improve the accuracy of self-reported BMI data. Future research on misreporting for Latino men should include weight awareness, acculturation, and length of U.S. residency as these variables may be related to self-reported weight and height.

Keywords

BMI, weight, Latino men, self-reported, methodology

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Rates of obesity are high among adults in the United States (39.8%), and this is particularly true among certain ethnic minority groups such as Hispanics/Latinos (47%) (Hales et al., 2017). Among Hispanic/Latino men, the rate of obesity is 43.1% (Hales et al., 2017) and the health of Latino men is a greatly understudied area (Aguirre-Molina et al., 2010). Thus, a greater focus on health issues such as obesity in Latino men is warranted. Rates of obesity also vary by Latino ethnic background. For example, data from the Hispanic Community Health Study/Study of Latinos (HCHS-SOL) identified that among Hispanic/Latino men, Puerto Rican men had the highest prevalence of obesity at 40.9%, followed by 38.6% of Dominican men and 36.8% of Mexican men (Daviglus et al., 2012).

Obesity prevalence and trend data are helpful for quantifying and tracking the scope of the obesity epidemic and informing public health policies (National Academies of Sciences, Engineering, and Medicine, 2016). Of common population surveillance surveys, the National Health and Nutrition Examination Survey (NHANES) is considered the gold standard for assessing obesity prevalence because it is the only one in which weight and height are measured in person by study staff (Yanovski & Yanovski, 2011). Self-reported data can

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introduce bias, especially when the subject matter is inherently sensitive, such as disclosing weight and height information (Cawley et al., 2015; Connor Gorber & Tremblay, 2010). While self-reported and measured weight and height are highly correlated, ranging from 0.84 to 0.97 (Avila-Funes et al., 2004; Fernández-Rhodes et al., 2017; Ortiz-Panozo et al., 2017), there is often a discrepancy between weight and height when self-reported and measured weight and height are compared.

Inaccurate self-reported weight and height may lead to misreporting national BMI prevalence (Flegal et al., 2019). Adults typically underreport their weight and overreport their height (Connor Gorber et al., 2007; Ng, 2019), which results in underestimated BMI calculations compared to objectively measured BMI calculations (Ezzati et al., 2006; Ng, 2019). In a comparison of self-reported and measured weight and height values in an NHANES data set, BMI was misreported by an average of 1.2 kg/m^2, which led to one out of seven individuals with obesity being misclassified with non-obese BMI values (Cawley et al., 2015). Another study used an algorithm to correct for misreporting and the percentage of Americans classified as obese changed from 16% to 28.7% for men and from 21.5% to 34.5% for women (Ezzati et al., 2006). Misreporting appears to be quite common, as nearly half (48.6%) of participants demonstrated misreporting of BMI in one study of adults in Ireland (Brestoff et al., 2011). The range of average misreporting of BMI in previous studies is 1.2 kg/m^2–1.53 kg/m^2 (Brestoff et al., 2011; Cawley et al., 2015; Ortiz-Panozo et al., 2017), with the greatest misreporting observed in a sample of Hispanic men (Cawley et al., 2015). Underestimation of obesity prevalence due to misreporting weight and height causes inaccurate estimates of health-care costs for obesity, which could lead to inadequate investment of prevention and intervention programs (Cawley et al., 2015).

The present study's focus on examining misreporting in Latino men is warranted since misreporting appears to vary by sex and ethnicity. Misreporting of weight among men is consistently demonstrated (Ambwani & Chmielewski, 2013; Fernández-Rhodes et al., 2017; Merrill & Richardson, 2009), and the extent of overreporting weight and height for men is significantly greater compared to women (DelPrete et al., 1992). Research has identified that Mexican ethnicity/background is associated with misreporting BMI (Fernández-Rhodes et al., 2017; Gillum & Sempos, 2005; Griebeler et al., 2011). The HCHS-SOL was the first study to examine misreporting among Hispanics of various ethnic backgrounds, including Mexican, Puerto Rican, Cuban, Dominican, and Central or South American (Fernández-Rhodes et al., 2017). This study did not report whether these between-group differences were statistically significant, but descriptive statistics suggest there may be differences in misreporting by Latino ethnic background in adult men and women such that Puerto Rican adults demonstrated greater misreporting than Mexican adults (Fernández-Rhodes et al., 2017). No other studies have examined ethnic group differences in misreporting of BMI, weight, or height among Hispanic males specifically.

The initial evidence suggesting that misreporting may vary by Latino background, coupled with the potential obesity risk observed in Latinos, supports examining misreporting in Mexican American men and Puerto Rican men. Hill et al. (2017) found that obesity prevalence was highest among Mexican American and Puerto Rican men compared to Caucasians and other Latino ethnic backgrounds, and authors called for obesity-related research examining differences in obesity-related behaviors by Latino ethnic background (Hill et al., 2017). Differences in misreporting by Latino ethnic background could account for the observed differences in obesity prevalence, rather than true differences in prevalence, when self-report is used to assess height and weight. No studies have examined whether cultural differences between Mexican and Puerto Ricans could contribute to variability in misreporting by group. However, in a prior study using data from the current study, cultural differences between Mexican and Puerto Rican individuals were illustrated. Puerto Rican men reported significantly higher levels of *familism* and *machismo* than Mexican men, whereas there were no differences in folk illness beliefs, *fatalism*, or *personalismo* between groups (Sanchez-Johnsen et al., 2019).

Independent of cultural differences, the flat slope syndrome may help explain misreporting patterns. The flat slope syndrome suggests that high values are underreported and low values are overreported (Kuskowska-Wolk et al., 1989). This pattern is consistent with research that demonstrated the higher someone's measured weight, the more they underreported their weight and the lower someone's measured weight, the more they overreported their weight (DelPrete et al., 1992). Further, several studies reported results consistent with the flat slope syndrome for the discrepancy between self-reported and measured weight (Ambwani & Chmielewski, 2013; Cawley et al., 2015; DelPrete et al., 1992; Larson, 2000; Merrill et al., 2009). The flat slope syndrome is also observed for misreporting of BMI (Ezzati et al., 2006). BMI is the preferred variable, compared to weight or height, for examining misreporting because it captures the bias within both self-reported weight and height (Cawley et al., 2015). Individuals' objectively measured BMI is consistently the strongest predictor of misreporting BMI, when compared to other variables such as age and sex (Cawley et al., 2015; Fernández-Rhodes et al., 2017; Ortiz-Panozo et al., 2017). As such, this study focused on examining misreporting of BMI as the main outcome variable in all analyses.

Social desirability bias may help explain the flat slope syndrome as it pertains to misreporting BMI. Social desirability bias occurs when people skew their report to be more in line with what is preferred by society (Aronson, 2004; Crowne & Marlowe, 1960). Several studies have recognized that society's preferred standards for weight and height (i.e., lower weight and taller height) may explain the observed misreporting (Ambwani & Chmielewski, 2013; Cawley et al., 2015; Connor Gorber et al., 2007; Kuskowska-Wolk et al., 1989; Larson, 2000). Burke and Carmen (2017) developed a theoretical model of misreporting weight and height, which suggests that people report values of weight and height that conform to a social norm and to what is socially desirable in an effort to make a good impression, even if that means that the reported value is inaccurate (Burke & Carman, 2017).

Latinos score higher on measures of social desirability compared to Caucasians (Burke & Carman, 2017; Domínguez Espinosa & van de Vijven, 2014; Hopwood et al., 2009; Ross & Mirowsky, 1984). Cultural differences may help explain differential scores between Latinos and Caucasians on measures of social desirability. Collectivistic culture among Latinos, compared to individualistic culture among Caucasian Americans, is associated with greater scores on social desirability (Hopwood et al., 2009). Further, the Latino cultural value of *simpatia*, meaning agreement or harmony, may also explain why Latinos score higher on social desirability measures than Caucasian Americans (Marín & Marín, 1991). Thus, it is possible that valuing the greater good of others and wanting to maintain harmony may lead Latino individuals to respond in a socially desirable manner.

The overall purpose of this study was to examine the role of BMI, Latino ethnic background, and social desirability on discrepancies between self-reported and measured BMI in Mexican and Puerto Rican men. This is the first study to directly examine potential differences in misreporting by Latino ethnic background and to examine whether measured BMI is the strongest predictor of misreporting BMI among Mexican and Puerto Rican men. While descriptive statistics suggest that Puerto Rican men misreport weight and height more than Mexican men, no study has examined whether these differences are statistically significant. If misreporting does vary by Latino ethnic background, the observed differences in obesity prevalence between Puerto Rican and Mexican men could be explained by misreporting. Given that Mexican and Puerto Ricans demonstrate a higher obesity prevalence compared to non-Latino whites and men of other Latino ethnic backgrounds (Hill et al., 2017), understanding BMI misreporting in Puerto Rican and Mexican men is particularly important to establish accurate obesity rates, and properly inform public health policies. Hypothesis I posited that Puerto Rican men would demonstrate greater misreporting of BMI compared to Mexican men. Puerto Ricans may demonstrate greater misreporting because a greater number of Puerto Rican men have obese BMI (40.9%) compared to Mexican men (36.8%) (Daviglus et al., 2012), which is associated with greater misreporting (Cawley et al., 2015; Ezzati et al., 2006; Fernández-Rhodes et al., 2017; Ortiz-Panozo et al., 2017) and because Puerto Rican adults demonstrate greater misreporting than Mexican adults (Fernández-Rhodes et al., 2017). Hypothesis II proposed that measured BMI would explain the most variance in misreporting BMI among Latino men, which would replicate previous research demonstrating the flat slope syndrome in a sample specific to Mexican and Puerto Rican men. Hypothesis III posited that measured BMI would moderate the relationship between social desirability and misreporting of BMI among Latino men, such that men with higher social desirability and a higher BMI would demonstrate greater misreporting compared to men with lower social desirability and lower BMI.

Methods

The proposed study was a secondary data analysis of a larger parent study that was called the "Latino Men's Health Initiative" (Sanchez-Johnsen et al., 2017), which examined cultural variables underlying race and ethnicity as it relates to diet, physical activity, and body image among Mexican and Puerto Rican men [initially funded by National Cancer Institute (NCI) grant (R21-CA143636)] and later funded by the NCI (U54CA202995, U54CA202997, & U54CA203000). The parent study was approved by the Institutional Review Board (IRB) of the University of Illinois at Chicago (UIC) (2011-0187) and the research review board at Alivio Medical Center. The present study was also approved the by IRBs of Rosalind Franklin University of Medicine and Science (CHP18-109) and UIC (2011-0187).

Participants

Eligibility criteria included: (1) Mexican and Puerto Rican men, (2) adults between the ages of 18 and 65, and (3) willing and able to provide informed consent. Exclusion criteria included: (1) BMI below 18.5 kg/m^2 (there was no upper BMI limit), (2) unable to speak/read English or Spanish, (3) met criteria for an eating disorder (i.e., anorexia nervosa, bulimia nervosa, and binge eating disorder), and (4) planned to move from the Illinois area during the course of the study (i.e., 6 weeks).

The sample included 203 Latino men (99 Mexicans and 104 Puerto Ricans), with attempts to recruit approximately 60 participants within each BMI category: normal BMI (18.5–25 kg/m^2), overweight BMI ($\geq$ 25–29.9 kg/m^2), and obese BMI ($\geq$30 kg/m^2).

Initial eligibility was assessed through a telephone or in-person screening, in which participants were asked to self-report their weight and height. If their self-reported values met the inclusion criteria, an in-person eligibility interview was conducted for all participants and their weight and height were then confirmed via objective measurements. A modified version of the Eating Disorder Examination-Questionnaire (Fairburn & Bèglin, 1994) was administered by the interviewer and used to exclude those with an eating disorder.

Procedure

Details of the recruitment strategies, study procedures, and measures are described elsewhere (Sanchez-Johnsen et al., 2017) and summarized here. Direct recruitment through "intercept sampling" (Backstrom & Hursh-Cesar, 1981) was conducted at organizations, churches, festivals, and health fairs that included a large number of Latinos. Indirect recruitment occurred through newspaper advertisements, newsletters of various organizations, and email listservs and websites from Latino organizations, including health organizations. Study procedures occurred at various community locations in Chicago in order to maximize convenience for participants. All participants provided written informed consent.

Measures

All questionnaire measures were administered during an in-person 2.5-hr health and culture interview. Measures were translated and back-translated by a professional translation company and then reviewed by members of the *Hispanic/Latino Health Community Advisory Board* (see Sanchez-Johnsen et al., 2017 for additional details).

Marlowe-Crowne 2 Social Desirability Scale (MC2SDS). Social desirability was measured using the Marlowe-Crowne 2 Social Desirability Scale (MC2SDS) (Strahan & Gerbasi, 1972). This is a 10-item self-report questionnaire that is a valid and reliable (Kuder–Richardson 20. = 0.62–0.75) abbreviated version of the original Marlowe–Crowne Social Desirability Scale (Crowne & Marlowe, 1960; Strahan & Gerbasi, 1972). Similar to the original measure, the MC2SDS includes statements that are socially acceptable and approved behaviors, but are also relatively unlikely to occur, and participants select true or false as to whether the statement applies to them (Crowne & Marlowe, 1960). Five items are reverse-scored. Higher scores indicate greater social desirability, and the total score of the scale comprised the social desirability variable for all analyses. The abbreviated forms of the Marlowe–Crowne Social Desirability Scale were recommended for conducting research with Hispanic populations (Marín & Marín, 1991). Cronbach's α for the current study was 0.65.

Self-Reported Weight, Height, and BMI. During the initial telephone or in-person screening, participants were asked to report their weight and height. Participants were never asked to self-report their BMI. Rather, the participants' subjective weight and height values were used to compute the value that is referred to as self-reported BMI [weight (kg)/height (m)²] (Garrow & Webster, 1985) throughout this paper. BMI categories was classified as follows: normal weight: BMI = 18.5–24.9; overweight: BMI = 25–29.9; obese: BMI > 30 (NIH/NHLBI, 1998). No participants had underweight BMI.

Measured Weight, Height, and BMI. During the in-person eligibility confirmation meeting, height was assessed using a stadiometer. Weight was also assessed during the in-person eligibility confirmation meeting using a Seca company digital scale with participants wearing light clothes and no shoes. Weight and height were measured two times and then averaged. If the two measurements were more than 0.2 kg/0.2 cm a part, the measurement was taken a third time, and the mean of the two closest measures was calculated. These objective measurements were used to compute measured BMI [weight (kg)/height (m)²] (Garrow & Webster, 1985) and the same classification as the subjective BMI categories was used.

Discrepancy Score for BMI. Self-reported and measured BMI were used to calculate the discrepancy score. The discrepancy score was calculated as the absolute difference between self-reported and measured BMI: |self-reported BMI – measured BMI|. The computation of this variable was selected to correct for a flaw with the common methodology of averaging positive and negative values of misreporting, which minimized the extent of misreporting since underreporting and overreporting would diminish absolute differences (Cawley et al., 2015).

Statistical Analyses

Data were analyzed using Statistical Package for Social Sciences (SPSS) (Version 25). The level of significance was $p < .05$. Normality was assessed for the discrepancy scores between self-reported and measured BMI, and

Table 1. Demographics and Descriptives.

	Total Sample (N = 202)	Mexican (n = 99)	Puerto Rican (n = 103)
	M (*SD*)	*M* (*SD*)	*M* (*SD*)
Years in the United States	31.18 (14.41)	25.55 (11.65)	36.55 (14.78)
Social desirability total score	6.36 (2.23)	6.51 (2.39)	6.22 (2.07)
Self-reported			
BMI (kg/m^2)	28.32 (5.35)	28.53 (5.42)	28.13 (5.29)
Height (cm)	172.60 (6.88)	172.61 (7.10)	172.59 (6.70)
Weight (kg)	84.50 (17.63)	85.01 (17.42)	84.00 (17.90)
Measured			
BMI[a] (kg/m^2)	28.46 (5.76)	28.68 (5.79)[a]	28.25 (5.76)[a]
Height (cm)	171.21 (6.42)	171.45 (6.53)	170.98 (6.34)
Weight (kg)	83.65 (18.86)	84.48 (18.76)	82.86 (19.01)
Discrepancy score			
BMI (kg/m2)	1.26 (1.14)	1.28 (1.00)	1.23 (1.27)
Height (cm)	2.50 (2.67)	2.30 (2.09)	2.67 (3.13)
Weight (kg)	2.80 (2.82)	2.89 (2.64)	2.71 (2.98)

Note. All reported values are prior to any data transformations and include the total sample (N = 202). Discrepancy scores were calculated as the absolute difference between the self-reported and measured value. BMI = body mass index.
[a]These data were also published in Sanchez-Johnsen et al., 2017 and presented here for comparison to self-reported data.

logarithmic transformation was applied. One outlier was omitted, and one participant was excluded from analysis due to missing self-reported weight. Descriptive statistics were calculated through frequencies and percentages.

In order to verify that the relationship between self-reported and measured BMI in this sample was consistent with results in previous studies (Avila-Funes et al., 2004; Fernández-Rhodes et al., 2017; Ortiz-Panozo et al., 2017), the correlation between self-reported and measured BMI was examined. A strong, positive relationship ($r \geq 0.8$) was hypothesized. Based on previous literature on misreporting for Hispanic adults (Avila-Funes et al., 2004; Fernández-Rhodes et al., 2017; Ortiz-Panozo et al., 2017), age was considered a potential covariate. The relationships between age and the dependent variable were tested, and age was only included in models in which it was significantly correlated with the dependent variable.

Analysis of variance (ANOVA) was conducted to examine whether misreporting of BMI varied by ethnic background. Stepwise multiple regression was conducted to examine whether measured BMI, ethnicity, or social desirability explained the most variance in misreporting of BMI. Multiple regression with moderation was conducted to examine whether measured BMI moderated the relationship between social desirability and misreporting of BMI. The interaction variable (measured BMI multiplied by social desirability) was created in SPSS and was entered as step 3 of the model.

Results from G*Power version 3.1.9.2. (Faul et al., 2009) indicated that with a sample size of 203 and $\alpha = .05$, the study had 29% power to detect a small effect ($f = 0.10$) and 94% power to detect a medium effect size ($f = 0.25$) for Hypothesis I; 36% power to detect a small effect ($f^2 = 0.02$) and 99% power to detect a medium effect size ($f^2 = 0.15$) for Hypothesis II; and 52% power to detect a small effect ($f^2 = 0.02$) and 99% power to detect a medium effect size ($f^2 = 0.15$) for Hypothesis III.

Results

Demographic Characteristics

Participants ($N = 202$) were on average 39.32 years old ($SD = 13.17$ years). Puerto Rican men were on average older than Mexican men (Sanchez-Johnsen et al., 2017). In terms of BMI category via objectively measured height and weight, results revealed that 33.7% ($n = 68$) of participants had a normal BMI, 34.2% ($n = 69$) were overweight, and 32.2% ($n = 65$) were obese. Average misreporting of BMI of the total sample was 1.26 kg/m^2. See Table 1 for additional demographic and descriptive analyses of the overall Latino sample and the sample by Mexican and Puerto Rican background. Age was not a significant covariate for the discrepancy score for BMI ($r = .002$, $p = .981$).

A total of 13.4% ($n = 27$) of participants' BMI categories changed when self-reported and objective measured BMI categories were compared (Table 2). The most common change was going from obese BMI according to self-report to overweight BMI according to objective measurement, which occurred for 6% of the participants ($n = 12$). Second most common was going from

Table 2. Change in BMI Category According to Self-Report to Objectively Measured Methodology.

Self-Report BMI Category	Objectively Measured BMI Category	Frequency	Percent	Kappa (*SE*)
Obese	Overweight	12	6.0	
Overweight	Normal	9	4.5	
Overweight	Obese	4	2.0	
Normal	Overweight	2	1.0	
				.799* (.036)

Note. Table only shows the 27 (13.4%) participants whose BMI category changed when self-reported and objectively measured categories were compared.
*$p < .001$.

overweight BMI according to self-report to normal BMI according to objective measurement, which occurred for 4.5% of the participants ($n = 9$). Next, 2% of participants ($n = 4$) went from overweight BMI according to self-report to obese BMI according to objective measurement. Finally, 1% of participants ($n = 2$) went from normal BMI according to self-report to overweight BMI according to objective measurement. Cohen's κ was run to determine level of agreement between self-reported and objectively measured BMI categories. There was a strong agreement between both methods, $\kappa = .799$ ($SE = .036$), $p < .001$, such that the agreement observed between the two methods was not due to chance.

Consistent with the hypotheses, strong positive correlations were observed between self-reported and measured BMI ($r = .956, p < .001$).

Main Analyses

One-way ANOVA revealed that misreporting of BMI did not vary by Latino ethnic background, $F(1, 199) = 1.141$, $p = .287$.

Objective BMI was the only variable that was included in the stepwise regression model predicting misreporting of BMI, $F(1, 199) = 16.825$, $p < .001$, $R^2 = .078$. The greater the participants' BMI, the greater the discrepancy in BMI, $t = 4.102$, $p < .001$. Social desirability and ethnicity failed to be included in the final model.

The interaction between social desirability and objective BMI did not significantly predict BMI discrepancy, F_{change} (1, 197) = 1.184, $p = .278$.

Post-Hoc Analyses: Nature of Misreporting

The nature of the misreporting BMI was further explored by examining under- and over-reporting BMI. The non-absolute discrepancy values for BMI were calculated by subtracting objective measured BMI from self-reported BMI. Negative values were considered underreporting of BMI and positive values were considered overreporting of BMI. A frequency analysis was then run to identify the prevalence for the total sample. Underreporting occurred for 55.94% ($n = 113$) of the sample, with an average underreporting of 1.24 kg/m^2 ($SD = 0.92$ kg/m^2). Overreporting occurred for the remaining 44.06% ($n = 89$) for the sample, with an average overreporting of 1.27 kg/m^2 ($SD = 1.37$ kg/m^2). When the main analyses were rerun with misreporting BMI split by underreporting and overreporting, the results were mostly consistent. The only difference was that for participants that overreported BMI, no variables significantly predicted misreporting. This result is inconsistent with the main findings (when misreporting was examined as the absolute value).

Post-Hoc Analyses: Identifying Normative Error

The main analyses were proposed with the assumption that substantial misreporting occurred in the current sample. However, most of the main analyses were nonsignificant and average misreporting was smaller than expected. Post-hoc analyses were conducted to distinguish between normative error and misreporting. Parsing out normative error from more substantial misreporting may better capture misreporting in the current sample.

The methodology for identifying misreporting due to normative error was modeled after Brestoff et al. (2011) who developed equations for calculating a sample specific BMI cutoff for misreporting (Brestoff et al., 2011). They considered BMI misreporting of ± 1.40 kg/m^2 to be considered normative error and values beyond that range were indicative of under- or overreporting (Brestoff et al., 2011). The equations used in Brestoff's study were applied to the present data in order to determine a cutoff for normative error versus misreporting (see Brestoff et al., 2011 for more information about the equations).

The equation for misreporting of BMI was applied to a range of increments in discrepancy scores for weight and height, which produced a table of discrepancy scores for BMI (Figure 1). Using the cutoff values of ± 2.0 kg and ± 2.0 cm for weight and height, respectively, as recommended by the original methodology, the table revealed BMI discrepancy scores that were considered

		Discrepancy Score for Height (m)																				
		-0.10	-0.09	-0.08	-0.07	-0.06	-0.05	-0.04	-0.03	-0.02	-0.01	0	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09	0.10
	-8.0	0.57	0.21	-0.14	-0.48	-0.82	-1.15	-1.48	-1.80	-2.11	-2.42	-2.73	-3.03	-3.32	-3.61	-3.89	-4.17	-4.44	-4.71	-4.98	-5.24	-5.50
	-7.5	0.76	0.40	0.05	-0.30	-0.64	-0.97	-1.30	-1.62	-1.94	-2.25	-2.56	-2.86	-3.15	-3.44	-3.73	-4.01	-4.29	-4.56	-4.82	-5.09	-5.34
	-7.0	0.96	0.59	0.24	-0.11	-0.45	-0.79	-1.12	-1.45	-1.76	-2.08	-2.39	-2.69	-2.99	-3.28	-3.57	-3.85	-4.13	-4.40	-4.67	-4.93	-5.19
	-6.5	1.15	0.78	0.43	0.07	-0.27	-0.61	-0.94	-1.27	-1.59	-1.91	-2.22	-2.52	-2.82	-3.11	-3.40	-3.69	-3.97	-4.24	-4.51	-4.78	-5.04
	-6.0	1.34	0.97	0.61	0.26	-0.09	-0.43	-0.76	-1.09	-1.42	-1.73	-2.05	-2.35	-2.65	-2.95	-3.24	-3.53	-3.81	-4.08	-4.36	-4.62	-4.89
	-5.5	1.53	1.16	0.80	0.45	0.10	-0.25	-0.58	-0.92	-1.24	-1.56	-1.87	-2.18	-2.49	-2.78	-3.08	-3.37	-3.65	-3.93	-4.20	-4.47	-4.73
	-5.0	1.73	1.35	0.99	0.63	0.28	-0.07	-0.41	-0.74	-1.07	-1.39	-1.70	-2.02	-2.32	-2.62	-2.92	-3.20	-3.49	-3.77	-4.05	-4.32	-4.58
	-4.5	1.92	1.54	1.18	0.82	0.46	0.11	-0.23	-0.56	-0.89	-1.22	-1.53	-1.85	-2.15	-2.46	-2.75	-3.04	-3.33	-3.61	-3.89	-4.16	-4.43
	-4.0	2.11	1.73	1.36	1.00	0.64	0.29	-0.05	-0.39	-0.72	-1.04	-1.36	-1.68	-1.99	-2.29	-2.59	-2.88	-3.17	-3.46	-3.73	-4.01	-4.28
	-3.5	2.30	1.92	1.55	1.19	0.83	0.48	0.13	-0.21	-0.54	-0.87	-1.19	-1.51	-1.82	-2.13	-2.43	-2.72	-3.01	-3.30	-3.58	-3.85	-4.13
	-3.0	2.49	2.11	1.74	1.37	1.01	0.66	0.31	-0.03	-0.37	-0.70	-1.02	-1.34	-1.65	-1.96	-2.26	-2.56	-2.85	-3.14	-3.42	-3.70	-3.97
	-2.5	2.69	2.30	1.93	1.56	1.19	0.84	0.49	0.14	-0.19	-0.53	-0.85	-1.17	-1.49	-1.80	-2.10	-2.40	-2.69	-2.98	-3.27	-3.55	-3.82
	-2.0	2.88	2.49	2.11	1.74	1.38	1.02	0.67	0.32	-0.02	-0.35	-0.68	-1.00	-1.32	-1.63	-1.94	-2.24	-2.54	-2.83	-3.11	-3.39	-3.67
	-1.5	3.07	2.68	2.30	1.93	1.56	1.20	0.84	0.50	0.15	-0.18	-0.51	-0.84	-1.15	-1.47	-1.78	-2.08	-2.38	-2.67	-2.96	-3.24	-3.52
Discrepancy	-1.0	3.26	2.87	2.49	2.11	1.74	1.38	1.02	0.67	0.33	-0.01	-0.34	-0.67	-0.99	-1.30	-1.61	-1.92	-2.22	-2.51	-2.80	-3.09	-3.37
Score	-0.5	3.46	3.06	2.68	2.30	1.93	1.56	1.20	0.85	0.50	0.16	-0.17	-0.50	-0.82	-1.14	-1.45	-1.76	-2.06	-2.35	-2.65	-2.93	-3.21
for	0.0	3.65	3.25	2.86	2.48	2.11	1.74	1.38	1.03	0.68	0.34	0.00	-0.33	-0.65	-0.97	-1.29	-1.60	-1.90	-2.20	-2.49	-2.78	-3.06
Weight	0.5	3.84	3.44	3.05	2.67	2.29	1.92	1.56	1.20	0.85	0.51	0.17	-0.16	-0.49	-0.81	-1.12	-1.43	-1.74	-2.04	-2.33	-2.62	-2.91
(kg)	1.0	4.03	3.63	3.24	2.85	2.48	2.10	1.74	1.38	1.03	0.68	0.34	0.01	-0.32	-0.64	-0.96	-1.27	-1.58	-1.88	-2.18	-2.47	-2.76
	1.5	4.22	3.82	3.43	3.04	2.66	2.28	1.92	1.56	1.20	0.85	0.51	0.18	-0.16	-0.48	-0.80	-1.11	-1.42	-1.72	-2.02	-2.32	-2.60
	2.0	4.42	4.01	3.61	3.22	2.84	2.47	2.10	1.73	1.38	1.03	0.68	0.34	0.01	-0.32	-0.64	-0.95	-1.26	-1.57	-1.87	-2.16	-2.45
	2.5	4.61	4.20	3.80	3.41	3.02	2.65	2.27	1.91	1.55	1.20	0.85	0.51	0.18	-0.15	-0.47	-0.79	-1.10	-1.41	-1.71	-2.01	-2.30
	3.0	4.80	4.39	3.99	3.60	3.21	2.83	2.45	2.09	1.73	1.37	1.02	0.68	0.34	0.01	-0.31	-0.63	-0.94	-1.25	-1.56	-1.85	-2.15
	3.5	4.99	4.58	4.18	3.78	3.39	3.01	2.63	2.26	1.90	1.54	1.19	0.85	0.51	0.18	-0.15	-0.47	-0.78	-1.10	-1.40	-1.70	-2.00
	4.0	5.19	4.77	4.36	3.97	3.57	3.19	2.81	2.44	2.07	1.72	1.36	1.02	0.68	0.34	0.01	-0.31	-0.63	-0.94	-1.24	-1.55	-1.84
	4.5	5.38	4.96	4.55	4.15	3.76	3.37	2.99	2.62	2.25	1.89	1.53	1.19	0.84	0.51	0.18	-0.15	-0.47	-0.78	-1.09	-1.39	-1.69
	5.0	5.57	5.15	4.74	4.34	3.94	3.55	3.17	2.79	2.42	2.06	1.70	1.35	1.01	0.67	0.34	0.01	-0.31	-0.62	-0.93	-1.24	-1.54
	5.5	5.76	5.34	4.93	4.52	4.12	3.73	3.35	2.97	2.60	2.23	1.87	1.52	1.18	0.84	0.50	0.17	-0.15	-0.47	-0.78	-1.09	-1.39
	6.0	5.95	5.53	5.12	4.71	4.31	3.91	3.53	3.15	2.77	2.41	2.05	1.69	1.34	1.00	0.67	0.34	0.01	-0.31	-0.62	-0.93	-1.24
	6.5	6.15	5.72	5.30	4.89	4.49	4.09	3.70	3.32	2.95	2.58	2.22	1.86	1.51	1.17	0.83	0.50	0.17	-0.15	-0.47	-0.78	-1.08
	7.0	6.34	5.91	5.49	5.08	4.67	4.27	3.88	3.50	3.12	2.75	2.39	2.03	1.68	1.33	0.99	0.66	0.33	0.01	-0.31	-0.62	-0.93
	7.5	6.53	6.10	5.68	5.26	4.85	4.45	4.06	3.68	3.30	2.92	2.56	2.20	1.84	1.50	1.15	0.82	0.49	0.16	-0.16	-0.47	-0.78
	8.0	6.72	6.29	5.87	5.45	5.04	4.64	4.24	3.85	3.47	3.10	2.73	2.37	2.01	1.66	1.32	0.98	0.65	0.32	0.00	-0.32	-0.63

Figure 1. Discrepancy scores for misreporting of body mass index. Values in each cell were computed based off of methodology from Brestoff et al. (2011) in order to determine a cutoff value for normative error and misreporting for the present study. The gray box represents values that are considered BMI discrepancy scores (i.e., misreporting) due to normative error. Using the cutoff values of ±2.0 kg and ±.20 m for weight and height, as recommended by the original methodology, BMI misreporting ±1.38 was considered normative error and values beyond that range were indicative of under- or overreporting.

Table 3. Normative Error and Misreporting by BMI Category.

	Normative Error (n = 133)	Misreporting (n = 68)	Total Sample (N = 201)
		n (%)	
Objective BMI category			
Normal weight	51 (38.3)	16 (23.5)	67 (33.3)
Overweight	49 (36.8)	20 (29.4)	69 (34.3)
Obesity class I	24 (72.7)	19 (59.4)	43 (66.2)
Obesity class II	7 (21.2)	7 (21.9)	14 (21.5)
Obesity class III	2 (.06)	6 (18.8)	8 (12.3)
		Degree of misreporting BMI (kg/m^2) M (SD)	
Objective BMI category			
Normal weight	.61 (.41)	2.26 (.87)	1.00 (.90)
Overweight	.68 (.35)	2.22 (.90)	1.13 (.90)
Obesity class I	.67 (.43)	2.19 (.95)	1.34 (1.03)
Obesity class II	.86 (.38)	2.51 (1.21)	1.69 (1.22)
Obesity class III	.88 (.61)	2.75 (.83)	2.28 (1.14)

Note. All reported values are prior to any data transformations and include the total sample except for the outlier (N = 201). BMI = body mass index.

normative error (Brestoff et al., 2011). For the present study, BMI misreporting ±1.38 was considered normative error and values beyond that scope were considered misreporting.

Misreporting of BMI was then dichotomized and classified as either *normative error* for values ±1.38 kg/m^2 or *misreporting of BMI* for values outside of that range. A frequency analysis to identify the prevalence of misreporting versus normative error was run for the total sample. Normative error values compromised 66.2% (n = 133) of the data while the remaining 33.8% (n = 68) represented misreporting (see Table 3 for normative error and misreporting by BMI category). Additional analyses were conducted to examine whether the predictor variables from the main analyses (i.e., Latino ethnic background, objective BMI, and social desirability) were associated with misreporting of BMI excluding normative error (n = 70). Latino ethnic background [$F(1, 67) = .327$, $p = .570$], objective BMI [$F(1, 67) = .805$, $p = .373$], and social desirability [$F(1, 67) = .335$, $p = .565$] were not significant predictors.

Discussion

Given that nearly half of Latino adults in the United States are obese (Hales et al., 2017), the need for accurate prevalence rates of overweight and obesity is evident. The present study examined the role of BMI, Latino ethnic background, and social desirability on discrepancies between self-reported and measured BMI in Latino men. Misreporting of BMI did not vary between Puerto Rican and Mexican men, and measured BMI did not moderate the relationship between social desirability and misreporting of BMI. However, results did support the hypothesis that measured BMI was the strongest predictor of misreporting BMI among Latino men. For participants that underreported BMI, measured BMI predicted misreporting BMI, which was not true for those that overreported BMI. This suggests that the main finding that objective BMI significantly predicts misreporting of BMI was driven by those participants that underreported (versus overreported).

The average misreporting of BMI of the total sample was 1.26 kg/m^2 and was slightly lower than a study of a nationally representative sample of 1900 Hispanic men, which calculated misreporting with the same methodology [BMI discrepancy = 1.53 kg/m^2 (Cawley et al., 2015)]. Participants may have demonstrated less misreporting because of biases inherent in their willingness to participate in a study focused on health. Those who chose to participate may have been inherently more health-conscious than those who did not enroll in the study and therefore may have underrepresented possible misreporting behavior among Mexican and Puerto Rican men in general.

Another consideration relevant to interpreting the present results includes the role of normative error when reporting anthropometric data. Factors such as normal daily weight fluctuations, wearing different shoes, and negligible differences in reporting, produce variance in weight and height, and therefore also BMI data.

Surprisingly, only one other study of misreporting calculated a normative range of error that is not labeled as misreporting. In the present study, post-hoc analyses were conducted to account for normative error within misreporting using Brestoff's method. The average misreporting of BMI of the present sample fell within the range of normative error, meaning, on average, participants did not misreport their weight and height. Only about one-third of the sample demonstrated misreporting. In Brestoff et al. (2011) study, nearly half of the sample (48.6%) demonstrated misreporting (defined as BMI misreporting greater than 1.40 kg/m^2 and less than −1.40 kg/m^2) (Brestoff et al., 2011). Although Brestoff's (2011) study is not demonstrative of Latino misreporting because it was a national survey of adults in Ireland, we would generally expect misreporting among Latino individuals to be greater than non-Hispanic Caucasian individuals, given that Hispanic individuals tend to misreport BMI more than non-Hispanic White or non-Hispanic European American individuals (Burke & Carman, 2017; Gillum & Sempos, 2005). Therefore, it appears that the participants in the present study more accurately reported their BMI compared to what would be generally expected among Latinos, based on prior research.

Normative error appears to be a common occurrence, which should not prevent self-reported values from being used to estimate obesity prevalence. Research that examines why misreporting occurs, with the ultimate goal of minimizing error in measuring anthropometric data, is impeded since most studies of misreporting fail to parse out normative error. Identifying normative error needs to become commonplace to advance an understanding of factors that influence misreporting, and ultimately to improve the accuracy of self-reported BMI data. Accounting for normative error could improve the accuracy and therefore utility of self-reported anthropometric data, particularly when self-reported anthropometric data collection eases participant burden, minimizes study costs (Ezzati et al., 2006), or when in-person anthropometric data collection is limited due to a pandemic like COVID-19.

Given that misreporting was less prevalent than expected, there may not have been enough variability in misreporting to support the proposed hypotheses that aimed to characterize misreporting. Post-hoc analyses were conducted to examine the predictor variables of interest with the one-third of the sample that demonstrated misreporting of BMI may have been impacted by the small sample size. Although objective BMI was a significant predictor of misreporting in the main analyses, this result was not replicated in the post-hoc analyses, which may be due to the analyses being underpowered. However, when only those who underreported BMI were examined, objective BMI predicted misreporting of BMI. This may suggest that the results of the main analysis were driven by those participants that underreported (versus overreported).

Results did not support the hypothesis that Puerto Rican men would have greater misreporting of BMI compared to Mexican men. No previous studies have directly compared misreporting among Puerto Rican and Mexican men; therefore, the present results cannot be contrasted with previous literature. This study also included participants with a BMI in the normal range, instead of only examining misreporting among participants who are overweight or obese. Differences in misreporting of BMI by Latino ethnic background may be observed within a sample that includes greater number of participants are overweight and obese and from a sample that is not specifically recruited for a health study.

It is possible that misreporting of BMI may not differ by Latino ethnic background among Mexican and Puerto Rican men due to shared cultural similarities between these two Latino groups. Although Mexicans and Puerto Ricans are distinct groups, aspects of their shared Hispanic culture may also be related to similar rates of misreporting between groups. For instance, some examples of cultural values and characteristics shared among Latinos include *simpatia* (agreement or harmony), *personalismo* (valuing personal relationships), and *dignidad* (dignity) (Sánchez-Johnsen, 2011; Santiago-Rivera et al., 2002). The relationship between cultural values and misreporting among Mexican and Puerto Rican men is an area in need of future investigation.

The present results are consistent with the hypothesis that measured BMI would explain the most variance in misreporting of BMI among Latino men. The higher someone's objective or measured BMI, the greater extent the misreporting of BMI. Measured BMI accounted for 7.73% of the variance in misreporting of BMI. Results are consistent with the flat slope syndrome (i.e., high values are underreported and low values are overreported; Kuskowska-Wolk et al., 1989) as well as studies that reported that measured BMI is the strongest predictor of misreporting BMI when compared to other variables (Cawley et al., 2015; Fernández-Rhodes et al., 2017; Ortiz-Panozo et al., 2017). This means that at present, among Mexican and Puerto Rican men, knowing their actual BMI appears to provide helpful information about how accurate their self-reported BMI will be. Those who are overweight and obese are more likely to provide BMI estimates that deviate from their actual BMI, and self-reported data collection is a less strong proxy for these individuals compared to objectively measured data collection.

Contrary to the hypothesis, social desirability was not associated with misreporting of BMI. Although Burke and Carmen (2017) reported a positive relationship between social desirability bias and misreporting of BMI, the authors also stated that some of their results were due to participants' lack of weight awareness. That is, rather than intentionally trying to report height and weight that is socially desirable, some participants' misreporting behavior occurred because they truly did not know their weight (Burke & Carman, 2017). If some individuals have no knowledge of their weight or have outdated information about their weight, it is plausible that their self-report weight would be more inaccurate compared to someone who is aware and has current information. A recent study reported that self-perception of one's BMI category was significantly associated with misreporting of BMI, such that those who perceived they were overweight underestimated BMI to a greater extent than those who perceived they were at "about the right weight" (Ng, 2019). Men are consistently more likely to misperceive their weight status compared to women (Bennett & Wolin, 2006; Dorsey et al., 2009; Gregory et al., 2008; New et al., 2013). Further, Hispanics are more likely to misperceive their weight compared to non-Hispanic Whites (Bennett & Wolin, 2006; Dorsey et al., 2009). In fact, Hispanics are 70% more likely to misperceive their weight status as "about the right weight" when in fact they were overweight or obese compared to non-Hispanic Whites (Bennett & Wolin, 2006). Weight awareness is an important construct to include in future studies of misreporting (Brestoff et al., 2011; Burke & Carman, 2017; Gillum & Sempos, 2005), particularly among Latino men.

Acculturation and length of U.S. residency may be relevant when examining misreporting in Hispanics. Some research suggests that greater acculturation is associated with higher BMI (Abraído-Lanza, et al., 2005; Bowie et al., 2007), and thus may also be associated with greater misreporting. However, in the HCHS-SOL, obesity and acculturation were not significantly associated (Isasi et al., 2015). Rather, length of residency in the United States was the strongest predictor of obesity, which the authors attribute to longer exposure to obesogenic environment (Isasi et al., 2015). The American diet and obesogenic environment negatively influence Hispanics' health (Batis et al., 2011). Immigrating to the United States, where processed food is often cheaper and more convenient than healthy food, coupled with little understanding of how to purchase and prepare healthy foods seems to contribute to the obesity epidemic within Hispanic immigrants (Valdez et al., 2017). Steady, long-term weight gain coupled with lack of weight awareness may be important factors to consider when examining misreporting of BMI among Latino men in future research.

Limitations and Strengths

This study has limitations worth noting. The recruitment and study procedures were not designed to specifically examine misreporting. Subsequently, participants seemed to more accurately report their height and weight compared to other study samples, which may not occur in a study primarily aimed to assess misreporting. Weight was also not assessed at a consistent time of day for all participants, and there was no way of knowing if participants weighed themselves prior to stating their self-reported weight. Internal consistency for social desirability was low, which may have contributed to nonsignificant findings for those analyses. The way that misreporting was defined in the main analyses did not account for random error in height and weight. Finally, the study was underpowered to detect small effects, which can be common in behavioral science.

The present study has several strengths. Computing misreporting as the absolute difference between self-reported and objectively measured BMI is a strength since it improves the error reported in previous misreporting literature. Another strength is that this study examined misreporting among a large sample of Puerto Rican men and is one of few studies to focus on the group with the greatest prevalence of obesity among Hispanic/Latino men (Daviglus et al., 2012). Finally, this is the first study to directly examine whether differences in misreporting BMI exist between Mexican and Puerto Rican men.

In conclusion, this study demonstrated that measured BMI was the strongest predictor of misreporting of BMI among Mexican and Puerto Rican men. The greater someone's objectively measured BMI, the greater extent their self-reported BMI differed from their actual BMI. Latino ethnic background and social desirability did not help explain misreporting among Latino men, which may be in part due to the relatively low rates of misreporting among the study sample compared to other population-based samples. Future research on misreporting should further investigate the roles of normative error, weight awareness, and length of U.S. residency to better understand the prevalence and extent of misreporting.

Author Notes

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Declaration of Conflicting Interests

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