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# Underreporting of Food Intake among Mexican/Mexican-American Women: Rates and Correlates

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## Abstract

**Background—**Underreporters are those individuals who report a dietary intake level that is not biologically plausible given their physiological status and physical activity level. Underreporting of food intake threatens the validity of dietary assessment; yet, little is known about the prevalence or correlates of underreporting in the Mexican/Mexican-American community.

**Objective—**To examine underreporting rates and correlates among Mexican/Mexican-American women using dietary data based on repeated 24-hour recalls and the Goldberg equation.

**Design—**Cross-sectional study of baseline data collected as part of a larger randomized controlled trial through structured interviews and anthropometrics measurements.

**Subjects/setting—**A random sample of 357 Mexican/Mexican-American women, ranging in age from 21 to 67 years, living in south San Diego near the U.S./Mexico border.

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**Statistical analyses performed—**Age, income level, education level, and weight status, all correlates of underreporting in samples of non-Hispanic white participants, were examined as potential correlates of underreporting among Mexican/Mexican-American women using binary logistic regression. Acculturation was examined to determine if it accounted for additional variance in underreporting. Finally, multivariate analyses using backward stepwise regression were conducted to determine which correlates remained significant in the final model.

**Results—**Rates of underreporting varied across the five detection methods employed, from 11.9% (n=42) to 81.3% (n=286). Obese weight status was the only significant correlate across all five underreporting detection methods and remained significant in the final model. Using backward stepwise regression, the final model showed weight status to be a significant correlate of underreporting both at the overweight ($p<0.05$) and obese levels ($p<0.01$). In addition, Anglo orientation score ($p<0.05$) remained significant in the final model, as well as the age group of 51 years or older ($p<0.05$).

**Conclusions—**Consistent with previous studies, underreporters in this Mexican/Mexican-American sample were more likely to be overweight or obese, and were older. They also were more likely to identify with the dominant Anglo culture. Additional studies are needed to further examine underreporting error in dietary assessment among Latinos, and to determine whether the effects of acculturation on underreporting are found in other Latino subgroups.

### Keywords

underreporting; Mexican/Mexican-American; acculturation; Goldberg equation; 24-hour dietary recall

## Introduction

Inaccurate assessment of dietary intake is pervasive, despite the availability of a variety of dietary assessment methodologies, including 24-hour dietary recalls and food diaries. One source of invalidity, underreporting, may result from a variety of factors including deliberate or inadvertent omission of consumed foods (1-3). As a result, researchers have tried to verify the accuracy of dietary reports using external biomarkers, such as urinary nitrogen levels and doubly labeled water, or validation equations such as the one developed by Goldberg and colleagues (4).

The majority of studies on underreporting have focused on non-Hispanic white populations, with several studies focusing specifically on African Americans. The available literature on primarily non-Hispanic white populations indicates that dietary underreporting occurs most frequently among participants who are women (3,5,6), obese (5,7-9), older (3,8,10-13), less educated (1,6,13,14), and poorer (6,8). Among older African Americans, rates of underreporting were lower than the rates of underreporting among similar Caucasian samples, despite the fact that the average body mass index (BMI) of the study sample was classified as obese. The authors attributed this finding to differing cultural views of excess body weight, and the African American tendency to accept overweight and obesity as a sign of health (15). An inverse association between underreporting and BMI was observed among African Americans with type 2 diabetes (16). The topic of underreporting among Hispanic populations is relatively unexplored, but a recent study of Caribbean Latinos noted that this pre-diabetic population underreported an average of 254 kilocalories per day (17). Among this sample, participants with higher BMI, those who were unemployed, those who were sedentary, and those with siblings diagnosed with diabetes, were more likely to underreport.

The present study sought to understand the rates and correlates of underreporting among Mexican/Mexican-American women using the Goldberg equation. The Goldberg equation calculates confidence limits of plausible energy intake at a given physical activity level. An individual's ratio of energy intake to basal metabolic rate is then compared to these confidence limits, with those whose ratio falls below the lower confidence limit considered to be underreporters (see the Methods section for further detail on the Goldberg equation).

Sociodemographic correlates of underreporting (age, income, weight status, and education level) cited in previous studies among predominantly non-Hispanic white samples were examined to better understand the individual and social context of underreporting among Mexican/Mexican-American women. Acculturation, an individual and social construct, was a specific focus of this study given its association with dietary intake. Despite findings that immigrants enter the United States with a health status that is greater than or equal to that of a native-born American, immigrant health status has been shown to deteriorate as length of residence in the United States increases (18). More acculturated Latinos are more likely to smoke, drink alcohol, and have a higher BMI than their less acculturated counterparts (19). Studies also suggest that the acculturation process affects dietary behaviors, possibly because adherence to traditional Latino diets declines with greater acculturation to the new culture (20,21). Based on the literature reviewed, it was hypothesized that underreporting would occur more frequently among those who were more acculturated, were older, had lower education/ income (as proxies of socio-economic status), and were overweight or obese.

## Subjects & Methods

### Study design and study site

Baseline data collected as part of *Secretos de la Buena Vida*, a randomized controlled trial designed to evaluate the impact of a intervention to increase dietary fiber consumption and reduce fat intake among Mexican/Mexican-American women, were used for the present cross-sectional study (22). The San Diego State University Institutional Review Board granted permission to conduct the original and the present study.

### Participants and recruitment

Three hundred and fifty seven (357) Mexican/Mexican-American women aged 21-67 (mean 39.7 years) from the San Diego area were recruited into the original study through random digit dialing using a list of telephone numbers generated for the designated study area and target population. Inclusion criteria included being a female 18 through 67 years of age and written and oral fluency in Spanish. Potential participants who were pregnant, on or living with someone on a strict prescribed diet, or planning to move of out the area within the 18-month study period were excluded (22,23). For the purposes of the present study, the sample size was limited to those with complete data needed for the underreporting analysis (n=352; mean age 39.78; mean BMI 29.61). Five cases were excluded from the present study given missing data on height and weight or physical activity level.

## Procedures

### Demographic Measures

Participants completed structured interviews and anthropometric measures during a home visit conducted by trained bilingual/bicultural evaluation assistants at baseline (24). Demographic information on age, education, and income was self-reported on the participant survey. Age was split into three categories based on the dietary guidelines: age 19 through 30; age 31 to 50; and age 51 and over (25). Because of its irregular distribution, education level was condensed into two categories: less than high school versus high school or higher (26). Income level was also condensed into two categories: low income ($2000 or less per month, just over the United States Census Bureau's 2006 poverty threshold for a family of four) versus high income ($2001 or greater per month) (26,27). Thus, the condensed income categories allowed for the examination of the relationship between underreporting and poverty status.

### Acculturation Measures

Acculturation level was measured using the Acculturation Rating Scale for Mexican Americans-II (ARMSA-II). The ARMSA-II scale consists of 30 items designed to measure one's involvement in the English or Spanish culture using a set of responses from 1 to 5, with 1 being “not at all,” and 5 being “extremely often/almost always.” A mean score for the Mexican orientation subscale was calculated based on the participant response to 17 of the 30 questions, and a mean score for the Anglo orientation subscale was calculated for each participant based on their answers to the remaining 13 questions. Using these two values, a composite acculturation level score was then calculated by subtracting an individual's Mexican orientation score from her respective Anglo orientation score (28), giving a single acculturation score ranging from very Mexican-oriented to very Anglo-oriented. The continuous measures for Anglo orientation score and Mexican orientation score were used in these analyses to determine the independent effects of these dimensions of the acculturation process.

### Physical Activity Level Measures

Participant physical activity level was measured with the following questions: “How many days in a typical week do you do vigorous physical activities for 20 minutes or more,” “How many days in a typical week do you do moderate physical activities for 30 minutes or more,” and “How many days in a typical week do you do moderate physical activities for 60 minutes or more?” (29). For the purposes of this study, participant responses to the two moderate activity questions were combined to calculate the total number of days they engaged in moderate activity. Then, participants were categorized into low, medium, or high physical activity levels using the following criteria (based on American College of Sports Medicine standards and Healthy People 2010 recommendations): Low-level PA = No moderate or vigorous physical activity; medium-level PA = one to two days of vigorous activity or one to four days of moderate activity; high-level PA = three or more days of vigorous activity or five or more days of moderate activity (30).

### Anthropometric Measures

Three repeated measures of participant height (with shoes removed) were taken to the nearest ¼ inch using a portable stadiometer. Three repeated weight measures with shoes and other heavy objects removed were taken to the nearest pound using a portable Health-o-meter® scale. The average height and weight values from the three repeated measures were then converted into meters and kilograms, respectively, and used to calculate participant body mass index using the Quetelet index, $kg/m^2$ (31). Participants were classified into three categories based on National Heart, Lung, and Blood Institute specifications: normal ($BMI<25$), overweight ($25\leq BMI<30$), and obese ($BMI\geq 30$) (32). Average height and weight values were also used to calculate basal metabolic rate (BMR) with the age and gender tailored Schofield equation (33).

### Dietary Measures

Dietary intake was measured using three consecutively administered Nutrition Data System (NDS) 24-hour dietary recall interviews developed by the Nutrition Coordinating Center at the University of Minnesota (version 4.04). Trained and NDS-certified bilingual/bicultural evaluation assistants interviewed participants using the multiple-pass approach to collect dietary intake data for the three days prior to the baseline home visit. First, participants were asked to provide a description of everything they ate over the past 24-hour period. They were then asked to provide details on these foods including type and quantity. Finally, the evaluation assistants read back the information to the participant to ensure that all foods, and in particular food additions, had been captured. Appointments were scheduled during the latter part of the week to obtain three days of dietary information on two weekdays and one weekend day (23). Measurement aids, such as three-dimensional food models and two-dimensional pictures, were used to help estimate portion sizes (22). Energy intake was generated by NDS based on the types and amounts of foods/beverages reported across the three days.

## Classification of subjects as underreporters

Underreporters are those individuals who report a dietary intake level that is not biologically plausible given their physiological status and physical activity level. This study employed Goldberg's cutoff methods based on sedentary behavior, as well as those cutoff values calculated using Black's modifications to account for participant physical activity level to determine underreporting (4,34). The Goldberg equation is based on the principle that energy intake (EI) equals energy expenditure (EE) when weight is stable. Therefore, EI may be substituted for EE in the ratio of EE to basal metabolic rate, or EE:BMR, which represents an individual's total energy expenditure for physical activity and basic bodily functions. In weight stable individuals, EE:BMR is a ratio equal to PAL, a value which represents energy requirements based on a given physical activity level. Therefore, with the substitution mentioned above, EI:BMR is hypothetically equal to PAL (34). Confidence limits of the EI:BMR/ PAL relationship need to be calculated as the two factors will not be equivalent due to measurement errors (34). Anything falling within the confidence interval is considered a valid report and anything above or below invalid, the latter defined as underreporting. In effect, participants classified as underreporters are at least two to three standard deviations below what their reported intake should be, depending on the confidence interval used (95% or 99.7%, respectively). To calculate the confidence interval, PAL can be adjusted to account for study-specific factors like sample size, gender, number of days of dietary assessment, and variation in BMR, dietary intake, and energy requirements, in addition to being estimated at either two or three standard deviations from the expected mean (95% or 99.7% confidence intervals (CI), respectively).

Five methods to categorize underreporting were compared in the present study. Methods 1 through 4 were based on the Goldberg equation and calculated the lower 99.7% CI cutoff values by adjusting the World Health Organization PAL values for low, medium, and high activity females (35). It is important to note that, although the PAL values were not specifically tailored to the present study's population, the values are consistent with previous research (36,37). Further, because coefficients of variation have not been established for Mexicans/Mexican-Americans, this study employed the pooled mean values suggested by Black (38).

Consistent with Goldberg's original cutoff method (4), the Method 1 cutoff value of 1.51 adjusted for the full study sample size and is based on the assumption of sedentary behavior. Method 2, modeled after the Goldberg equation with Black's modifications, adjusted for both sample size and for individual participant's physical activity level, with cutoff values of 1.51, 1.58, and 1.76 for those with low, moderate, and high physical activity levels, respectively (34). Methods 3 and 4 calculated the Goldberg cutoff value using a conservative sample size of n = 1, rather than the present study's actual sample size. This conservative approach has been used in other studies (1,6,8), and according to Klesges et al. (1, p. 440), calculating the cutoff value using the smallest possible sample size provides a more conservative method to more accurately “classify the low end of reported intake.” Similar to Method 1, Method 3 did not account for physical activity; therefore, it was calculated based on a sample size of one and assumed sedentary behavior, with a resultant cutoff value of 0.81. Method 4, on the other hand, used the conservative n = 1 sample size and adjusted for participant's physical activity level with 0.81, 0.85, and 0.95 as the cutoff values for those with low, moderate, and high physical activity levels, respectively.

Method 5 is the only method not based on the Goldberg calculation. For this method, the median ratio of reported energy intake to BMR ($EI_{rep}$:BMR) of participants was determined and then used as a cutoff value for underreporting [Method 5]. In this scenario, a participant whose ratio of average reported energy intake to BMR fell below the median value of 1.23 was classified as an underreporter. Thus, this approach categorized people into the upper half versus the lower half of the distribution, and provided a more general way to examine higher versus lower likelihood of underreporting among participants. The methods are further in summarized in Table 1.

## Statistical Methods

Analyses were conducted using the Statistical Package for the Social Sciences (SPSS, v.13). SPSS was used to generate descriptive statistics and to determine the prevalence of underreporting among *Secretos de la Buena Vida* participants using each of the five methods. Once underreporting rates were determined for each of the five methods, the potential correlates of underreporting were examined using binary logistic regression with the dichotomous dependent variable being underreporter yes=1 versus no=0.

Separate binary logistic regressions were performed to determine the associations between presence of underreporting (dependent variable) and age, education level, income level, acculturation level as indicated by Anglo orientation score and Mexican orientation score, and weight status categories (independent variables) for all five detection methods. The age and acculturation variables were continuous, while the education, income, and weight status variables were categorical. For education level, no high school was the reference category; for income level, earning $2000 or less per month was the reference category; for weight status, the classification of normal (BMI<25) was the reference category. P-values equal to or less than 0.05 were considered statistically significant in this study. Additional bivariate analyses (chi-square) were conducted to determine the direction of each association.

Finally, Method 4 was selected for multivariate analysis assessing the independent effects of all significant predictors examined simultaneously, because it provided a conservative approach using a sample size of n=1 and it took PA level into account. The conservative approach of Method 4 made it less likely that the rate of underreporting among Mexican/ Mexican-American women would be overestimated. That this study is one of the first attempts to determine the rate as well as correlates of underreporting in this Latino subgroup makes selection of the conservative approach advisable. This method also accounted for participant physical activity level, which should make this method more valid than those that do not account for physical activity. Backward stepwise regression procedure was performed to determine which correlates would remain significant when examined simultaneously with the other correlates.

## Results

Table 2 presents the characteristics of the study sample. The majority of participants in the study were middle-aged, had a low-income level, less than a high school education, were classified as overweight or obese, and tended to identify more with their traditional Mexican culture than with the dominant culture along the U.S.-Mexico border, which is a blend of Mexican and Caucasian.

## Underreporting rates

Among the five methods of detection, underreporting rates varied substantially, ranging from 20.5% underreporters for Method 4 and 81.3% underreporters for Method 2. The methods and their respective rates of underreporting are summarized in Table 1.

## Correlates of Underreporting as Determined by Binary Logistic Regressions

Significant correlates varied depending on the method of underreporting detection employed. Table 3 presents a summary of the relationships between independent variables and underreporting, including correlates that were found to be significant, for each of the five methods.

**Method 1—**Using Method 1 (which adjusts for sample size but not physical activity), 72.2% (n=254) of participants were classified as underreporters. Chi-square analyses revealed that, of the obese participants, 81.4% (n=118) were found to be underreporters using this method; 69.1% (n=94) of overweight participants and 58.8% (n=40) of normal weight participants were underreporters. Among high-income participants, 77.7% (n=115) were underreporters compared to 67.6% (n=125) among the low-income participants.

**Method 2—**The rate of underreporting increased when sample size and physical activity level were accounted for using Method 2, as 81.3% (n=286) of participants were classified as underreporters. Chi-square analyses revealed that, of the obese participants, 86.9% (n=126) were underreporters, whereas 80.9% (n=110) of overweight individuals, as compared with 70.6% (n=48) of normal weight individuals, were underreporters.

**Method 3—**Underreporting rates dropped drastically when the more conservative form of the Goldberg cutoff was used in Method 3 (assuming sample size of n=1, and not accounting for physical activity), with only 11.9% (n=42) of participants classified as underreporters. Obese participants had almost five times the odds of being underreporters as normal weight participants. Of the obese participants, 18.6% (n=27) were underreporters using this method, compared to 8.1% (n=11) of overweight participants and 4.4% (n=3) of normal weight participants. Participants aged 51 or older had over five times the odds of being underreporters as those aged 19-31 years old. Of participants aged 51 or older, 28% (n=16) were underreporters using this method, as compared to 9.4% (n=22) of participants aged 31 to 50, and 6.7% (n=4) of participants aged 19 to 30 years old.

**Method 4—**Using the Method 4 cutoff values calculated based on a sample size of n=1 and all physical activity levels (low, medium, and high), rates of underreporting were found at 20.5% (n=72). Chi-square analyses revealed that 25.5% (n=37) of obese participants were underreporters using this method, as compared to 19.9% (n=27) of overweight participants and 8.8% (n=6) of those in the normal BMI range. Of high-income participants, 25.7% (n=38) were underreporters, compared to 15.7% (n=29) of low-income participants. Participants aged 51 or older had four times the odd of being underreporters as those aged 19-31 years old. Of participants aged 51 or older, 38.6% (n=22) were underreporters using this method, as compared to 17.9% (n=42) of participants aged 31 to 50, and 13.3% (n=8) of participants aged 19 to 30 years old. Higher education and having a more Anglo orientation also were significantly associated with underreporting using Method 4.

**Method 5—**Finally, when participant EI:BMR was compared to the sample's median EI:BMR ratio of 1.23, exactly half of the sample, 50.0% (n=176), were classified as underreporters. Chi-square analyses revealed that 57.2% (n=83) of the obese participants in the sample were underreporters, compared to 48.5% (n=66) of the overweight participants and 36.8% (n=25) of normal range BMI participants. Among participants 51 years of age or older, 66.7% (n=38) were underreporters, while 47.0% (n=111) of individuals aged 31-50 years of age and 44.3% (n=27) of individuals aged 19-30 years of age were classified as underreporters.

### Multivariate Analysis Predicting Underreporting Using Method 4

To determine the relationship between the independent variables found to be significant in the bivariate analyses of Method 4, and the dependent variable, underreporting, multivariate analysis using backward stepwise regression was performed using the significant correlates from Method 4. Backward stepwise regression was selected given the exploratory nature of the analyses. Age, BMI weight status, education level, income level, and Anglo orientation score were included in the multivariate model. Anglo orientation score was chosen for inclusion in the multivariate analysis to represent the acculturation measure, as it was the most significant of the acculturation related variables. In Step 1, with all variables included in the model, age of 51 and over was a significant variable, as well as BMI weight status of overweight and obese. In Step 2, education level was removed, and the significant variables were age of 51 and over, Anglo orientation score, and BMI weight status of overweight and obese. Therefore, the results of this multivariate analysis, presented in Table 4, revealed that being overweight and obese, being 51 years of age or older, and having an orientation toward the Anglo culture, are significant correlates of underreporting.

## Discussion

This study sought to understand the prevalence of underreporting in the Mexican/Mexican-American community, as little research has been conducted in this area. Despite differences in rates of underreporting across the five methods, Methods 1 and 2 yielded results consistent with the literature (36), as did Methods 3 and 4 (1,6). The increase in rates of underreporting from Method 1 to 2 and from Method 3 to 4 reflect the increased energy intake/expenditure associated with physical activity, consistent with previous research (12). This study also sought to understand better the individual and sociodemographic characteristics that are associated with underreporting. Based upon the results of the multivariate analyses, weight status was positively associated with underreporting in Mexican/Mexican-American women, consistent with the findings of Olendzki et al. in their study of Caribbean Latinos (17). Age was a significant correlate of underreporting in the bivariate analyses for Methods 3, 4 and 5 as well as the multivariate analysis, consistent with studies among non-Hispanic whites (3,8,11-13).

The positive association between relatively higher income and underreporting in Methods 1 and 4 contrasts with previous results with primarily non-Hispanic white populations that show negative relationships between underreporting and income level (6,8). Further, the finding that education was a significant correlate of underreporting was also contrary to that of other underreporting studies with primarily non-Hispanic white samples (1,13,14). The association between underreporting and high income as well as higher education may reflect a greater exposure to messages about healthy diet, which may prompt this reporting bias. Alternatively, greater underreporting may occur as a result of higher Anglo orientation among those with higher income and education, as these individuals may be more likely to be exposed to the dominant ideals of dieting and the media's glorification of thinness. Acculturation was found to be a significant correlate in both the bivariate analyses and multivariate analysis of Method 4. One may speculate that greater identification with the non-Hispanic culture and the potential adoption of the dieting and health behaviors of this culture may alter reporting accuracy. This would be consistent with the results of the study comparing African populations in rural Cameroon, Jamaica, and the United Kingdom, as researchers found that underreporting rates were significantly higher in more “Westernized” environments (39). However, further research is needed given the restricted range in socioeconomic status observed in the present study.

### Study Limitations

Biases related to our 24-hour dietary recall protocol are a limitation in this study including the three consecutive days of dietary data collection (11,40). Investigators must also be mindful of the age, literacy level, and ethnicity of their sample prior to the administration of the methodology to ensure that the methodology is tailored to the target population (41). In regards to age, it is important to distinguish underreporting from low energy reporting, which commonly occurs among older adult populations because of a lack of or decrease in energy intake (42). Most studies included samples that ranged in age from 18 to 82; however, typically the mean age was in the 40s. The incorrect categorization of physical activity based on participants' self-reports to a brief scale is a second limitation, as 53% of participants were categorized as “high activity,” despite evidence that only 35.6% of Hispanic women meet physical activity recommendations (43). This latter finding may be due to greater work-related activity that is not captured in the leisure-time physical activity recommendations (44) Physical activity has been shown to decline with age (45) and may be overreported among obese individuals (7). Reports of both diet and physical activity levels may have resulted in part from limited numeracy skills among participants; their ability to conceptualize or quantify their diet and physical activity levels may be reflected in their numeracy skills. The lack of measurement of numeracy skills limits our ability to examine this as a covariate. Future investigators should incorporate more objective measures of diet and physical activity to ensure proper classification (33).

It is possible that the underreporting calculation may not be an appropriate application, as the equation was previously formulated and tested in a non-Hispanic sample. Further, the Schofield equation may overestimate BMR among the following two groups: “obese individuals with a higher percentage of body fat, or among persons over 60 years of age” (13, p. 679). Therefore, the calculated BMR included in the Goldberg equation should be viewed only as a crude estimate, and measured BMR should be used whenever possible. In addition, the coefficients of variation for BMR, physical activity, and dietary intake were not tailored to this population and may not provide appropriate estimates of variance specific to this population. Future studies should test components of the Goldberg equation, such as the coefficients of variation for BMR, physical activity, and dietary intake among Hispanic samples. If resources allow, investigators should employ the doubly labeled water (DLW) technique to validate dietary reports, as this method will allow investigators to use a more reliable and less biased methodology to determine underreporting.

Not accounted for in the present analysis was that underreporting in this sample may be due to social desirability response bias. In a study examining social desirability scores among job applicants, Hispanics were found to score “significantly higher than their White counterparts” (46). Therefore, it is possible that participants in the present study chose to respond in a socially desirable manner, and failed to report a portion of their intake due to fear of embarrassment or judgment. Furthermore, although participants were not randomized at the time of measurement, they were still informed that the study was focused on nutrition and healthy eating behaviors.

Study inclusion criteria limit generalizability to those individuals with similar characteristics. Furthermore, the study locale further limits the generalizability of these findings, as San Diego is a unique border community given its close proximity to Mexico. Additional studies are needed to better understand underreporting trends in different Latino subgroups.

### Study Implications and Future Research

Relatively little is known about the phenomenon of underreporting in the Latino population. As the present results indicate, underreporting is prevalent among Mexican/Mexican-American women, especially among those of higher weight status, those who are older, and those who are more Anglo oriented. Therefore, public health researchers should monitor underreporting among Mexican/Mexican-American women in future dietary studies to ensure that valid dietary reports are collected and to ensure that all related assumptions are drawn based on valid data.

The importance of understanding the sociodemographic context of underreporting cannot be minimized. A framework developed by Sorenson and colleagues (47) suggests that researchers should gain a better understanding of sociodemographic characteristics, modifying conditions within the social context, as well as mediating mechanisms within the individual and social context to understand their implications on health behaviors and health outcomes. A comprehensive understanding of these factors will aid in the creation of effective interventions to help individuals become more conscious and aware of their dietary intake behaviors.

Self-reported data on dietary intake is important in helping to explain how total energy intake and consumption patterns are related to obesity and other health conditions among different populations. Public health researchers, interventionists, and advocates use these data to formulate and influence policy and to explain the relationship between diet and disease; therefore, it is of utmost importance that the data used for this purpose is accurate (1,6,48).

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**Table 1**

**Rates of underreporting in the current sample based on five different detection methods**

| Method | Goldberg Method? | Accounts for PA? | Sample size used | PAL Cutoff values | Rate of underreporting % (n) |
|---|---|---|---|---|---|
| 1[a] | Yes | No | n=352 | 1.51<br>Low PA = 1.51 | 72.2% (254) |
| 2 | Yes | Yes | n=352 | Mod. PA = 1.58<br>High PA = 1.76 | 81.3% (286) |
| 3 | Yes | No | n=1 | 0.81<br>Low PA = 0.81 | 11.9% (42) |
| 4 | Yes | Yes | n=1 | Mod. PA = 0.85<br>High PA= 0.95 | 20.5% (72) |
| 5[b] | No | No | n/a | 1.23 | 50.0% (176) |

[a]Methods 1-4 were calculated based on a 99.7% confidence interval.

[b]The Method 5 cutoff value is the median $EI_{rep}$:BMR ratio of participants.

**Table 2**

**Descriptive statistics: characteristics of the sample**

| | % (n [a]) | Mean (SD, Range) |
|---|---|---|
| Age | | 39.78 (9.93, 21-67) |
| Age Group | | |
| 18-30 years old | 17.0% (60) | |
| 31-50 years old | 66.8% (235) | |
| 51+ years old | 16.2% (57) | |
| High Income (>$2001 per month) | 44.4% (148) | |
| Education Level of High School or Higher | 48.3% (170) | |
| Born outside of the United States | 96.4% (333) | |
| Acculturation | | |
| Anglo Orientation Score | | 2.33 (0.69, 1.08-4.54) |
| Mexican Orientation Score | | 4.15 (0.44, 2.35-5.00) |
| Acculturation Score | | 1.82 (0.90, - 3.49-1.95) |
| Body Mass Index Category | | |
| Normal | 19.5% (68) | |
| Overweight | 39.0% (136) | |
| Obese | 41.5% (145) | |
| Physical Activity Level | | |
| Low | 24.7% (87) | |
| Medium | 22.4% (79) | |
| High | 52.8% (186) | |
| Mean Body Mass Index | | 29.61 (5.52, 16.13-50.35) |
| Mean Energy Intake (mjs) | | 7.88 (2.95, 2.12-22.90) |
| Mean Basal Metabolic Rate | | 6.11 (0.72, 4.70-10.40) |
| Mean $EI_{rep}$:BMR [b] | | 1.29 (0.49, 0.32-3.84) |

[a] n ranged from 333 to 352 due to missing data

[b] $EI_{rep}$:BMR is the ratio of reported energy intake to basal metabolic rate

**Table 3**

**Result of binary logistic regressions of potential correlates of underreporting–Methods 1 through 5**

| | Method 1 | | Method 2 | | Method 3 | | Method 4 | | Method 5 | |
|---|---|---|---|---|---|---|---|---|---|---|
| | **OR** | **95% CI** | **OR** | **95% CI** | **OR** | **95% CI** | **OR** | **95% CI** | **OR** | **95% CI** |
| Age | | | | | | | | | | |
| 31-50 years old | 0.76 | 0.40, 1.44 | 0.78 | 0.37, 1.65 | 1.45 | 0.48, 4.37 | 1.42 | 0.63, 3.20 | 1.09 | 0.62, 1.93 |
| 51+ years old | 1.39 | 0.58, 3.36 | 1.23 | 0.45, 3.36 | 5.46 | 1.70, 17.56** | 4.09 | 1.64, 10.21** | 2.44 | 1.16, 5.17* |
| Body Mass Index Category | | | | | | | | | | |
| Overweight | 1.57 | 0.86, 2.87 | 1.76 | 0.90, 3.46 | 1.91 | 0.51, 7.08 | 2.56 | 1.00, 6.54* | 1.62 | 0.89, 2.95 |
| Obese | 3.06 | 1.62, 5.80*** | 2.76 | 1.36, 5.62** | 4.96 | 1.45, 16.97** | 3.54 | 1.42, 8.86** | 2.30 | 1.27, 4.17** |
| >$2001/month | 1.67 | 1.02, 2.74* | 1.38 | 0.79, 2.42 | 1.29 | 0.65, 2.53 | 1.86 | 1.08, 3.19* | 1.39 | 0.90, 2.15 |
| ≥ High School | 1.02 | 0.64, 1.62 | 1.15 | 0.67, 1.97 | 1.87 | 0.97, 3.63 | 1.79 | 1.06, 3.02* | 1.00 | 0.66, 1.52 |
| Acculturation Level | | | | | | | | | | |
| Anglo orientation score | 1.01 | 0.72, 1.41 | 0.94 | 0.64, 1.38 | 1.09 | 0.68, 1.73 | 1.49 | 1.03, 2.14* | 0.81 | 0.60, 1.10 |
| Mexican orientation score | 0.81 | 0.47, 1.39 | 1.06 | 0.58, 1.95 | 0.85 | 0.41, 1.74 | 0.76 | 0.42, 1.35 | 1.07 | 0.67, 1.73 |

* P<0.05,

** P<0.01,

*** P<0.001

**Table 4**

**Result of Multivariate Analyses using Backward Stepwise Regression–Method 4**

| | B | S.E. | Odds Ratio |
|---|---|---|---|
| *Step 2* | | | |
| Age | | | |
| 31-50 years old | 0.20 | 0.43 | 1.22* |
| 51+ years old | 1.10 | 0.50 | 3.01* |
| Body Mass Index Weight Status Category | | | |
| Overweight | 1.10 | 0.53 | 3.01* |
| Obese | 1.35 | 0.53 | 3.84** |
| High Income Level (>$2001/month) | 0.53 | 0.30 | 1.70 |
| Education Level of High School or Higher | Removed | Removed | Removed |
| Acculturation Level | | | |
| Anglo orientation score[a] | 0.42 | 0.21 | 1.52* |

[a] Anglo orientation score was chosen for inclusion in the multivariate analysis because it was significant in the bivariate analyses.

* P<0.05,

** P<0.01,

*** P<0.001