The relationship between interviewer–respondent race match and reporting of energy intake using food frequency questionnaires in the rural South United States

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ARTICLE INFO

ABSTRACT

Objective. The purpose of the observational study was to determine whether interviewer race influences food frequency questionnaire (FFQ) reporting accuracy in a Deep South, largely African American cohort.

Methods. A secondary analysis was conducted to investigate the influence of interviewer race on energy reporting of 319 African Americans who participated in the Mississippi Communities for Healthy Living intervention in May–June 2011, a community-based and USDA-funded project. Reported energy intake was compared to total energy expenditure to identify normal (ENR), under-(EUR) and over-reporters (EOR). Multivariate logistic regression models determined the relationship between race match and energy misreporting, accounting for confounding variables (educational level, health status perception, BMI, gender, and age) identified using chi-square/correlation analyses.

Results. The sample included 278 African Americans with 165 EURs, 26 EORs, and 87 ENRs identified. Logistic regression analyses revealed that there was no relationship between race-matched participants and EUR or EOR; controlling factors, BMI and perceived health status were significant in the model.

Conclusion. This study is the first to our knowledge to examine whether race influences dietary intake reporting which may influence assessment data used for comparison with health outcomes. This may have important implications for research conducted in health disparate populations, particularly rural, Southern populations.

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Introduction

Obesity is a major public health issue with higher rates in the Southern US, especially in 'Deep South' states (Alabama, Georgia, Louisiana, Mississippi, and South Carolina) (Centers for Disease Control and Prevention, 2014), and rural areas (Befort et al., 2012). Uniquely, compared to the rest of the nation, Deep South states also have a higher population density of African Americans (Rastogi et al., 2011), who have higher rates of obesity compared to other racial groups (Flegal et al., 2010). Therefore, the representation of African Americans in research is particularly important for the prevention of chronic disease in the South.

Typically, African Americans have been underrepresented in research, which has been attributed to cultural mistrust (Huang and Coker, 2010). Additionally, perceived racial barriers to health care and participation in clinical trials by African Americans, as well as Whites, have been noted in the rural South (Fowler-Brown et al., 2006). Compounded with racial mistrust, perceptions of racial bias may also be an issue for health disparities researchers targeting rural populations in the Deep South due to a pervasive history of slavery and racial segregation/discrimination (American civil rights movement, 2014).

Community interventions, focused on improving nutrition and physical activity behaviors, have shown to be promising for improving the health of African Americans and preventing chronic disease (Lemacks et al., 2013), which may also be relevant for other ethnic groups residing in the rural South. Due to the nature of community-engaged research, requiring researchers to collect dietary assessment data in the field versus in well-controlled clinical settings, there is a heavy reliance on the accuracy of self-report dietary assessment measures, such as food frequency questionnaires (FFQs); however, FFQs are not without limitations. FFQs are vulnerable to intra-individual variation, and misreporting of dietary intake has been associated with certain personal characteristics. As an example, overweight and obese

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individuals have been shown to underreport energy intake (Samuel-Hodge et al., 2004), and compared to women, men are less likely to under-estimate energy intake (Braam et al., 1998).

Interviewer-administration of FFQs, versus self-administration, may improve dietary intake reporting accuracy (Block et al., 2006), but what remains elusive is how an interviewer's race may influence the participant's energy intake reporting, as assessed by FFQs. A research participant's feelings of cultural mistrust or perceptions of racial barriers or stereotyping may influence dietary assessment results as well, which may in turn misrepresent relationships between diet and health outcomes. Thus, the purpose of this study was to determine whether interviewer–respondent race match influenced FFQ energy reporting accuracy in a Deep South (the Lower Mississippi Delta [LMD] Region of the US), largely African American, study population. High obesity rates (Zhang et al., 2011), partially attributed to poor dietary quality (Thomson et al., 2011), plague both African American and White Delta residents. This region has been the target of health intervention research (Tussing-Humphreys et al., 2013) and therefore, was an ideal location within which to investigate influences of interviewer race on dietary data quality. The specific objectives were to classify energy misreporters, identify relationships between misreporting and confounding variables, and establish whether interviewer–respondent race match impacts FFQ reporting accuracy among a LMD population.

Methods

Study design and participants

An observational study of a cohort participating in a USDA-funded project by the Delta Obesity Prevention Research Unit in the LMD was conducted. The overall goals of the project were: (1) to adapt the Dietary Guidelines for Americans (DGA) eating patterns for the LMD population and (2) to conduct intervention studies testing the effectiveness of the adapted DGA eating patterns in reducing weight gain and risk factors for obesity-related chronic disease in the LMD population. Data from a FFQ were used to identify intake deficiencies or excesses based on food groupings which guided the targets of a nutrition education intervention to improve adherence to the DGA.

Women living in 11 LMD counties in Mississippi were the primary target of this project; however, men were not excluded. Our previous research in the region indicated that women were "gatekeepers" of food and nutrition in the Delta (McGee et al., 2008; Huye et al., 2013). Second, the theoretical underpinning of the intervention was Rogers' diffusion of innovations theory, thus we chose to target women who were likely to be "early adopters" of new ideas, which in this case were dietary behaviors (manuscript in review). Early adopters as described by Rogers are often well educated with higher socioeconomic status than late adopters (Rogers, 1995). Early adopters can be influential in spreading new ideas to late adopters because they are often seen as leaders in their communities. In the Delta, well-educated, higher socioeconomic status women are leaders in civic, social and religious organizations that often have community improvement as organizational goals (Huye et al., 2013). Thus, we purposively located these organizations and recruited members to participate in an effort to eventually "diffuse" the adapted DGAs to the broader population in the region.

Participants for this secondary analysis were selected from 319 participants who completed a baseline assessment during May–June 2011 for participation in the Mississippi Communities for Healthy Living intervention. Recruitment of participants was carried out through a variety of means, including contacts with civic and social clubs identified through Chamber of Commerce listings and the internet and personal contacts with churches. Among those completing the baseline assessment, 286 (89.7%) were women. Inclusion criteria included participants with complete data and African Americans, considering the small number of Caucasians in the original sample (n = 14).

Food frequency questionnaire protocol

Dietary intake data were collected during the baseline assessment using an FFQ designed specifically to capture dietary intake, over the past three months, of African American and White residents of the LMD (Tucker et al., 2005). The instrument included region-specific foods and was thus designed to reduce energy underreporting that may have been a result of commonly eaten foods not being captured. Trained data collectors administered FFQs with each participant, lasting approximately 30 min, and used food model kits to assist with determination of portion sizes. Data used in this analysis were collected at enrollment, with minimal contamination of nutrition education or other intervention efforts.

All data collection protocols of the original project were approved by The University of Southern Mississippi Institutional Review Board (IRB). The protocol directly related to this observational study was exempt from IRB approval.

Energy intake and reporting assessment

Reported energy intake (rEI, kcal/day) was obtained from FFQs. The scannable FFQs were analyzed by the dietary assessment center at Northeastern University (Boston, MA), and dietary data were generated for each participant at each time point. Predicted total energy expenditure (pTEE, converted to kcal/day), based on age (in years), weight (in kilograms), height (in centimeters), and sex (is 0 for men and 1 for women), was estimated for each participant using the Vinken et al. (1999) equation, developed for use in any field setting. Measures used in this equation are practical for community-engaged research, and the equation was shown to compare favorably with doubly-labeled water measurements in 93 adult men and women (Vinken et al., 1999). The equation is as follows:

$$pTEE = 7.377 - (90.07 \times age) + (0.0806 \times weight) + (0.0135 \times height) - (1.363 \times sex).$$

Cut-off values, developed by the Energy Metabolism Laboratory at the Jean Mayer USDA Human Nutrition Research Center (McCrory et al., 2002) and based on the Vinken et al. (1999) equation, were utilized to classify energy under-(EUR), over-(EOR), and accurate or normal (ENR) reporters with rEI <70% or >130% of pTEE (± 1 standard deviation), respectively. These values are considered useful for examining relationships between habitual dietary intake and health outcomes (McCrory et al., 2002), as would be our purpose for future analyses.

Other variables

The primary independent variable was "race match", a dichotomous variable indicating whether or not interviewer-reported race matched (was the same as) that of the interviewee (study participant). Several other potential predictors of energy intake misreporting were selected based on previously reported relationships in various populations, including educational level (Abbot et al., 2008; Braam et al., 1998), perception of health status (Abbot et al., 2008), body mass index (BMI) (Samuel-Hodge et al., 2004), gender (Braam et al., 1998), and age (Braam et al., 1998). Body mass index was calculated as weight (kg) divided by height $(m)^2$, measured to the nearest 0.1 kg with a Tanita 310 model digital scale and to the nearest cm with a portable stadiometer, respectively. Other variables were derived from enrollment survey data (Table 1).

Statistical analyses

Initially, chi-square and correlation analyses were conducted to identify relationships of the categorical variables EUR and EOR with educational level, perception of health status, BMI, gender, and age (described in Table 1). Variables with an identified significant

Table 1
Obesity and demographic characteristics of 278 African American participants of the Mississippi Communities for Healthy Living nutrition intervention.

Characteristic	n (%)
Obesity classification, BMI (n = 278)	
Non-obese, 18.0–29.9	81 (29.1)
Obese class 1, 30.0–34.9	85 (30.6)
Obese class 2, 35.0–39.9	56 (20.1)
Obese class 3, ≥40.0	56 (20.1)
Gender (n = 278)	
Male	31 (11.2)
Female	247 (88.8)
Age (n = 278)	
18 to 45 years	61 (21.9)
46 to 64 years	152 (55.7)
65 years and over	65 (23.4)
Educational level (n = 278)	
Less than high school	29 (10.4)
High school or GED	55 (19.8)
Trade or VOC school	7 (2.5)
Some college	45 (16.2)
College degree	52 (18.7)
Some graduate	29 (10.4)
Graduate or professional degree	61 (21.9)
Income (n = 263)	
$14,999 and under	79 (28.4)
$15,000 to 24,999	34 (12.3)
$25,000 to 34,999	37 (13.4)
$35,000 to 44,999	32 (11.5)
$45,000 to 54,999	24 (8.7)
$55,000 and over	44 (15.8)
Perceived health status score (n = 278)	
1—Poor	4 (1.4)
2—Fair	91 (31.2)
3—Good	142 (48.6)
4—Very Good	44 (15.1)
5—Excellent	11 (3.8)

relationship were considered possible confounding variables and were included in further analyses. Multivariate logistic regression models were employed to investigate the relationship between race match and energy misreporting; a separate model was employed for both EUR and EOR. All data were analyzed using IBM SPSS Statistics 20.0 software (Chicago, IL) with α = 0.05 for significance. Participants with incomplete data were not included in this analysis (case-wise deletion).

Results

There were 13 trained data collectors conducting interviews at enrollment with 58.6% of interviews being completed by African American interviewers and 41.4% being completed by White interviewers. The sample of 278 participants included in this analysis were African American, and had a mean BMI and age of 34.0 (SD, 7.8) kg/m² and 54.8 (SD, 13.9) years, respectively. More than two-thirds of the sample was considered obese. Table 1 provides additional data to describe the population. The proportions of obesity and age were similar for both men and women (data not shown).

There were 165 (59.4%) EURs, 26 (9.4%) EORs, and 87 (31.3%) ENRs identified. Chi-square tests revealed no significant gender (men versus women) or racial (White versus African American) differences in either misreporting group (data not shown). BMI was significantly related to EUR classification and Perceived Health Status trended toward significance (Table 2). Neither of the other variables (educational level, age) were significant in the EUR model. Additionally, none of the selected variables were related to EOR classification; therefore, the same variables (BMI and perceived health status) were used in further analysis of both EUR and EOR classifications, along with controlling for gender.

Table 2
Correlational association between misreporting classification and select characteristics of EURs and EORs[a] identified from baseline data of 278 participants of the Mississippi Communities for Healthy Living nutrition intervention.

	Underreporting model		Overreporting model	
	(n = 252; 165 EUR[a])		(n = 113; 26 EOR[a])	
	r	p-Value	r	p-Value
BMI[b] (kg/m²)	0.14	0.03	0.09	0.34
Age (years)	−0.04	0.52	−0.07	0.44
Educational Level	−0.04	0.51	0.06	0.52
Perceived Health Status	0.12	0.06	0.06	0.56

[a] EUR and EOR = 1; normal reporting = 0.
[b] BMI, body mass index; EUR, energy underreporters; EOR, energy overreporters.

For the EUR model, logistic regression analyses revealed that race match (interviewer race matched participant race) was not a statistically significant (p = 0.081), independent predictor of normal reporting (when compared to underreporting), and remained non-significant (p = 0.075) after adjustment for BMI and health status scores (Table 3). Results were interpreted as participants of the same race as their interviewer had 1.7 times the odds of being an ENR compared to those whose race did not match the interviewer's race, when accounting for BMI and health status, but were not statistically significant. For the EOR model, none of the variables, including race match, were statistically significant predictors of normal reporting.

Discussion

The majority of the study population underreported energy intake with about a third being normal reporters. Results of this study also indicated that race match of the interviewer and respondent was not a statistically significant influence of participant reporting accuracy of dietary intake. Although not statistically significant, participants who were not matched with a same-race interviewer had greater odds of being energy underreporters than those who were matched. The relationship remained non-significant when BMI and perceived health status were included in the model. Sample size was only 252 for the underreporting models and 113 for the overreporting models which may not be adequate to substantiate a significant finding among other significant confounding factors (i.e., participant BMI). To examine the effect of this relationship, we calculated and examined the relative risk

Table 3
Multivariable logistic regression odds of normal reporting[a] compared to misreporting in race matched interviewers and participants of the Mississippi Communities for Healthy Living nutrition intervention.

	Underreporting (n = 252; 165 EUR[b])	Overreporting (n = 113; 26 EOR[b])
	OR (95% CI)	OR (95% CI)
Step 1		
Race match		
No	1.00	1.00
Yes	1.63 (0.94–2.81)	1.54 (0.63–3.80)
Step 2		
Race match		
No	1.000	1.00
Yes	1.67 (0.95–2.93)	1.48 (0.55–3.97)
BMI (kg/m²)	0.95 (0.91–0.99)*	1.04 (0.97–1.11)
Health status score	0.65 (0.46–0.93)*	0.88 (0.48–1.61)
Gender	1.49 (0.63–3.52)	1.00 (0.18–5.46)

* p < 0.05.
[a] Normal reporting was coded as 1; underreporting and overreporting were coded as 0.
[b] Abbreviations: EUR, energy underreporters; EOR, energy overreporters; OR, odds ratio; CI, confidence interval.

ratio (RR = 0.86) for underreporting when interviewer and respondent race did not match. A participant who was not matched with a same race interviewer had 85% the chance of underreporting as the participant who was matched. Although not statistically significant, it is possible this effect could have implications in future research in similar regions.

Underreporting was more prominent in this population than overreporting, which isn't entirely a surprise due to the fact that the population was predominantly women and women tend to underreport in higher proportion than men, along with the known influence of obesity on UR (Samuel-Hodge et al., 2004). Although our study found no gender differences in reporting accuracy, it is highly likely that there were not enough men in the sample to be representative and this distinguished any relationship. Our study does display similar findings on BMI and perceptions of health influences to other research on misreporting (Abbot et al., 2008; Samuel-Hodge et al., 2004). Underweight interviewers and normal weight/obese interviewers stimulated under- and overreporting, respectively, in a large sample of Dutch adults (Eisinga et al., 2012). However, we did not have interviewer BMI data available and thus, were unable to investigate any influence that interviewer BMI may have had on participant misreporting.

Our study was unable to compare energy reporting to the gold standard of energy expenditure assessment, doubly labeled water measurements. Predicted total energy expenditure was calculated for each participant using the Vinken equation (Vinken et al., 1999). The equation was not originally developed using a highly obese population and was likely not African Americans from the Mississippi Delta (ethnicity/race of participants were not identified in the original study). Additionally, this equation does not capture physical activity differences which could result in an inaccurate energy reporting classification. We did not ask participants about their activity levels directly, and the large proportion of obese participants may have been less physically active than those participants in the Vinken equation study. Therefore, calculated energy expenditure is a gross estimate; although, we considered the equation reasonable due to the large range for normal reporters (70–130%).

Notable is that, although 60% of this study sample was classified as energy underreporters, there was no relationship between educational level and reporting status in this sample where approximately 70% had beyond a high school education. One study (Braam et al., 1998) reported that FFQ underreporting was associated with lower educational levels. The population represented in the present study was highly educated; however, the likelihood of underreporting differences associated with education level may have been reduced because the FFQ was interviewer-administered. This provided increased researcher control of data quality, which has been shown to improve validity of FFQ data in a low income, Hispanic population (Block et al., 2006). It may be that FFQ interviews eliminate one disadvantage (unreliable data collected among low literacy groups (Block et al., 2006)) associated with self-administered questionnaires but introduce another possible vulnerability associated with personal interactions between researchers and participants.

An individual's feelings of racial mistrust do crossover into the intervention research literature as a major obstacle inhibiting African American participation in research studies (Huang and Coker, 2010). Within the minority research participation literature, strategies to improve African American participation have included increasing diversity or representation of minorities on the research team (Huang and Coker, 2010). On the contrary, there is evidence suggesting that matching participants with same race interviewers did not mitigate study participation (Thompon et al., 1996) and more than 90% of African American participants have reported no discomfort being interviewed by White researchers (Kerkorian et al., 2007). More than half of our interviews were conducted by African American researchers and the remaining administered by White researchers mostly indigenous to Mississippi. Therefore, we suggest the issue may be larger than the diversity of the

research team due to contradicting evidence suggesting certain African American populations may not be influenced by interviewer race (Kerkorian et al., 2007; Thompon et al., 1996).

Racial residential segregation is a major factor that influences interracial trust. A study reported that the longer individuals lived in a racially segregated neighborhood, the more diminished their trust was for 'outsiders' (Boyas and Sharpe, 2010). Racial residential segregation is typically more pronounced in nonmetropolitan and rural areas in the US (Lichter et al., 2007), which would likely be relevant to this population sample, located in the LMD region. Since our sample was largely African American with very small numbers of White participants, we interpret the finding of this study as an issue of a White interviewer and African American participant interaction dynamic. It may be that these issues are resolved by discussing trust/mistrust with participants, introducing the entire research team and providing biographical information about the research team to participants, as suggested by Mason (Mason, 2005). The original project was a community-based project, where researchers have deep and long-standing connections with the community, which may have mitigated any mistrust issues that may have been present.

Another potential explanation for these findings is social desirability bias, where respondents may provide information that represents socially acceptable behaviors which may not be their own (DeMaio, 1984). Telephone and personal interviews, as methods of data collection, have been found to be prone to social desirability bias. This is of concern in community-engaged health research as participants may be aware of each other's participation. On top of that, building rapport and trust within the community is paramount among community-engaged research principles (Campbell-Voytal, 2010), which naturally establishes relationships between researchers and participants. We have no way of examining social desirability bias in this group, however, it has been found to be more common among older women (Visser et al., 1989) and with lower socio-economic status (Visser et al., 1989), and older age (Deshields et al., 1995). For future studies social desirability can be examined through use of a social desirability scale.

Conclusion

This study is the first to our knowledge to examine whether race match influences dietary intake reporting and thus may influence assessment data used for comparison with health outcomes. Due to the purposive sampling method, these findings may not be generalizable to the broader US population but may be comparable to African American populations with similar cultural and historical backgrounds. This relationship should be examined in larger more representative samples with the addition of other confounding factors, including interviewer and interviewee BMI. If this relationship persists in larger samples, this may have important implications for research conducted in health disparate populations, particularly rural, Southern populations. Racial dynamics between researchers and participants should be considered in intervention protocol development to improve the quality of dietary data and strengthen the associations between diet and chronic disease prevention or health outcomes.

Conflict of interest statement

The authors report no conflicts of interest.

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