

Feasibility and Acceptability of Dietary Intake Assessment Via 24-Hour Recall and Food Frequency Questionnaire among Women with Low Socioeconomic Status



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ABSTRACT

Background Comprehensive evaluation of dietary interventions depends on effective and efficient measurement to quantify behavior change. To date, little is known regarding which self-reported measure of dietary intake is most feasible and acceptable for use in evaluation of the effectiveness of diet intervention studies among underserved populations.

Objective This research focused on evaluating feasibility and acceptability of two self-report measures of diet.

Design Cross-sectional.

Participants/setting Two interviewer-administered 24-hour recalls and a 110-item food frequency questionnaire (FFQ) were administered to both English- and Spanish-speaking participants (n=36) by native English- and Spanish-speaking research assistants. On completion of both dietary assessments, participants were interviewed regarding their preference of measure.

Main outcome measures Feasibility for completion of the dietary assessment measures was determined for contacts and retention. Acceptability of the measures was determined through responses to open- and closed-ended questions.

Results During the 5-month trial, 36 participants were enrolled; 29 completed both intake measures, and 26 completed both measures and the interview. Participants were mainly Hispanic/Latina (72%), with a mean age of 37.0 (\pm 7.6) years. Feasibility targets were met for contacts (1.9, 1.6, 1.8 contact attempts to complete each diet assessment measure with a target of \leq 2) and for retention with 89% and 91% completing two 24-hour recalls and the FFQ, respectively. Participants indicated both diet assessment methods were generally acceptable; both positive and negative comments were received for use of the FFQ.

Conclusion Dietary assessment with the use of 24-hour recalls or an FFQ can be feasible and acceptable among women with low socioeconomic status, although care should be taken to address cultural appropriateness in the selection of the measurement method.

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DIETARY INTAKE MEASUREMENT IS ESSENTIAL FOR both nutrition epidemiological and intervention research. No single dietary assessment method that measures true, usual intake in free-living populations is available to researchers.¹⁻³ Methods have been developed to provide an estimate of true intake, although none are free from measurement error. Diet records, 24-hour recalls, and food frequency questionnaires (FFQs) are the tools most often used to measure food and nutrient intake in research studies.^{4,5}

The 24-hour recall method was developed to measure food or nutrients consumed by an individual on 1 or more days.⁶ Benefits to use of 24-hour recalls include the ability to

estimate absolute rather than relative intake and their “open-ended” format, which does not limit participants in their responses regarding the foods they eat. Limitations of this method include individuals’ reliance on episodic memory (a person’s unique memory of a specific event⁷), error in representing usual intake (particularly if only a small number of days are captured), and other random error.⁸

FFQs were developed to estimate dietary intake over longer periods, and in full-length FFQs, individuals are asked to report the frequency of usual intake of approximately 100 to 200 foods, generally grouped by similarities in nutrient composition. FFQs have several applications in diet research. One common use is in large epidemiological studies in which

researchers measure average long-term dietary exposures within populations to rank individuals according to their level of nutrient intake to determine associations with health outcomes. Advantages of FFQs include lower relative cost and reliance on semantic (memory of general facts) rather than episodic memory. Limitations include error associated with estimation of individuals' absolute intake, participant burden associated with completion of often lengthy questionnaires, potential for decreased accuracy among participants who become bored or fatigued, potential for differential bias between those in the intervention group and those in control groups, and known systematic error.⁹

Given the current landscape of dietary assessment methods, there is no consensus on which method is most appropriate for measuring dietary change in intervention research. In one large systematic review, the use of 24-hour recalls and FFQs in intervention trials was examined, and investigators determined that both methods demonstrated differences in dietary intake with a similar degree of responsiveness.¹⁰ Which method is chosen is determined by a number of factors, including level of precision needed, research design, and cost. A number of additional factors may require special consideration when dietary intake is assessed in underserved populations, including individuals with low income and those who belong to racial/ethnic minority groups. These factors include the feasibility and acceptability of the measure. It is unclear whether FFQs or 24-hour recalls are equally feasible and acceptable to underserved populations. A review of intervention studies to measure change in fruit and vegetable intake among low-income and racial/ethnic minority populations revealed that for the nine intervention studies cited, six included a version of an FFQ and three included 24-hour recalls.¹¹ Additional research has sought to develop valid and acceptable measures of dietary intake among low-income populations in clinical settings, yet there is less research on the use of full-length FFQs and/or 24-hour recalls.^{12,13}

The objective of this study is to examine the feasibility and acceptability of two self-reported dietary assessment methods (a full-length FFQ and two 24-hour recalls) in underserved populations. Findings from this study can be used to guide future decisions about the most appropriate selection of diet intake assessment tools for use in intervention research.

METHODS

Participants

Participants were enrolled from the adult cohort (n=211) (English and Spanish-speaking women residing in 10 family public housing developments) of a parent trial that examined a 1-year environmental-level intervention.¹⁴ Data collection for the parent trial was completed by 2015. Recruitment began by accessing a list from the parent study containing participants' names, addresses, and primary spoken language. Flyers were mailed to participants from the parent study notifying them of the new study. Afterward, study staff conducted up to three home visits to enroll individuals. To be included in the current study, participants were required to be between the ages of 18 and 72 years; to live in public housing with no plans to move within the next 6 months; to be a participant in the parent study; and to be able to

understand English or Spanish sufficiently to comprehend the purpose, procedure, risks, benefits, and voluntary nature of the study, as well as to complete the surveys and provide information in either language. Participants provided oral consent as a waiver of documentation of informed consent was obtained. Recruitment ended after contact was attempted at least three times for all eligible participants. Participants received a \$10 gift card for each assessment they completed, up to \$30. This study was approved by the Boston University Medical Campus Institutional Review Board.

Design and Measurement/Assessment

Pairs of research assistants (at least one of whom was bilingual in Spanish and English) administered two dietary assessment methods on paper forms: (1) two interviewer-administered 24-hour dietary recalls and (2) one interviewer-administered FFQ (the Block FFQ 2005).¹⁵ The first batch of 24-hour recall intake data was collected within 30 days of enrollment. The second batch of 24-hour recall intake data was collected within 30 days of the first recall, and the FFQ intake data were collected within 30 days of the second 24-hour recall.

24-Hour Recalls. Study staff were trained in administering 24-hour recalls using a multiple-pass method.^{16,17} Interviews were conducted in each participant's preferred language. Staff used scripts, visuals, and other aids such as measuring cups and food models to assist participants. On completion of the 24-hour recall data collection, participants were asked to schedule a second 24-hour recall, and after the second 24-hour recall, an appointment was made for completion of the FFQ.

FFQ. Food frequency data were collected using the pre-printed, paper-based 110-item Block Food Questionnaire 2005 in a bilingual format.¹⁵ Research assistants administered the FFQ by reading the instructions and questions to the participants in either Spanish or English, depending on the participant's preference, and marked the participant's answers on the form. To promote accuracy and completeness of the survey, staff used a pictorial of serving sizes, provided by NutritionQuest as a companion to the FFQ, and a "flashcard" that contained the response options for "how often" reported foods were consumed.

Feasibility. To evaluate feasibility, research assistants noted on a tracking form whether the participant was home and willing to complete the interview; the number of contacts required to complete each diet assessment; the date and time of each visit; and the participant's response to each home visit.

Acceptability. After participants completed both the 24-hour recall and FFQ dietary assessments, they completed a structured interview conducted in their preferred language with closed- and open-ended questions designed to elicit feedback regarding the acceptability of each diet assessment method. The closed-ended questions asked participants directly which dietary assessment method they preferred. The open-ended questions were designed to elicit from participants what they liked or disliked about each dietary

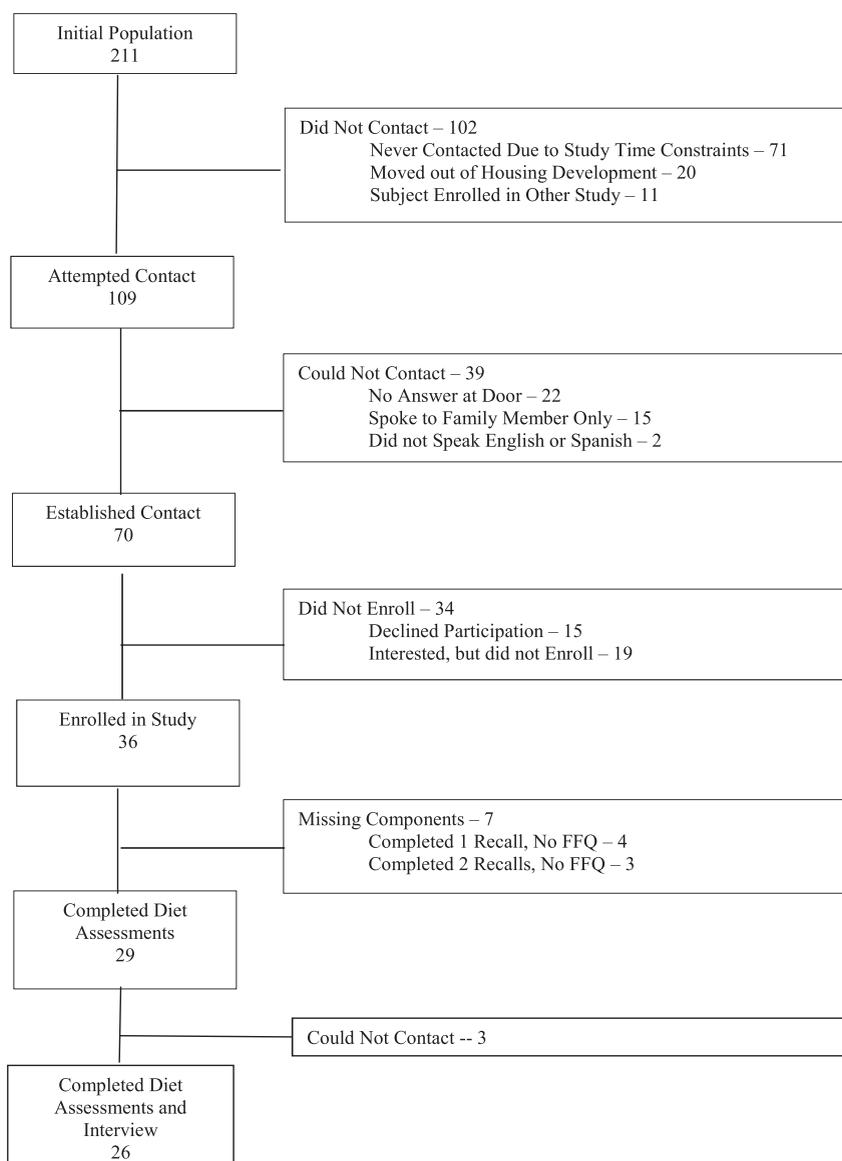


Figure 1. Diagram of participant flow through completion of two 24-hour recalls, the food frequency questionnaire (FFQ), and the interview for assessment of dietary intake method feasibility and acceptability.

assessment method (eg, “What did you like best [or least] about that/those interviews?”).

Demographics. Age, education level, and race/ethnicity were collected during the parent study (May through November, 2013) before the beginning of data collection for the present study.

Analysis Plan

Feasibility was determined quantitatively using two domains: number of participant contacts to complete the dietary assessment measures and participant retention.¹⁸⁻²⁰ Targets used to determine feasibility were obtained from the literature^{21,22} or were developed based on the authors’ collective research experience.²⁰ Feasibility of contacts was defined as the number of contact attempts required to

complete each of the measures (target ≤ 2 attempts). Feasibility of retention was defined as the percentage of total participants approached who completed two 24-hour recalls and the FFQ assessment measurements (target $\geq 70\%$).

Quantitative data for acceptability were analyzed for frequency of response to the closed-ended question regarding method preference and are presented using descriptive statistics (eg, “Which way of asking you questions about the foods you eat did you think was better?”). Qualitative analysis was guided by correspondence theory. In this approach, the researcher works from the perspective that there is a true reality that exists, and the collection and evaluation of the data are attempts to find that truth.²³ Responses to the open-ended questions were coded by hand by the first author (M.A.D.) using the interview question domains (primary codes) and then, for emergent themes, through repeated analysis of the content (secondary codes).²³ Reliability of

Table. Results of feasibility analysis for number of contacts needed and participant retention in a study of 24-hour diet recalls and food frequency questionnaire administration among women living in public housing developments

Contacts (n = 36)	n (%)
No. of attempts needed to complete recall 1	
1	13 (36)
2	12 (33)
3	11 (31)
Mean±SD ^a	1.9±0.8 ^b
Target	≤2
No. of attempts needed to complete recall 2	
1	19 (53)
2	11 (31)
3	6 (17)
Mean±SD	1.6±0.8 ^b
Target	≤2
No. of attempts needed to complete food frequency questionnaire	
0	5 (14)
1	11 (31)
2	11 (31)
3	9 (25)
Mean±SD	1.8±1.0 ^b
Target	≤2
Retention	
24-hour diet recall 1 completed	
Yes	36 (100)
No	0 (0)
24-hour diet recall 2 completed	
Yes	32 (89)
No	4 (11)
Food frequency questionnaire completed	
Yes	29 (91)
No	7 (19)
Subjects completing all three diet assessment measures	29 (81) ^b
Target	≥70

^aSD=standard deviation.

^bTarget met.

coding was evaluated by employment of a second coder (research assistant who was not involved in data collection) who independently coded the responses using the final codebook. A debriefing session was conducted between coders, which demonstrated an initial agreement in coding of 96% with resolution to agreement of discrepant codes after discussion.

RESULTS

A diagram of participant flow throughout the study is presented in [Figure 1](#). The study was conducted over 5 months (December 2014 through April 2015). During that time, a total of 36 participants were enrolled, and 29 (81%) completed both dietary intake assessment measures. Three participants could not be reached for the final interview to assess feasibility and acceptability. By design, all participants were low-income women who lived in public housing. Mean age was 37.0 (±7.6) years. Most participants were Hispanic/Latina (72%), followed by black/African American (17%). The majority of participants had a less than high school education (42%) or were high school-/GED-educated (28%). About half identified as Spanish-language speakers (58%).

Feasibility analysis for contacts and retention domains is presented in the [Table](#). For contacts, the number of attempts per dietary intake assessment measure required to complete that measure were met for the first 24-hour recall, the second 24-hour recall, and the FFQ (1.9±0.8, 1.6±0.8, and 1.8±1.0, respectively). For retention, the percentage of enrolled participants who completed two 24-hour recalls (32/36 or 89%) and who completed the FFQ (29/32 or 91%) met our threshold.

In terms of acceptability, 35% of respondents preferred the 24-hour recall dietary intake assessment, and 35% preferred the FFQ dietary intake assessment. The remaining 30% of respondents did not express a preference for one method over the other. A summary of the open-ended responses is presented in [Figure 2](#). Overall, participants liked the 24-hour recall diet assessment method. For many, the format was preferred because it contained fewer questions and was perceived as being more detailed. For many participants, completing the 24-hour recall method was enjoyable because it made the participants pay attention to and reflect on what they eat. A number of participants commented on the perceived accuracy in completing the 24-hour recall, saying they learned something from completing it. Learning for most participants was reported in the form of a better understanding of portion sizes.

Participant impressions of the FFQ assessment method were mixed. For participants who liked the FFQ, reasons expressed were that they liked the format (more choices) and/or they liked that the FFQ asked that them to reflect on their dietary intake over the course of a year. With regard to the FFQ, participants also commented favorably that they enjoyed talking about their food intake with the interviewer, and many participants stated that completing the FFQ helped them learn about their eating habits. Conversely, a number of participants expressed that they did not like the FFQ dietary intake measurement tool. A couple of participants indicated that they did not like the format, because questions about foods they did not eat were asked. Some participants stated that they did not like the length of time required to complete the FFQ. For some, it was too long, although others expressed that the tool was quick. Others stated that they did not like answering the personal questions associated with the FFQ (eg, "Do you smoke?").

DISCUSSION

We enrolled women living in public housing to evaluate the feasibility and acceptability of two dietary intake assessment methods (24-hour recall and FFQ). The results of our analyses

Process	Themes	Subthemes	Quotes
24-hour recall dietary data assessment method	Participants liked completing the 24-hour recalls	Liked the format	"It was the easier of the two because it had less questions and was easy to remember what I ate the day before compared to what I ate all year."
		Liked that it made them realize/pay attention/reflect on what they eat/ate	"It made [me] see what nutritious and non-nutritious foods [I] was consuming."
		Liked the time it took to complete the measure	"The timing was quick."
		Liked that the measure was "accurate"	"...with the FFQ, [you] may only have an item once in a year or had in previous years, but not the current year, so it [the FFQ] is inaccurate at measuring fluctuations in the diet."
	Participants learned from completing the 24-hour recalls	Learned about portion sizes	"...it helped me to worry about the measurement of the food and the amount."
FFQ ^a dietary data assessment method	Participants liked completing the FFQ	Liked the format	"more choices"
		Liked reflecting on their intake over the course of a year	"Makes you realize what you ate during the year...what types of food throughout the year."
		Liked the timing	"quick"
		Liked talking about food/intake	"I liked talking about food and about the ways I cook and what recipes I used."
	Participants did not like completing the FFQ	Did not like the format	"I didn't like that there were more questions about the foods I don't eat."
		Did not like the time it took to complete the measure	"too long"
		Did not like being asked personal questions (e.g., "Do you smoke?")	"I didn't like the personal questions...like if you smoke or drink."
	Participants learned from completing the FFQ	Learned about their eating habits	"...learn[ed] about both those foods I am eating and the foods I am not eating at the same time."

^aFFQ=food frequency questionnaire.

Figure 2. Summary of processes, themes, subthemes, and quotes developed from analysis of semi-structured interview data for acceptability of diet assessment methods (n=26).

were positive: we met our targets for both number of contacts to complete each diet assessment measure and retention. The majority of participants who gave consent and entered the study completed both diet assessment measures (80%), although with attrition, we did lose participants for the poststudy interview, which reduced our retention to 72%. Retention of low-income and/or underrepresented racial/ethnic minorities in research is often lower compared with other population groups.^{24,25} Our ability to retain our

enrolled participants for both dietary assessment measurements was promising and may be related to repeated contact by a small number of study team members who became familiar to our participants,²⁶ as well as the relatively short period during which this research was conducted (5 months).

Although literature on the feasibility and acceptability of diet assessment among low-income and racial/ethnic minority people is limited, our findings can be compared with some existing research. In one study, Toozee and colleagues²⁷

sought to develop a diet assessment tool for low-literacy, low-income populations.²⁷ These investigators asked participants to answer six closed-ended questions using a 4-point Likert scale to rate survey characteristics such as “difficult to answer,” “difficult to understand,” “enjoyable to answer,” and “length of time to answer” after they had completed three FFQs. They found that most participant assessment scores for each FFQ averaged lower than 2.0 (less favorable). Another study examined the feasibility and acceptability of web-based 24-hour recall dietary assessments in a group of white and African-American men and women.²⁸ Their results suggest that completion of dietary recalls using this method is both feasible and acceptable. Similarly, other researchers have evaluated smartphone dietary assessment methods, which may improve participant perceptions of measurement acceptability.²⁹

Our qualitative analysis extends the findings of previous research with the use of questions designed to evoke participant preferences when both 24-hour recalls and an FFQ are compared. For both the 24-hour recalls and the FFQ, overall, participants reported that they liked both methods and learned from completing the tool. Therefore, either method could be used in studies in which assessment of dietary intake is needed. However, there were indications that participants preferred the 24-hour recalls because the only negative comments relative to assessment method were in relation to the completion of the FFQ. Caution should be used in interpreting this finding because our respondent sample may be biased by dropout after completion of the 24-hour recall assessment method.

For the FFQ method, some participants reported that they did not like the format or the length of time it took to complete the tool. Negative comments relative to the FFQ also came in the form of participants reporting that they did not like being asked “personal questions. Personal questions were built into the FFQ we used in this study, although they were not a part of the 24-hour recall data collection. If personal questions had been included in the 24-hour recall data collection, we may have received similar negative comments about it. Others have also noted similar concerns from research participants of minority race/ethnicity backgrounds.^{30,31} They and others^{24,32} suggest that the personal nature of some of the information gathered is one reason that underrepresented groups may be hesitant to participate in research. Therefore, we caution against using unnecessary personal questions in dietary assessment research, or, if such questions are necessary, we suggest placing them at the end of the survey. For both methods, expressions that participants enjoyed discussing the foods they ate or that they were learning from the assessment indicate that these assessment methods may veer into intervention strategies. Thus, research staff will need to be adequately trained to follow standardized protocols to solely assess intake, while also maintaining good rapport with participants.

A few limitations to our study should be mentioned. First, our sample size was small. Therefore, more research is needed to determine the representativeness of our findings. Second, we did not systematically conduct 24-hour recalls on both weekdays and weekend days, as is preferred in dietary intervention research; thus, we cannot determine whether our findings are equally applicable across days of the week. Third, the bilingual Block FFQ we used was validated in a

Spanish-speaking population primarily composed of Mexican Americans. Although the FFQ may not have adequately captured the cultural foods eaten by our participants (many of whom were from other Spanish-speaking countries), we believe it is important to test the feasibility of a single FFQ, given that it might not be possible to use different FFQs for different populations within the context of intervention studies in public housing. Finally, because both 24-hour recalls and the FFQ were all assessed within a 90-day window, we cannot rule out some measure of learning bias as a result of repeated exposure to the measurement process. In future research, investigators should consider randomization of groups to receive either the 24-hour recall or FFQ measure first. This would also allow exploration of whether randomization might have influenced retention and acceptability. In the current study, by design, only those participants who completed the 24-hour recalls were approached to complete the FFQ.

Our research does include a number of strengths. Our use of both quantitative and qualitative methods contributes to a comprehensive assessment of feasibility and acceptability. In addition, conducting this study among women with low socioeconomic status from racial/ethnic minority groups contributes to our understanding of diet assessment in populations that are in particular need of diet intervention research.

CONCLUSION

Our results suggest that either dietary assessment method can be feasible with regard to participant contact and retention for observational and intervention research in a similar population. In addition, both dietary intake assessment methods were found to be acceptable, with generally positive perceptions about the 24-hour recalls and both positive and negative perceptions about the FFQ. Attention to cultural appropriateness, including the need to eliminate any extraneous personal questions, is warranted to enhance acceptability. Research teams should also be attentive to whether participants are using the diet assessment process as a learning opportunity and be prepared to address this concern. Future research should look to expand the development of dietary assessment tools that are valid for use in research that involves dietary outcomes in ethnic, low socioeconomic groups.

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STATEMENT OF POTENTIAL CONFLICT OF INTEREST

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