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Validity of a telephone-administered 24-hour dietary recall in telephone and non-telephone households in the rural Lower Mississippi Delta region

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ABSTRACT

Objective To determine if 24-hour dietary recall data are influenced by whether data are collected by telephone or face-to-face interviews in telephone and non-telephone households.

Design Dual sampling frame of telephone and non-telephone households. In telephone households, participants completed a 24-hour dietary recall either by face-to-face interview or telephone interview. In non-telephone households, participants completed a 24-hour dietary recall either by face-to-face interview or by using a cellular telephone provided by a field interviewer.

Subjects/setting Four hundred nine participants from the rural Delta region of Arkansas, Louisiana, and Mississippi.

Main outcome measures Mean energy and protein intakes.

Statistical analyses performed Comparison of telephone and non-telephone households, controlling for type of interview, and comparison of telephone and face-to-face interviews in each household type using unpaired t tests and linear regression, adjusting for gender, age, and body mass index.

Results Mean differences between telephone and face-to-face interviews for telephone households were -171 kcal ($P=0.1$) and -6.9 g protein ($P=0.2$), and for non-telephone households -143 kcal ($P=0.6$) and 0.4 g protein ($P=1.0$). Mean differences between telephone and non-telephone households for telephone interviews were 0 kcal ($P=1.0$) and -0.9 g protein ($P=0.9$), and for face-to-face interviews 28 kcal ($P=0.9$) and 6.4 g protein ($P=0.5$). Findings persisted when adjusted for gender, age, and body mass index. No statistically significant differences were detected for mean energy or protein intake between telephone and face-to-face interviews or between telephone and non-telephone households.

Applications/conclusions These data provide support that telephone surveys adequately describe energy and protein intakes for a rural, low-income population. *J Am Diet Assoc* 2001;101:216-222.

Dietary assessment is essential to understand the relationship between diet and health (1), and to interpret periodic nutrition surveillance (2), especially among high-risk subgroups such as low-income populations (3). Residents of the Lower Mississippi Delta region of the United States comprise a unique but virtually unstudied high-risk population with respect to nutritional health. This predominantly rural, traditionally agricultural region bordering the Mississippi River in Arkansas, Louisiana, and Mississippi has a high prevalence of poverty (4-6) and diet-related chronic diseases (5,7). Local data on nutritional status and nutritional health of this region are scarce because of lack of regional nutrition surveys. Therefore, the Lower Mississippi Delta Nutrition Intervention Research Consortium (Delta NIRI) was established to collect baseline data on the nutritional health of Delta residents to develop and evaluate sustainable nutrition interventions (5).

Initial nutrition assessment of Delta residents was composed of measurement of food intake. Although several methods are available to conduct dietary assessment, research has shown that the 24-hour dietary recall method yields useful estimates of mean intakes of nutrients for groups of persons (8). Having trained interviewers administer the 24-hour dietary recalls in face-to-face interviews using the multiple-

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pass approach (9) has been shown to limit the extent of underreporting. However, administering face-to-face interviews is expensive and can be logistically complicated particularly in rural areas (10). The validity of telephone interviews to collect data for various types of health surveys has been measured (11-13). For example, telephone interviews were sufficient for self-reporting of well-defined clinical conditions (14,15) but were unsatisfactory for self-reporting of sensitive habits such as smoking (16).

In addition to health interview data, telephone interviews also have been used to obtain dietary information (17-22). In a 1992 review, Fox et al (23) concluded that well-designed and well-administered telephone surveys are as good as—and perhaps better than—other methods of obtaining dietary information. However, there were differences in the populations sampled, study design, and whether comparisons were within-person or between-person. Further, none of these studies was done in a rural area with a large minority population. Also, the dietary assessment method used as the basis of comparison differed. Therefore, the applicability of these findings to the use of the telephone to administer 24-hour dietary recalls in low-income populations in rural areas such as the Lower Mississippi Delta remains uncertain.

One important concern about telephone interviews, especially in low-income populations, is noncoverage bias, that is, the impact of excluding non-telephone households on estimates of the health and nutrition factors under study. Some studies have shown that persons without telephones are more likely to have chronic health problems and poor health practices (10). Households without telephones also may differ with respect to diet and nutrient intakes. Therefore, the impact of excluding non-telephone households on estimates of nutrient intakes must be investigated (24).

The objective of this study was to compare 24-hour dietary recalls obtained by telephone or cellular telephone interviews with those obtained by face-to-face interviews in telephone and non-telephone households; and to compare 24-hour dietary recalls controlling for type of interview in telephone and non-telephone households in a sample of residents in the Lower Mississippi Delta. To our knowledge, this is the first study to validate telephone-administered 24-hour dietary recall data from a rural, low-income population composed of households with and without telephones.

MATERIALS AND METHODS

Sample

The Foods of Our Delta Study (FOODS) was designed to validate telephone-administered 24-hour dietary recalls in Chicot County, Ark, Madison Parish, La, and Yazoo County, Miss. Two sets of households were identified: telephone households using list-assisted random digit dialing (RDD) (25), and non-telephone households using area survey sampling (26). A non-telephone household was defined as a household with no working telephone. Following recruitment and identification of persons living in either household type, 1 adult and 1 child (if present) were randomly selected from within each household, and randomized to 1 of 4 groups where a 24-hour dietary recall was conducted by either a face-to-face or telephone interview. The number of households and participants in the 4 study groups are shown in Table 1. Participants from the sampled households had lived in the county (or parish) for at least 12 months.

Table 1
Number of households and completed 24-hour dietary recalls, by study group

	Telephone households		Non-telephone households	
	Telephone interview	Face-to-face interview	Cellular telephone interview*	Face-to-face interview
Households	65	73	64	66
Twenty-four-hour recalls ^b	97	103	105	104

*A cellular telephone was temporarily provided by the field interviewer during interview.

^bAdults and children.

Procedures

In the telephone households, participants who were randomized to telephone interview were telephoned again to complete the dietary interview after measuring guides were mailed to their home. Participants randomized to face-to-face interviews were interviewed by the field interviewer who came to their home. To locate non-telephone households, field interviewers conducted a door-to-door screen in randomly selected census blocks with relatively high rates of households without working telephones and recruited households to participate in the study. The participants from non-telephone households randomized to a telephone interview were interviewed using a cellular telephone temporarily provided by the field interviewer.

Personnel from the Westat Telephone Research Center conducted the telephone interviews. Face-to-face interviews were conducted by field interviewers who were local residents living near or within the sampled counties and parish. Both sets of interviewers received standardized training on using the multiple-pass methodology to obtain 24-hour dietary recalls: field interviewers received intensive training for the area survey sampling method, and telephone interviewers received extensive training in RDD interviewing.

Verbal consent to participate in the study was obtained from all participants at their initial interview contact. For minors, verbal consent was obtained from parents with the verbal assent of the child. Approval was obtained from the Institutional Review Board of each participating institution.

The 24-hour Dietary Recall Interview

Information on food consumption for the previous 24 hours was obtained using the multiple-pass methodology developed by the US Department of Agriculture (USDA) for the Continuing Survey of Food Intakes of Individuals (CSFII), 1994-96 (9,27,28). In the multiple-pass procedure, the respondent is first prompted to provide a quick list of items consumed; standardized probes from the CSFII Food Instruction Booklet (29) follow to elicit more detailed information on food eaten. Probes for foods common in the Lower Mississippi Delta were added to the CSFII Food Instruction Booklet. Measuring guides were used: a set of 3-dimensional measuring cups and spoons, a ruler, and a laminated 4-page booklet of 2-dimensional photographs and line drawings of common foods (30,31).

Dietary recall data were limited to intake on weekdays because of the tendency of most persons to alter eating patterns or not to be at home during the weekend. Interviews with

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Table 2
Demographic characteristics of adults and children, and mean nutrient intakes of all participants by study group

	Telephone				Non-telephone							
	Telephone interview		Face-to-face interview		Cellular telephone ^a interview		Face-to-face interview					
Adults	n	65	%	n	73	%	n	64	%	n	66	%
Sex												
Male	20		31	27		37	24		38	30		45
Female	45		69	46		63	40		63	36		55
Race/ethnicity												
African-American	39		60	43		59	57		89	57		89
White	26		40	30		41	7		11	7		8
Other	...		...	...		...	...		...	2		3
<12 years education	13		21	22		31	34		53	41		63
Age (yrs)												
20-39	27		42	27		37	41		64	31		47
40-59	25		38	29		40	15		23	22		33
≥60	13		20	17		23	8		13	13		20
Children		32			30			41			38	
Sex												
Male	18		56	17		57	18		44	14		37
Female	14		44	13		43	23		56	24		63
Race/ethnicity												
African-American	25		78	19		63	36		88	34		89
White	7		22	11		37	5		12	3		8
Other	...		...	...		...	...		...	1		3
Age (yrs)												
0-2	5		15	5		17	14		34	8		21
3-5	3		9	4		13	7		18	14		37
6-11	12		38	7		23	10		24	9		24
12-19	12		38	14		47	10		24	7		18
All respondents (adults and children)		97			103			105			104	
Nutrient intake	<i>mean ± standard error</i>											
Energy (kcal)		1,830±81		2,001±83		1,830±143		1,973±195				
Protein (g)		74±4		81±4		75±5		75±9				

^aA cellular telephone was temporarily provided by the field interviewer during interview.

Table 3

Mean differences for energy intake and protein intake between interview types within telephone and non-telephone households, and mean differences for energy intake and protein intake between household types using telephone or face-to-face interview

Difference in interviews	Telephone households		Non-telephone households	
	Mean difference Telephone—face-to-face	P value interview term	Mean difference Cellular telephone ^a —face-to-face	P value interview term
Total energy^b (kcal)				
Interview type (model 1)	-171	0.1	-143	0.6
Interview type, age, gender (model 2)	-132	0.2	-160	0.6
Interview type, age, gender, BMI (model 3)	-139	0.2	-143	0.6
Protein^c (g)				
Interview type (model 1)	-6.9	0.2	0.4	1.0
Interview type, age, gender (model 2)	-5.0	0.4	0.2	1.0
Interview type, age, gender, BMI (model 3)	-4.8	0.4	0.5	1.0
Difference in households				
	Telephone interview		Face-to-face interview	
	Mean difference Telephone—non-telephone ^a	P value household term	Mean difference Telephone—non-telephone	P value household term
Total energy^d (kcal)				
Household type (model 1)	0	1.0	28	0.9
Household type, age, gender (model 2)	2	1.0	-26	0.9
Household type, age, gender, BMI (model 3)	19	0.9	-7	1.0
Protein^e (g)				
Household type (model 1)	-0.9	0.9	6.4	0.5
Household type, age, gender (model 2)	-2.3	0.8	2.4	0.8
Household type, age, gender, BMI (model 3)	-0.6	0.9	3.4	0.7

BMI=Body mass index.

^aInterviews in non-telephone households conducted using a cellular telephone that was temporarily provided by the field interviewer.

^bMean energy intake telephone interview minus mean energy intake face-to-face interview.

^cMean protein intake telephone interview minus mean protein intake face-to-face interview.

^dMean energy intake telephone household minus mean energy intake non-telephone household.

^eMean protein intake telephone household minus mean protein intake non-telephone household.

children were conducted in the presence of a parent or guardian, who assisted with all interviews of children younger than 11 years. Additional information about foods eaten by children when away from home was retrieved from personnel at schools, day care centers, and from child care providers. Dietary intake data were coded using Survey Net; the CSFII computer-assisted food coding system (32). Nutrient analysis was conducted using the 1996 CSFII nutrient database (USDA Survey Nutrient Database, 1998, National Technical Information Service, Springfield, Va).

Statistical Analysis

The sample size of 90 persons in each study group was designed to detect a difference between groups of 0.50 standard deviation for mean energy intake and mean protein intake with a power of 0.9 (Type 2 error of 0.1). Data were weighted to reflect the probability of selecting persons within households,

and a screener nonresponse adjustment factor was used.

Differences in mean energy or protein intake between face-to-face interviews and telephone interviews were computed by 3 estimates: Model 1, simple unadjusted estimates; Model 2 regression model using age and gender, and Model 3, regression model using age, gender, and body mass index (BMI). Two sets of these estimates for each of the 3 models were computed: differences between means (interview type) within the telephone households, and differences between means (interview type) within non-telephone households.

Values for BMI (33) were included in regression models to control for differences in body size that might affect energy and protein intakes. BMI was computed from self-reported height and weight; missing values were imputed for 7% of the subjects using the 50th percentiles for age and gender for adults (34) for children aged 5 to 17 years (35), and for children under 5 years (36).

Differences between the mean energy and protein intake in telephone and non-telephone households were computed by 3 models (simple unadjusted; adjusted for age and gender; and adjusted for age, gender, and BMI). Two sets of these estimates were computed: differences between means of household types where both were interviewed by telephone, and differences between means of household types where both were interviewed face-to-face.

Analyses were performed by using WESWGT software (WESWGT SAS Macro, Version 2.0, 1997, Westat, Rockville, Md) to compute sample weights; WesVar software (WesVar Complex Samples, Version 3.0, 1998, SPSS Inc, Chicago, Il) to compute variances by the replication method with a jackknife approach to forming the replicate estimates (37); and WesVar software to compute descriptive statistics and regression analyses, which took into account the sampling design and adjusted variances accordingly.

RESULTS

Of the 321 telephone numbers that were sampled and determined to be residential numbers of households, 197 completed the household screen, yielding a response rate of 60%; 16 households were ineligible because of residency requirements. Of the remaining households, 138 agreed to complete the dietary interview, yielding 200 24-hour dietary recalls from adults and children (Table 1). In the area sampling survey to identify non-telephone households, 1,661 households were contacted, 153 were determined to be eligible non-telephone households, and 144 completed the household screen, or 95%. Of these households, 130 agreed to complete the dietary interview, yielding 209 24-hour dietary recalls (Table 1).

Gender, age, and educational level of participants completing the 24-hour dietary intake interview were similar (Table 2). Means (\pm standard error) for energy and protein are presented by study group using weights as previously described (Table 2).

Differences in mean energy and mean protein intakes for telephone interviews and face-to-face interviews were not statistically significant (Table 3). Lack of statistically significant differences between telephone and face-to-face interviews for mean energy or protein intakes persisted after adjustment for age and gender (Model 2), and after adjustment for age, gender, and BMI (Model 3).

No statistically significant differences were detected in the unadjusted comparison (Model 1) between the 24-hour dietary data collected by telephone interviews in telephone or non-telephone households (Table 3). Similarly, there were no statistically significant differences between dietary data collected by face-to-face interviews in telephone and non-telephone households. After adjustments for age and gender (Model 2), or for age, gender, and BMI (Model 3), the lack of statistically significant differences in energy and protein intake persisted (Table 3). Hence, this study yields no evidence that mean energy intake and protein intakes are affected by whether a survey is conducted by telephone or face-to-face in telephone or non-telephone households.

DISCUSSION

Assessing the nutritional health, food, and nutrient intakes of persons living in rural, low-income areas is extremely important in light of their risk to food insecurity, and limited access to and availability of nutritionally complete diets. Importantly, we have shown in this first validation study for telephone-

administered 24-hour dietary recalls concentrated in a low-income rural population in the Lower Mississippi Delta, that telephone surveys may adequately describe mean energy and protein intakes for a rural, low-income population. This conclusion is based on the findings in this validation study that mean energy and protein intakes reported by 24-hour dietary recalls obtained by telephone interview did not differ significantly from those obtained by face-to-face interview. Moreover, energy and protein intakes reported in telephone households did not differ significantly from those reported in non-telephone households. These findings also provide support for the use of telephone surveys to obtain dietary data and that the exclusion of non-telephone households will have little or no effect on estimated mean intakes.

The validity of administering 24-hour dietary recalls by telephone has been examined by several investigators, but the design, target-population, and gold standard reference have differed slightly from those in this study. In agreement with our findings, Posner (38) reported that nutrient intakes from 24-hour dietary recalls obtained by telephone interview were similar for low-income elderly persons compared with a similar group from the 1971-1974 National Health and Examination Survey. However, data for the comparison group were collected approximately 5 years before that collected by telephone interview. Likewise, findings from several studies that used a pairwise design (telephone and face-to-face interview of 24-hour dietary recalls both administered to each subject) agree with findings from our study. Galasso et al (21) concluded that multiple telephone and multiple face-to-face interviews of 24-hour dietary recalls from 49 Italian women were equivalent. Several other studies used the paired design. In those studies 24-hour dietary recalls were found to be consistent with 13-day food records from 40 adolescents (17), 3-day food records as records as recorded by parents from 32 children (39), and direct observations of foods eaten in a college dormitory from 107 college students (20). Two studies that validated the use of telephone interviews for other dietary data collection methods (not 24-hour dietary recalls) involved telephone self-report by 159 elderly subjects for their mid-day meal eaten at a congregate feeding center compared with direct observation (18), and telephone response to food frequency questionnaires compared with face-to-face administered food frequency (19). These latter studies also reported that telephone methods had satisfactory agreement with selected reference methods.

In addition, our results are consistent with those from a similar and recently published study by Casey et al (40). In their study, 700 telephone-based 24-hour dietary recalls from women aged 20 to 49 years were compared to 540 24-hour dietary recalls from women (20 to 49 years) interviewed face-to-face in the 1994-1996 CSFII survey. They found no significant differences in the food group data for all years of 1994-1996 CSFII data, and no significant differences between the telephone survey and 1996 CSFII results. These authors concluded that collecting 24-hour dietary recalls over the telephone is a practical and valid data collection tool for use in national food consumption surveys.

A few limitations were present in this study that may affect the generalizability of the results. First, the data were collected from a sample in 3 counties. The response rates were lower in the telephone households consistent with the normal tendency for telephone surveys to have lower response rates than face-to-face interview. Data from our study add to the knowl-

edge regarding dietary assessment methodology and the use of telephone surveys to collect dietary data. In conclusion, our findings support the hypothesis that telephone surveys adequately describe mean energy and protein intakes for a rural, low-income population.

APPLICATIONS

- The use of telephone surveys may adequately describe mean energy and protein intakes for a rural, low-income population. This is an important finding because use of telephone interviews increases access to remote and rural areas.
- There were no statistically significant differences between the telephone and non-telephone households, regardless of interview type. To our knowledge, this is the first study designed to collect and compare dietary data and methodology between telephone and non-telephone households, and it contributes to our knowledge and understanding of dietary methodology.
- The efficacy of this study was increased by the use of the multiple-pass method, interview techniques, and database from a nationwide survey, as well as adaptation to food probes and recipes that were needed to address specific regional language, literacy, recipes, and food patterns.

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RESEARCH

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