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SELF-ADMINISTERED FOOD FREQUENCY QUESTIONNAIRE FOR WOMEN WITH LOW LITERACY SKILLS: A STUDY OF ALTERNATIVE INSTRUCTIONS AND RECORDING TECHNIQUES

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ABSTRACT

SELF-ADMINISTERED FOOD FREQUENCY QUESTIONNAIRE FOR WOMEN WITH LOW LITERACY SKILLS: A STUDY OF ALTERNATIVE INSTRUCTIONS AND RECORDING TECHNIQUES

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This study determined if the design of a self-administered food frequency questionnaire (FFQ) used to determine program eligibility for low-income low literacy applicants, e.g. WIC program, affects response accuracy. Six FFQ treatments were developed based on low literacy literature and expert advise to test two types of instruction and three recording techniques. Response consistency was addressed by comparing food category scores on a self-administered FFQ to scores on the same form completed during an interview by a registered dietitian. From six local WIC agencies, 144 English speaking pregnant adult participants were randomly assigned to one of these six treatments. Fifty-eight percent of subjects read $\leq$ 8th grade. ANCOVA revealed no significant difference between response accuracy based on instruction type, recording method or interactions. Response accuracy on self-administered FFQs is not affected by instruction type or recording method when FFQ design incorporates low literacy recommendations.

ACKNOWLEDGMENTS

Although this project turned into a thesis, appropriate dietary assessment tools for the WIC Program have been a topic of discussion even before 1987 when I was contracted as Nutrition Consultant for the WIC Program by the Michigan Department of Public Health. A mock-grant proposal developed during a dietary assessment course led to an idea for a food frequency study.

In November 1988, federal interest in the study led to an award of $18,500 by the Midwest Regional USDA Office to validate a food frequency questionnaire for the Michigan WIC Program. Due to a reorganization of the State WIC Office and staff energy redirected to switch to a new computer system, the project lay dormant for the next seven months.

Thanks to the National WIC Office, I was asked to present plans for the project during a meeting of the National WIC Task Force on Dietary Assessment, July 25-26, 1989. The two days of discussions not only renewed my energy for the project, but I left the meeting feeling a need to look at whether or not the design of a self-administered food frequency questionnaire impacts on the accuracy in which a low literacy population self-reports the data.

At that point, the project took a new focus and the Michigan WIC Office committed 8-16 hours per week of my time to pursue the attached project. Without this funding by the Midwest Regional USDA Office and additional funding and time commitment by the Michigan Department of Public Health (MDPH), this project would not have been possible.

Another important factor in the success of this project was the guidance from faculty of Michigan State University. Through their teachings, I gained the skill and the confidence to carry out this project. My faculty advisor, Judith V. Anderson, Dr. P.H., R.D. was always there when I ran across hurdles or was not sure if I was on the right track. Her empathetic and encouraging words kept me going the entire way. Thanks to my committee members, Sharon Hoerr, Ph.D., R.D., Jenny Bond, Ph.D., R.D. and Steve Yelon, Ph.D. who helped me work through three different angles before the project began to take shape. Additional thanks

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A project with resources and a workable design does not make it off the mark without the help of people in the field. Valuable input into the layout and design of the instructions and questionnaires was gained from the following teachers of Lansing Adult Education, Lansing MI: Mary Ann Mansour, GED teacher; Jacquie Foss, Reading Specialist; Lorraine Lacourse, Adult Basic Education I & II; and Bob Olsen, Adult Basic Education II.

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The geologic clock of state government could have meant disaster for the project timeline had it not been for my supervisors Marian Van Nierop and Diane Revitte at the Michigan WIC Office. When it looked as though time was not going to be allocated for the project, they helped to get that approved. When I needed assistance in getting approval to contract for the interviewer positions, writing position descriptions and contracts, interviewing for the positions, figuring out a way to use the project money to reimburse subjects, they were there to guide me in the right direction. Many thanks to Diane and Marian whose technical support and ongoing encouragement were key in completing

this project in only nine months. (It hardly registered on the geologic clock!)

Final thanks to my husband Lyn and to my family and friends for helping me experience some of the joys in life other than working full-time, taking classes and coordinating this project.

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INTRODUCTION

The purpose of this project is to determine appropriate designs of a self-administered food frequency questionnaire (FFQ) to assess the dietary intake of women with poor reading skills, especially those applying to the WIC[1] Program during a pregnancy.

Fifty percent of the WIC population may be functionally illiterate (i.e. reading below an 8th grade level) according to Gloria Grady Mills (1989), Statewide Literacy Coordinator for Michigan. The patients and clients seen by nutrition and health professionals "often have reading abilities at the 6th grade level or lower" (Nitzke, 1989).

Sixty-seven percent of State WIC agencies use a self-administered dietary assessment tool (U.S. Department of Agriculture, 1988) due to limited staff time (U.S. Department of Agriculture, 1989). According to National WIC Standards, eligibility for the Program based on dietary risk must be determined from information gathered with a food

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[1] WIC stands for the Special Supplemental Food Program for Women, Infants and Children. Enrollees must have an income $\leq$ 185% of poverty and a medical and/or nutritional health risk to qualify for the Program. Program benefits include nutrition education, coupons for nutritious foods and referrals to other health care and assistance providers.

frequency questionnaire (WIC Focus on Management, 1988). In order for a FFQ to be self-administered to the majority of WIC applicants, the FFQ must be designed for an adult reading at a 6th grade or lower reading level.

Although such an instrument is desirable, a food frequency instrument for poor readers does not exist, based on the literature and discussions with WIC Nutrition Administrators and National level staff (U.S. Department of Agriculture, 1989).

Determining appropriate designs for a FFQ for women with low literacy skills will provide national, state and local agency WIC staff and researchers with information that may improve the reliability and validity of questionnaires developed to assess the dietary intake of women with poor reading skills (Talmage, 1981).

PERTINENT LITERATURE AND THEORY

The adequacy of an individual's dietary patterns is considered when eligibility for the WIC program is determined. Dietary patterns may be established by reviewing either the actual or the usual intake of an applicant. Specific intake gathered with a 24-hour recall or 3-day record, does not account for individual variability of food consumption (Basiotis et al., 1987; Beaton et al., 1979; Sempos et al., 1985). A measure of usual intake, such as obtained by a food history or food frequency, presents a more representative picture of dietary patterns because intake over a longer period of time is assessed. When the usual dietary intake of an individual is desired, several researchers support the use of food frequencies over other methods (Block et al., 1986; Hankin, 1986; Karbeck, 1987; Willett et al., 1985).

Food frequencies are tools used to estimate how often an individual consumes "most frequently used types of food" over a specified time period (Smiciklas-Wright et al., 1984). The tool is usually designed to be either self-administered or administered by a trained interviewer. To meet the resource needs of the WIC program, a self-administered questionnaire is necessary.

Literature is lacking that specifically addresses how to design a self-administered food frequency questionnaire for a semi-literate population. In lieu of this, to establish the approach to take with such a questionnaire, a review of the literature will focus on the food list and recording methods of a self-administered food frequency questionnaire and techniques to increase the readability of print materials. The following sections will address:

- The food frequency questionnaire as a self-administered dietary assessment tool, and
- Designing a food frequency questionnaire to enhance readability.

Food Frequency Questionnaire as a Self-Administered Tool

Food list. The purpose of a food frequency tool determines which foods are listed on the questionnaire and the length of the list. Often the purpose of the questionnaire is to gather information about an individual's consumption of one of the following: a) foods from certain food groupings (Axelson et al., 1983; Mullen et al., 1984); b) specific nutrients of interest (Hankin et al., 1983; Willett, 1987); c) food groups and specific nutrients of interest (Chu et al., 1984; Thompson et al., 1987); d) energy (Flegel et al., 1987) or e) the total diet, energy

and specific nutrients (Block et al., 1986; Morgan et al., 1978; Pietinen et al., 1988; Willett et al., 1987).

The length of a food frequency questionnaire is also dependent upon its purpose. According to Byers et al. (1985, page 47),

> if the purpose is to generate a point estimate of actual level of intake of a number of foods or nutrients, then the list of foods included in the questionnaire will need to be extensive . . . (if the) need is simply to represent variance among study subjects with regard to intake of a nutrient, the required number of the foods will be considerably smaller.

The initial draft of the list is commonly determined with input from an experienced dietitian (Samet et al., 1984; Willett et al., 1985). The next step, which is the first step for some, is to use a reference standard. Standards used include HANES food group classifications (Stuff et al., 1983), USDA Handbook No. 8 and Dietary Nutrient Guide (Mullen et al., 1984), and population based dietary intake data (Block et al., 1986; Hankin, 1986; Willett et al., 1987). Items are chosen for the list because of the significant contribution made to the foods and nutrients of interest for the average individual (Block et al, 1986; Hankin, 1986). Additional food items may be added if they have suspected health implications (Block et al., 1986; Willett et al., 1987), are important for geographic or ethnic groups or without which a few people would be misclassified (Block et al., 1986). Pretesting or pilot testing of the food frequency questionnaire was used by some

researchers to modify food items that caused difficulty for respondents (Block et al., 1986), to ensure the list was representative of the regional food habits (Mullen et al., 1984) and to remove foods which did not add appreciably to between person validation in food intake (Willett et al., 1987).

According to Krall et al. (1987, page 1376), a respondent's memories about foods eaten can be cued with the food list. "The name of an individual food, e.g. 'orange' is a specific cue and should elicit a response more readily than simply the category name 'fruit'".

To prevent over reporting of a food item, when foods are eaten both alone or as part of a mixed dish, only the single food items should be listed (Samet et al., 1984). Jain et al. (1982) discovered respondents were over reporting fat intakes because they reported both added fat and fats used in cooking. It was hoped this could be corrected by "rearranging the added fat line, immediately after the intake of items that have the fat added instead of toward the end . . . (of the) questionnaire (Jain et al., 1982, page 934)."

Another factor to consider is whether to group foods together or list them singly on a line of the questionnaire. Block et al. (1986) use the following criteria for grouping or keeping foods separate: similarity of the foods to the respondent, usual portion size and similarity of nutrient

content, whether the food is important to classifying the nutritional risk of the client, and number of persons who would be misclassified if the food is not included.

In summary, the food frequency food list is constructed based on the purpose of the questionnaire. It should reflect foods commonly eaten by the population, in this case WIC program applicants, and foods that are significant contributors of the food groups of interest. Accuracy of the information supplied by the applicant can be improved through the manner in which foods are listed on the page.

Recording Methods. The self-administered food frequency questionnaire requires an individual to record how often she/he consumes particular food types. A variety of recording methods are employed on self-administered food frequency questionnaires. A respondent is often asked to indicate her/his usual intake for a time period combination, such as: 1) "day or week", 2) "day or week or month", or 3) "day or week or month or year". "Rarely/never" is an option commonly included with these combinations. A variation to this approach is to use a mixture of time period categories within a questionnaire, for example "per day or per week" for foods usually consumed frequently and "per day or per week or per month" for other foods (Pietinen et al. 1988). Another alternative is to specify a range of options within

a time period, such as 1 per day, 2-3 per day, 4-5 per day and 6+ per day (Willett et al., 1987).

The technique to indicate a response can range from recording a number (Block et al., 1986; Mullen et al., 1984), shading in a circle (Willett et al., 1987), circling a number (Pietinen et al., 1988), recording a number from a code list (Smith-Barbaro et al., 1982) and placing a mark (X) in the appropriate box (MDPH, 1988).

A portion size assessment is important for at least some age-sex groups and nutrients, according to Block et al. (1986). Recording methods on some self-administered food frequency questionnaires require the respondent to estimate typical portion size or estimate frequency of intake of a specified portion size. A respondent may be requested to estimate if her usual serving size is smaller or larger than the listed medium serving (Block et al., 1986). The respondent may be asked to estimate the serving size after viewing a set of pictures as a reference (Jain et al., 1982)(Pietinen et al., 1988). Another approach is to specify a food amount on the questionnaire and then request the frequency that the food amount is consumed (Willett et al., 1987). Willett et al. (1987) lists portion sizes commonly used by respondents when possible. Examples would be one slice of bread or 8 ounces (1 cup, 227 ml) of milk. Diet records of 173 women (Willett et al., 1985) were used

to characterize foods without common portion sizes such as string beans or ice cream.

It has been recognized that respondents in general often have difficulty in estimating portion size. An inability to correctly judge the portion size at the time it was consumed may result in distorted reports of the amounts of food eaten. Dwyer and colleagues (1987) reported that the degree of value perceived in an object or event can affect the systematic overestimation or underestimation of stimuli recalled from the past.

Hunter et al. (1988) found when weighed food records for 194 subjects were analyzed for 68 commonly consumed foods, the within-person variance in portion size exceeded the between-person variance for all but seven items. Hunter stated that this may have accounted for the difficulty some people have in estimating "usual" portion size. The conclusion of this research was that giving a specified portion size may help clarify questions for respondents, if the portion amount approximates the norm for the study population.

Block et al. (1986) has used a standard medium portion to produce accurate estimates for the female population, excluding young and elderly women. Block et al. (1986) emphasized the importance of using serving size standards that reflect the portions typically consumed by a population instead of convenient standards, such as one-half cup. The

portion sizes used by these investigators were decided using the distribution of actual portion sizes of 11,658 NHANES II respondents. The median size was determined along with small and large portions for different age-sex categories. This information could be used to analyze a diet using a computer program to reflect age and sex differences.

Suiter et al. (1989) deleted most of the portion size information following pretesting of a prenatal food frequency questionnaire with 73 low income pregnant women identical to the target population for the WIC program. These investigators found that indicating portion size to the right of the food item appeared to increase the reading time required by a substantial number of subjects who were reading word by word. In this study, post-test questioning revealed that such portion size information was not generally used. For calculation purposes, Suiter and colleagues assigned portion sizes to each food item primarily on the basis of median portion size as discussed by Block et al. (1986).

The questionnaire may include a list of questions in addition to the food frequency section. Added questions might focus on brand of breakfast cereal, amounts of bran and sugar added to foods, vitamins (Willett et al., 1987); restaurant foods, consumption of skin on chicken or fat on meat (Block et al., 1986); type of fat used in cooking or at the table (Block et al., 1986; Willett et al., 1987); or an

open ended question to allow a respondent to record frequently eaten foods that do not appear in the food frequency section (Block et al., 1986; Jain et al., 1982; Willett et al., 1987).

In summary, the recording method of a food frequency questionnaire includes a means to report the frequency a food is consumed and often a section related to portions. The literature does not indicate an appropriate recording method for respondents with poor reading skills.

Designing A Food Frequency to Enhance Readability

From a review of dietary assessment literature, Medlin and Skinner (1988) concluded research is needed on "data collection techniques that are appropriate for population segments of varying age, educational levels and literacy in English." Before beginning research on dietary data collection techniques for varying literacy levels, a review of the literature about developing print materials for poor readers is helpful.

Because a food frequency questionnaire does not include sufficient written text, it is not possible to check the reading level of the questionnaire with readability formulas [i.e. Fry Readability Graph (Fry, 1968; Fry, 1977) and the SMOG Grading (McLaughlin, 1969)].

Lettering and Page Layout. Considerations for laying out a page of print materials for semi-literate audiences are addressed by Doak et al. (1985), Nitzke et al. (1986a), Nitzke (1989), Smith et al. (1988) and Sticht (1975):

Lettering -

- Use larger point type or lettering, such as 12 or 14 point.
- Stick to a serif type style, for example Times Roman font, instead of very simple or very fancy lettering.
- Use the same type style throughout a printed page.
- Use capitals and lowercase letters, instead of capitalizing all of the letters in words.
- Highlight with circles, arrows or underlining, rather than all bold, italics or capitals.

Page Design -

- Keep headings simple.
- Use lots of white space to separate and surround the copy. Nitzke et al. (1986a) aimed for 1/2 of each page as white space.
- If illustrating how to complete a step, keep all photos and drawings related to the step on one page or opposing pages so all of the illustrations can be seen without turning the page.
- Use bright colors (Nitzke et al., 1986a).

- Sharp contrasts between ink and paper colors are preferable for ease of reading (Doak et al., 1985).
- Keep right margins jagged, rather than right justifying the margins.

Food List. Doak et al. (1985) made several suggestions when visuals are chosen for poor readers:

1) Simple line drawings are often more effective than any other format.
2) Increasing the number of colors will not increase comprehension. Use the fewest colors consistent with the essential message of the visual. In most cases, simple black and white drawings that show shape and texture are suitable.
3) Pretest the illustration with clients. Comprehension of visuals depends on the viewer's logic, language and experience.

Instructions. Recommendations on writing text for the low literacy population can be applied to writing instructions on completing the food frequency. Words included in the instructions should all be necessary (Sticht, 1975). Nitzke (1989, page 21) recommends,

> As a general rule, sentences should be short and simple, but shortening sentences can be overdone. A series of very short sentences can appear monotonous, childish and choppy ... a longer sentence is sometimes easier to understand than two short sentences because connecting words add cohesion to the flow of information.

A successful technique to convey messages is using the statements made by peers of the target population as the text (Nitzke et al., 1986b).

Sticht (1975) suggested presenting instructions in the sequence they are to be performed. This applies to pictures, paragraphs, sentences and phrases within sentences that relate to the instruction (Sticht, 1975). In order to accomplish this, Sticht recommended using task analysis to determine the sequence a respondent will go through to complete the questionnaire. The significant points should then be pretested with the prospective user.

Doak et al. (1985) offered other suggestions:

- Write complete sentences and avoid abbreviations.
- Use personal pronouns (e.g. you) rather than the impersonal.
- Do not use nouns made from verbs.
- Use active voice.
- Avoid having the meaning of the sentence rely on a single word, especially when it changes the meaning from negative to positive or vice versa.
- Use direct positive statements.
- Use words consistently.
- When appropriate, use advanced organizers such as headers or other clues to alert readers as to what is coming and to focus on the intended message.

In addition to specific suggestions on writing for the semi-literate, Doak et al. (1985) found that persons with poor reading skills may follow instructions literally because they may not have developed skills for analyzing instructions then translating the information into a behavior or problem solving skills which draw on inferences and previous experience. Doak et al. also determined persons may have limited vocabulary even for common words used in instructions.

Gunning (1952, page 144) explained limited vocabulary: "the reader's personal experience is not only the sole means he will use, it is the sole means he can use to give your words meaning".

In summary, many of the quidelines for writing print materials for the poor reader can be applied to the lettering, page design and instructions of a self-administered food frequency questionnaire.

DEFINITIONS

A food frequency questionnaire that is given to a subject without any verbal review of the written instructions is referred to as written only instructions. Written plus verbal instructions refer to a verbal review of all of the written instructions followed by a demonstration on completing the questionnaire and a check that the subject can complete the questionnaire on her own.

A recording technique refers to the manner in which a subject records the frequency she/he usually consumes a specified amount of food named on the questionnaire. For example, writing the number; circling the number; or marking the box to correspond to how often the food listed is eaten.

Accuracy is defined as the difference between food category scores on an interview administered food frequency questionnaire gathered from the subject by a registered dietitian and the scores on the same form of the questionnaire self-administered by the subject.

SIGNIFICANCE

In the WIC setting, food frequency information is gathered by either interview-administered or self-administered questionnaires. When applicants can self-administer a food frequency questionnaire, staff time is saved, thus allowing for additional applicants to be screened for the program and more nutrition education services to be provided to program participants.

In most instances, the food frequency information gathered from a subject by a registered dietitian would be the ideal in a WIC setting. If the information gathered by a self-administered food frequency questionnaire was comparable to the information a registered dietitian could gather, then a self-administered questionnaire would be a more efficient means of gathering information, because the interviewer could see more applicants in the same time period.

Based on the literature, the self-administered food frequency questionnaire is an appropriate dietary assessment method to use when determining an applicant's eligibility for the WIC program. The effectiveness of using such a tool, however, will depend on how well the tool can be completed by the majority of WIC applicants.

RESEARCH QUESTIONS

A food frequency questionnaire is composed of three major parts: the food list, recording method and instructions. A review of the literature provides some guidance in developing the food list and writing the instructions, but it is not clear which recording technique and type of instructions will provide the most accurate information on a self-administered food frequency questionnaire to be used by a low literacy population. To address this problem, this study focused on the following three questions:

1. Does the type of instruction, written only or written plus verbal, provided with the administration of the food frequency questionnaire, affect the subject's accuracy in self-administering the questionnaire?

2. Does the type of recording technique on the food frequency questionnaire affect the subject's accuracy in filling out the questionnaire?

3. Does the interaction between the type of instruction and type of recording technique affect the accuracy in which

subjects self-administer the food frequency questionnaire?

METHODS

Subjects

A total of 144 pregnant women participated in the study. Twenty-four subjects were obtained from each of six Michigan WIC agencies, three urban and three rural. The site selection process was not random. Sites were chosen if the agency served over 100 White or Black pregnant adult women, were within a 1-2 hour driving distance from the state WIC office, had a private room available for interviews and consented to allow the study to take place in their clinic over a two month period.

Pregnant women who were Caucasian or Black, 18 years of age or older, used English as their primary language and did not have any medical situations affecting their diet were asked to participate in the study. The race and age criteria were chosen because this subject population represented 95% of the pregnant women enrolled in the Michigan WIC Program (WIC Division, March 1989).

Potential subjects were approached after they were randomly selected from the clinic schedule book on coupon pick-up days using a predetermined procedure (see Appendix A). Women who met the prescreening criteria and consented to participate were grouped based on race-ethnicity (Caucasian and Black), then randomly assigned to one of the

six treatment groups. Blocking of subjects by race was chosen to reduce the chance of bias being introduced due to the differences of race-ethnicity between the subjects and the interviewers. Thus, each treatment group consisted of the same number of subjects from each of the racial groups for a total of 24 subjects exposed to a treatment (Table 1).

Table 1: Number of subjects assigned to treatment groups.

	Recording Technique		
Instructions	Write the Number	Circle the Number	Mark the Box
Written only	24	24	24
Written plus Verbal	24	24	24

Grade-equivalent reading level was determined using the reading test from the Wide Range Achievement Test (Jastak et al., 1984). The interview also included questions about month of gestation, previous exposure to the WIC Program and grades completed in school.

As compensation for completing the tasks of the study, subjects received $5.00. All subjects involved in the study completed an informed consent form (Appendix B). Informed consent procedures were approved prior to use by the Human Subjects Review Committees of Michigan State University and the Michigan Department of Public Health (Appendix C).

Research Design

Two experimental variables, recording technique and instructions, were tested. The recording technique variable had three levels, 1) write the number, 2) circle the number, and 3) mark the box. The two levels of the instruction variable were 1) written only, and 2) written plus verbal. For each recording technique tested, there were a written only and written plus verbal set of instructions. Hence, there were a total of six treatment groups:

1) Write the number, written only
2) Write the number, written plus verbal
3) Circle the number, written only
4) Circle the number, written plus verbal
5) Mark the box, written only
6) Mark the box, written plus verbal

A measure of criterion validity (Talmage, 1981), established which of the three food frequency recording techniques and two types of instructions were most appropriate to use when self-administering a food frequency questionnaire with the Michigan WIC Population. Criterion validity was determined by comparing a standard to the subject's reported frequency of food consumption on a self-administered questionnaire. In this study, the standard was the information gathered by interview administering the same food frequency on a clean form to the subject by a registered dietitian. Every completed questionnaire had servings per week scores computed for each of these food categories: 1) milk and cheese, 2) meat, poultry, fish and dried beans, 3) vegetables and fruit, 4) citrus, 5) deep

green - deep yellow vegetables and fruit, and 6) bread and cereal. The food category scores obtained on a subject's self-administered questionnaire were subtracted from the scores computed on the interview-administered questionnaire resulting in a difference in scores number (e.g. interview-administered milk/cheese score minus self-administered milk/cheese score = difference in milk/cheese scores number). Next, for each food category, the equation mean difference score for all subjects in a treatment group was computed; then the six treatments were compared statistically.

Materials

Food Frequency Questionnaire Development. Three food frequency questionnaires were designed for this project each with a different technique for recording a response (Appendix D). The food list was the same on each questionnaire. The instructions were similar in that they contained the same information with different words to identify the recording procedure. A discussion of the procedure and considerations made in designing the food list, recording method, instructions and page layout of the questionnaires follows.

Criteria for questionnaire. The Michigan WIC Program needed a food frequency questionnaire to assess and compare an applicant's dietary patterns to pre-established

eligibility criteria to determine if the applicant was eligible for the WIC Program based on inadequate diet. The eligibility criteria used in Michigan were based on the Suggested Daily Eating Guide published in Basic Nutrition Facts (Anderson et al., 1989). During a review of Michigan's dietary eligibility criteria by State WIC Program Staff and the Investigator, it was agreed the hand scored self-administered food frequency questionnaire more appropriately screened for intake of foods from food categories rather than for specific nutrients. For example, intake of deep green and dark yellow vegetables and fruits was a more realistic criteria than Vitamin A because other sources of Vitamin A were not considered (i.e. eggs, milk, liver, etc.). Other eligibility criteria affected for this same reason were milk and cheese instead of calcium, citrus versus Vitamin C and meat, poultry, fish and dried beans rather than protein. To make scoring computations easier, State WIC Program Staff agreed the criteria could be converted from servings per day to servings per week, i.e. from <3 servings per day to <21 servings per week. The proposed revision to Michigan's dietary eligibility criteria for pregnant women by State WIC Staff necessitated a food frequency questionnaire that assesses for servings per week of foods from each of six food groups (Appendix E). Thus a useful food frequency questionnaire must supply appropriate

information for comparing the applicant's usual dietary intake to the eligibility criteria.

A FFQ feasible for the Michigan WIC Program needed to meet the following criteria (U.S. Department of Agriculture, 1989):

- could be self-administered by the applicant in 5-10 minutes.
- did not overwhelm the applicant.
- required minimum conceptualization by the applicant (i.e. did not request both frequency and portion size information).
- could be used to appropriately assess an applicant's dietary intake to the dietary eligibility criteria for the WIC program.
- could be hand scored in 1-2 minutes (did not require a computer for data analysis).

Development. For this project, a food list was created through a series of steps. The food groups listed in the Suggested Daily Eating Guide of Basic Nutrition Facts (Anderson et al., 1989) established the categories of foods to appear on the questionnaire. The six categories were milk and cheese; bread and cereal; vegetable and fruit; citrus; deep green and deep yellow vegetables and fruit; and meat, poultry, fish and dried beans.

An initial list of foods was established by comparing the information on Block's short version, 60-item, diet questionnaire (Appendix F) to the food categories. A food was removed if it did not fall within one of the food group

categories of the Suggested Eating Guide. Next, several WIC registered dietitians reviewed the food list and additional items commonly consumed by the population were added. The final food list had a total of 48 food item lines (Appendix D).

Using the Block questionnaire as a model, foods were either listed in groups or singly, depending on what Block found was most effective on a self-administered food frequency questionnaire. For example, apples, applesauce and pears were grouped together, but oranges and grapefruit were listed singly based on the Block model (Appendix F).

Because the Michigan WIC Program planned to use eligibility criteria based on a weekly number of servings per food category (Appendix E), the recording method used requests daily, weekly, monthly, yearly or rarely or never information. Responses in the daily, weekly and monthly columns of each food category were converted to a weekly score. Respondents were not asked to indicate portion sizes. Instead a medium portion size was assumed.

Because the literature did not suggest a recording method to use with a low literacy population, this study tested three recording techniques currently used on self-administered food frequency questionnaires: 1) recording a number, 2) circling a number, and 3) placing a mark (x) in a box.

The first recording technique was identical to the method used by Block (Health Habits and History Questionnaire, 1989). This technique required the respondent to write a number under the day, week or month column heading that corresponded to the frequency the food was consumed. A "rarely or never" column was also included.

The second recording technique used a day, week and month column heading, but the subject circled one of the preprinted numbers under the column heading. This technique appeared on a food frequency developed by the WIC Program of the New York State Health Department (1988). This questionnaire also had a "never or rarely" column.

The third technique was similar to that used by Willett et al. (1987) in that the respondent made a mark under the appropriate time period range (i.e. 1 per day, 2-3 per day, 4-5 per day and 6 or more per day, 1 per week, 2-4 per week, 5-6 per week, 1-3 per month, rarely or never.)

Because uncertainty existed as to which level of instruction facilitated accurate self-administration of the questionnaire by the majority of poor readers, this study tested two instruction types -- written only and written plus verbal.

The instructions printed on the questionnaire included how to use the recording technique to record how often a food item was consumed and an example that visually illustrated the technique (Appendix D). All subjects were

briefly told the purpose of the questionnaire, to think about how often certain foods were eaten and to record only one answer per food item (Appendix E).

A food frequency questionnaire given to a subject with a verbal explanation of only the points described above, i.e. without an explanation of how to record a response, was referred to as "written only" instructions. The subject had to read the instructions to determine how to record a response.

"Written plus verbal" instructions referred to a verbal review of all of the written instructions by the interviewer followed by a demonstration on completing the questionnaire and a check on three food items to determine that the subject could complete the questionnaire on her own.

Both the "written only" and "written plus verbal" instructions were standardized. Refer to Appendix G for a sample of the verbal instructions.

In all cases, subjects were also given a colored strip of paper, 2" x 8 1/2" and told, "Because there are lots of lines, this strip of paper may be helpful to keep your place".

The layout of questionnaire pages were also similar. Each food frequency was printed on four 8 1/2" x 11" pages to create as much white space as possible. A 12 point lettering and a font with serifs, Times, was chosen (Nitzke, 1989). Although it may be useful to include drawings of the

food on the questionnaire, the development and pretesting of such drawings was beyond the scope of this project.

To complete the development of the questionnaires, low literacy experts and a group of adults preparing to take GED classes were consulted for understanding and ease of reading and completing the food frequency questionnaires. Based on their comments, revisions to the questionnaires included rewording the instructions, adding a column to record yearly intake, increasing the definition between the columns and shading every other food line. Revisions were completed prior to pretesting and the three questionnaires were produced to near professional quality as suggested by Bertrand (1978).

Pilot testing was carried out with 12 women from a clinic different from those included in the study. The women were either WIC participants or had a child currently receiving WIC benefits. Pilot testing revealed confusion over the wording of a few items on the food list. Consequently, modifications were made to the wording of milk as a beverage, carrots, greens and hamburger. The standardized instructions were modified slightly to be more personalized and conversational. For instance, the wording of the example on the questionnaire was changed from "Let's say you . . . Here's how you fill this in . . ." to "If you . . .For each food, you would put a number in only one box

to show how often you eat it". In addition, "Never eat liver" was changed to "Never eat ice cream".

Scoring Procedure. A hand method of scoring the food frequencies was developed for this study. Initially, the eligibility criteria required servings per day information, but through practice with various scoring methods it was found that a servings per week score was an easier math computation and less susceptible to error. With approval of State WIC Program Staff, procedures were developed to determine servings per week scores.

To eliminate unnecessary distractions for the respondent, a scoring aid used by the scorer did not appear on the questionnaire. Instead, scorers used laminated overlays. A set of four overlays were developed for each food frequency questionnaire (write, circle and mark) to aid in scoring the food group categories.

Appendix H includes the scoring instructions and shows how the overlays appear when placed on top of the questionnaire pages. Only the day, week and month columns were using in scoring. The other columns were blocked out by the opaque portion of the overlay. Portions of the overlay were cut out to enable the scorer to make computations directly on the questionnaire without moving the scoring aid. The use of cutouts lessened computation errors and aided in checking the scores.

Servings per week scores were computed for the six food categories represented in the eligibility criteria. Because only frequency information was recorded on the questionnaire by the responder, servings were computed during scoring by the interviewers. A median portion size was assumed as described by Block et al. (1986). When the median size was other than the serving size listed in Basic Nutrition Facts (Anderson et al., 1989), the scoring aid listed a number by the food the interviewer multiplied the frequency number by to convert it to the appropriate number of servings. For example, because the median serving for bread was 2 slices, a bread frequency of 3 was multiplied by 2 to convert the frequency number to six servings.

Interview Schedule. An interview schedule was used to standardize the techniques of the two interviewers. This schedule was based on a task analysis performed by the investigator. As a consequence, the investigator developed the following procedures for the interviewers to carry out this study:

- Procedures for subject sampling and assignment to treatment group (Appendix A)
- Administration of the prescreening questions (Appendix B)

- Procedures for obtaining subject consent (Appendix B)
- Protocol for subject self-administering the six food frequency treatments (e.g. write the number-written only) (Appendix B)
- Protocol for interview-administering the food frequency questionnaires (Appendix B)
- Procedures for administering food portion visual and probing guidelines (Appendix B)
- Standardized verbal instructions (Appendix G)
- Procedures for scoring the food frequencies (Appendix H)
- Administration of the reading level test (Appendix I)

The interview schedule included the wording of health status, demographic and program-related questions asked of the subjects covering the following topics: pregnancy status, months of gestation, race, age, medical situations affecting current eating behaviors, English as their primary language, number of months the subject had been exposed to the WIC Program and grades of school completed.

The type and amount of probing the dietitians could pursue was specified in the interview schedule (Appendix B). A two-dimensional food portion visual aid developed by Posner and Morgan (1982) was used by the dietitians when

interview-administering the questionnaire to the subject. This was used to gather information about usual serving size. Although portion size information was gathered, it will be used in a future study.

The interview schedule included how to administer the reading level test and the scoring procedure (Appendix I). Reading grade-equivalent was determined with the reading test from the Wide Range Achievement Test-Level 2 (Jastak et al., 1984). In taking the test, the subject pronounced words from a list of 74 words. A raw score was calculated from the number of words the subject mispronounced or did not pronounce because the interviewer asked them to stop after they mispronounced 10 consecutive words. The raw score was located on the reading line of the "Raw Score to Grade Equivalents" chart at the bottom of the test to identify the reading grade equivalent.

To administer the word list, the words were retyped in the same order, but split into three approximately equal groups, one group per page. One word was typed on every other line using the Times Roman font and size 12 point. Each page of words was glued to 6" x 12" heavy weight poster board. The prereading portion of the test, i.e. the 13 letters, were placed on a separate card, evenly spaced on the same horizontal line. All of the word list cards were covered with contact paper to withstand use throughout the study.

To standardize the interviewer's skill in rating the correctness of subjects' pronunciation of the words, audiotapes were made of the correct pronunciation by a volunteer used by the Radio Talking Book (services for the blind). Interviewers listened to the tapes to develop an ability to quickly ascertain if the pronunciation of a word was correct.

Procedure

Two registered dietitians (R.D.s) were hired to administer the treatments and carry out the data collection procedures. Current clinic staff were not used for two reasons. First, non-clinic staff were perceived to be less threatening because they would not be determining the subject's eligibility for the WIC Program. Second, because clinic staff time was not used, it was easier to obtain WIC agency permission to use clinic site(s) for the study.

The registered dietitians were trained by the Investigator to administer the questions and food frequency questionnaires following the interview guide. The interviewers pretested the procedures on 12 pregnant WIC participants. Interviewer reliability was checked on subjects' frequency of food consumption, scoring of the various food frequencies and reading level determination until inter-rater agreement was consistently above 80%.

Using the preestablished process to randomly select subjects, the interviewers asked pregnant women to participate in the study. Women interested were asked the prescreening questions. If answers to prescreening questions indicated the subject study criteria for subject selection in the study were satisfied, then the consent form was read to each woman for consideration. If the subject agreed to participate, she was next assigned a treatment from the random assignment log. The interview took place in a private room. During the interview, the subject provided food frequency information twice for the same list of foods. First the subject self-administered the assigned food frequency questionnaire. Then an R.D. interviewed the subject for frequency of consumption of the same foods and obtained information on usual portion size using standardized probing (Appendix B). A reading level test and questions about month of gestation, previous exposure to the WIC Program and grades of school completed finished the session. The subject was provided $5.00 as compensation for participating in the study. The entire process took approximately 30 minutes per subject.

Following the interview, the dietitian scored each of the subject's interview-administered and self-administered questionnaires and the reading level test.

Analysis

SPSS/PC+ Studentware (Norusis, 1988) was used to enter the data into a data file and to perform a majority of the analysis.

Each of the subject's questionnaires, self-administered and interview-administered, were scored for a total of six scores for each questionnaire. A score equated to the number of servings per week a food group was usually consumed (i.e. milk and cheese). The true difference between the two questionnaire scores for the same food group was computed (R.D. interview score minus self-administered score). The mean score from the group of subjects exposed to a treatment was computed and compared to the mean scores from the other treatment groups using analysis of covariance. Analysis of covariance was performed by food category with the difference score as the dependent variable, independent variables of instruction (written only or written plus verbal) and recording technique (write, circle or mark), and covariates of reading grade equivalent and months of WIC exposure for the subject. Because Michigan dietary eligibility is determined looking at each of the six food categories independently, a combined difference score from all food categories was not used to answer the research questions.

Including all 144 subjects, multiple regression was used for each of the six food categories to determine the

relationship between subject food group difference scores and reading raw scores.

The "straight edge" refers to a colored strip of paper 2" x 8 1/2" subjects' were offered as an aid to keep their place when self-administering the questionnaire. If a subject used the straight edge initially, but stopped at least midway, they were counted as a non-user. If a subject did not use the straight edge at first, but started to use it at some point, the subject was recorded as a user. An independent sample chi-square test was used to determine the significance between the subjects' use of the straight edge by treatment and whether the absence or presence of recording errors differed between users and non-users of the straight edge.

Descriptive statistics were performed on demographic data and on information pertaining to completing the food frequency questionnaires. One way analysis of variance was used to test whether the treatment groups were statistically different on the continuous demographic variables, such as age, trimester of gestation, months on WIC, school grade completed and reading raw score.

The most desirable food frequency recording method and instruction combination has the fewest instances of misclassifying individuals or having a high number of false-negative and false-positive determinations. To rate the performance of each of the FFQ treatments in correctly

classifying individuals by food category, a method for rating diagnostic tests was applied (Appendix J). Subjects' food category scores from the self-administered FFQ and the R.D. interview FFQ were compared to the proposed WIC eligibility criteria and recorded on 2 x 2 contingency tables to indicate the agreement between the scores. Hand calculations were used to compute an index for each food category by FFQ treatment. This index was used to compare each treatment to the others for each of the food categories to determine if a treatment did better than another at correctly classifying an individual as eligible or not for the WIC Program.

RESULTS

Subject Selection Procedures

Early in the study, the subject selection procedures using the schedule book were discontinued after it was discovered the names on the schedule book did not correspond to the women showing up for clinic. Random numbers were only used when the clinic waiting room was full at the time the interviewer was available to prescreen potential subjects.

As planned, whenever the interviewer was available to prescreen potential subjects, all eligible persons in rural clinics were asked to participate in the study. Initially the interviewers were instructed to ask every other eligible person from an urban clinic to participate, but this was changed to every eligible person due to the few number of eligible persons showing up during study times. One agency required pregnant WIC applicants to complete a dietary questionnaire one week prior to their certification appointment. In this circumstance, if a pregnant woman had been on the WIC Program during a previous pregnancy, as long as she met the other study criteria, she was asked to participate in the study, even though she was not currently enrolled on the WIC Program.

Even with the change in subject selection procedures, it was still difficult to obtain subjects at the original WIC site selected for five of the six agencies because of the few eligible women showing during times scheduled for WIC coupon pick-up. At three agencies, an additional site was added because pregnant WIC participants were also using a second location for coupon pick-up. In another instance, the WIC agency had integrated so well with the agency's Maternal Support Services (MSS) Program, that WIC coupons were distributed during MSS appointments. At this agency, women enrolled in WIC attending either the WIC or MSS clinic were prescreened for the study. At a different agency, it was discovered that WIC participants could be found at the prenatal clinic, so women were prescreened at both the WIC and prenatal clinics.

On the average, it was possible to complete all 24 interviews at an agency with 48 hours or less of R.D.'s time. Despite using two sites at one urban agency, only 12 interviews were completed after 80 hours of interviewing time spent in the clinic. Because the average reading level for the completed interviews was similar to the other urban sites, the last 12 subjects for this agency were obtained from the other two urban agencies.

In most instances the interviewers asked the prescreening questions of potential study subjects. At one site, the agency WIC staff initially thought it would be

easier for them to maintain clinic flow if they did the prescreening, but only five subjects were prescreened in this manner.

Description of Subjects

Of the 144 subjects, 67% were white and 33% black (Table 2). This proportion is consistent through all treatment groups. Based on one way analysis of variance, treatment groups were not statistically different in age, trimester of gestation, and months on WIC by treatment group (Table 2). Age ranged from 18 to 38 years with an average age of 23 $\pm$ 4 years. Seven percent of the women were in their first trimester of pregnancy, 46% in the second trimester and 46% in the third. The number of months a woman or her child had received WIC benefits ranged from 1 to 144 months with an average of 17 $\pm$ 21 months and a median of 9 months. WIC participation was new for 44% of the subjects as indicated by WIC exposure history (Table 2). These subjects were exposed to the dietary assessment process used by the WIC program only once before participating in the study. Subjects with previous WIC exposure, 56% of subjects, answered dietary assessment information for WIC eligibility determination two or more times for either themselves or for a child prior to participating in this study.

Table 2. Subject characteristics.

Variable	Treatment Group: Write Written	Write Verbal	Circle Written	Circle Verbal	Mark Written	Mark Verbal	Total
Sample Size	24	24	24	24	24	24	144
Race (%)							
White	67	67	67	67	67	67	67
Black	33	33	33	33	33	33	33
Age (years)#							
Mean	25±5	23±4	22±4	23±4	23±3	24±5	23±4
Range	(18-38)	(18-32)	(18-31)	(18-32)	(18-30)	(18-38)	(18-38)
Trimester(%)#							
first	8	8	8	8	8	0	7
second	33	46	63	46	29	62	46
third	58	46	29	46	63	38	46
Months on WIC#							
Mean	17±21	21±26	10±10	15±17	20±24	19±24	17±21
Median	12	10	4	6	8	9	9
Range	(1-144)	(1-84)	(1-38)	(1-64)	(1-78)	(1-96)	(1-144)
WIC Exposure History (%)							
First Time	33	42	54	50	42	42	44
Previous	67	58	46	50	58	58	56

Treatment groups were not statistically different based on one way analysis of variance.

The grade of school completed ranged from grade 7 through 6 years of college, with an average of 12 $\pm$ 2 grades (Table 3). Reading grade equivalent scores ranged from below 3rd grade to above 12th grade (Table 4). Overall, 12% of the study population was reading at the equivalent of a third grade level or less, 35% at sixth grade or below and 58% at an eighth grade level or less. A one way analysis of variance on reading raw scores revealed treatment groups were not statistically different in terms of estimated reading ability.

Findings Related to Research Questions

The three research questions of this study were:

1. Does the type of instruction, written only or written plus verbal, provided with the administration of the food frequency questionnaire, affect the subject's accuracy in self-administering the questionnaire?

2. Does the type of recording technique on the food frequency questionnaire affect the subject's accuracy in filling out the questionnaire?

3. Does the interaction between the type of instruction and type of recording technique affect the accuracy in which subjects self-administer the food frequency questionnaire?

Based on ANCOVA, subject accuracy in self-administering the questionnaire was not affected by the type of instructions provided, type of recording technique on the questionnaire or the interaction between these two variables

Table 3. School Grade Completed.

Variable	Treatment Group: Write Written	Write Verbal	Circle Written	Circle Verbal	Mark Written	Mark Verbal	Total
School Grade Completed#							
mean ± SD	11±1	12±2	12±2	11±2	11±2	12±2	12±2
range	(9-15)	(8-17)	(8-16)	(8-18)	(8-15)	(8-13)	(7-18)

Treatment groups were not statistically different based on one-way analysis of variance.

Table 4. Reading Grade-Equivalent.

Variable	Treatment Group: Write Written		Write Verbal		Circle Written		Circle Verbal		Mark Written		Mark Verbal		Total	
Reading Grade Equivalent#	frq	cum %	frq	cum %	frq	cum %	frq	cum %	frq	cum %	frq	cum %	frq	cum %
< 3rd	2	8	2	8	1	4	6	25	2	8	4	17	17	12
4th-6th	4	25	4	25	4	21	5	46	10	50	7	46	34	35
7th-8th	10	67	4	42	7	50	5	67	4	67	3	58	33	58
9th-11th	7	96	6	67	6	75	3	79	4	83	5	79	31	80
≥ 12th	1	100	8	100	6	100	5	100	4	100	5	100	29	100

Treatment groups were not statistically different based on one way analysis of variance.

for any of the food categories. As shown in Table 5, for each of the food categories, statistical significance at the $p \leq .05$ level was not achieved for the main effect of recording method (A), because the F-value did not exceed 3.06. For the main effect of instructions (B) to be statistically significant at the $p \leq .05$ level, the critical F-value = 3.91. The effect of instructions (B) was not statistically significant for any of the food categories. The interaction between the two variables (A x B) for each of the food categories was not statistically significant, because the F-value was not greater than 3.06.

Related Findings of Interest to WIC

Descriptive statistics of difference scores by treatment group and food category are presented in Table 6. A food group difference score of zero indicates no difference between a subject's R.D. interview score and her score on the self-administered FFQ. The large range of difference scores for each treatment by food category demonstrates discrepancies between information collected using the interview administered FFQ and the subject self-administered FFQ.

Predicting which WIC applicants are likely to have large difference scores would help staff prioritize applicants for an interview versus self-administered FFQ. Multiple regression analysis was used to determine whether it is

Table 5. Analysis of covariance by intruction type and recording technique with reading grade equivalent and months exposed to WIC as covariates.*

Source of Variation	df	Mean Square	F
MILK & CHEESE DIFFERENCE SCORES			
Covariates			
Reading Grade Equivalent	1	502.154	4.6652
Months Exposed to WIC	1	63.979	.594
Main Effects			
Recording Technique (A)	2	138.469	1.286
Instructions (B)	1	77.207	.717
A x B	2	169.681	1.576
Error	136	107.638	
Total	143	111.052	
BREAD & CEREAL DIFFERENCE SCORES			
Covariates			
Reading Grade Equivalent	1	167.188	.341
Months Exposed to WIC	1	1064.619	2.173
Main Effects			
Recording Technique (A)	2	286.141	.584
Instructions (B)	1	646.647	1.320
A x B	2	791.601	1.615
Error	136	490.026	
Total	143	494.566	

* To be statistically significant at the $p < .05$ level, the required F-values for the Main effects and the interaction were: Recording Technique (A): Critical F = 3.06; Instructions (B): Critical F = 3.91; and Interaction (A x B): 3.06.

For all food categories, subject accuracy was not affected by the type of instructions provided, type of recording technique on the questionnaire or the interaction between these two variables.

Table 5. (continued)

Source of Variation	df	Mean Square	F
CITRUS DIFFERENCE SCORES			
Covariates			
Reading Grade Equivalent	1	7.577	.1372
Months Exposed to WIC	1	61.314	1.109
Main Effects			
Recording Technique (A)	2	21.514	.389
Instructions (B)	1	56.500	1.022
A x B	2	57.375	1.037
Error	136	55.304	
Total	143	54.559	
DEEP GREEN FRUIT & VEG DIFFERENCE SCORES			
Covariates			
Reading Grade Equivalent	1	307.699	7.722
Months Exposed to WIC	1	22.210	.577
Main Effects			
Recording Technique (A)	2	12.109	.304
Instructions (B)	1	8.967	.225
A x B	2	35.585	.893
Error	136	39.847	
Total	143	40.990	

* To be statistically significant at the $p \leq .05$ level, the required F-values for the Main effects and the interaction were: Recording Technique (A): Critical F = 3.06; Instructions (B): Critical F = 3.91; and Interaction (A x B): 3.06.

For all food categories, subject accuracy was not affected by the type of instructions provided, type of recording technique on the questionnaire or the interaction between these two variables.

Table 5. (continued)

Source of Variation	df	Mean Square	F
TOTAL FRUIT & VEG DIFFERENCE SCORES			
Covariates			
Reading Grade Equivalent	1	4547.247	7.955
Months Exposed to WIC	1	289.897	.507
Main Effects			
Recording Technique (A)	2	471.475	.825
Instructions (B)	1	804.449	1.407
A x B	2	883.026	1.545
Error	136	571.605	
Total	143	602.776	
MEAT, POULTRY, FISH AND DRIED BEANS DIFFERENCE SCORES			
Covariates			
Reading Grade Equivalent	1	4432.127	9.476
Months Exposed to WIC	1	25.801	.055
Main Effects			
Recording Technique (A)	2	178.575	.385
Instructions (B)	1	303.876	.650
A x B	2	427.396	.914
Error	136	467.704	
Total	143	486.827	

* To be statistically significant at the $p \leq .05$ level, the required F-values for the Main effects and the interaction were: Recording Technique (A): Critical F = 3.06; Instructions (B): Critical F = 3.91; and Interaction (A x B): 3.06.

For all food categories, subject accuracy was not affected by the type of instructions provided, type of recording technique on the questionnaire or the interaction between these two variables.

Table 6. Summary of difference scores for treatment groups by food category.* (n=144)

Variable	Treatment Group: Write Written	Write Verbal	Circle Written	Circle Verbal	Mark Written	Mark Verbal	Total
MILK							
Range	-12-46	-15-12	-32-16	-21-31	-24-24	-16-24	-32-46
Mean	3±14	-1±6	-4±10	1±13	-2±9	0±9	0±11
Median	-1	0	-2	-1	-2	0	-1
BREAD							
Range	-54-17	-36-25	-63-25	-44-40	-28-80	-94-82	-94-82
Mean	-4±16	-6±17	-8±21	-5±17	6±22	-7±35	-4±22
Median	-2	-5	-2	-3	2	-1	-2
CITRUS							
Range	-20-7	-8-16	-21-8	-21-4	-28-18	-26-22	-28-22
Mean	-3±6	0±5	-4±8	-1±5	-1±8	-2±10	-2±7
Median	0	0	-1	0	0	0	0
DEEP GREEN FRU & VEG							
Range	-20-1	-5-8	-13-7	-37-8	-30-6	-32-6	-37-8
Mean	-2±5	0±2	-1±3	-3±9	-3±8	-2±8	-2±6
Median	0	0	0	0	0	0	0
TOTAL FRU & VEG							
Range	-80-12	-10-16	-66-14	-166-6	-106-32	-62-55	-166-55
Mean	-17±27	-2±6	-9±16	-15±35	-10±27	-5±23	-10±25
Median	-6	-2	-5	-7	-2	-3	-4
MEAT							
Range	-136-3	-23-19	-112-6	-89-10	-120-24	-67-14	-136-24
Mean	-11±29	1±8	-7±24	-10±23	-6±26	-7±16	-7±22
Median	-3	1	-1	-2	0	-3	-1

Table 6. (continued)

*Legend:

0 = Perfect score: difference between interview FFQ and self-administered FFQ = 0.
- = Negative difference score: indicates subject overreported intake on self-administered FFQ as compared to the interview administered FFQ.
+ = Positive difference score: indicates subject underreported intake on self-administered FFQ as compared to interview administered FFQ.

possible to predict food category difference scores on the basis of the subject's reading raw score, FFQ completion time, grade of school completed and month of gestation. In all cases, either one predictor variable (reading raw score or time) was significant or nothing was significant. In each case that a predictor variable was significant, it only explained 3-7% of the variation.

Should the large range of difference scores be a concern? How many subjects had large difference scores for the various food categories? What was the reading level of subjects by difference score? Frequency of difference scores by reading grade equivalent revealed very high discrepancy scores either positive or negative, occurring for reading levels for most food categories. Bar charts, Figures 1 through 6, demonstrate by food category the number of subjects within various ranges of difference scores for the total sample size (n=144). When applicable, a bar depicts the number of subjects reading at the 8th grade level or less and at the 9th grade level or higher.

Figures 1, 2b, 3, 4, 5b and 6b include the range -5 to 5. This range represents the investigator's estimation of acceptable error when the diet of a WIC applicant is screened for servings per week by food category. The percentage of subjects outside this range for each food category was: milk, 44%; bread and cereal, 60%; citrus, 29%; deep green and yellow fruits and vegetables, 14%; total

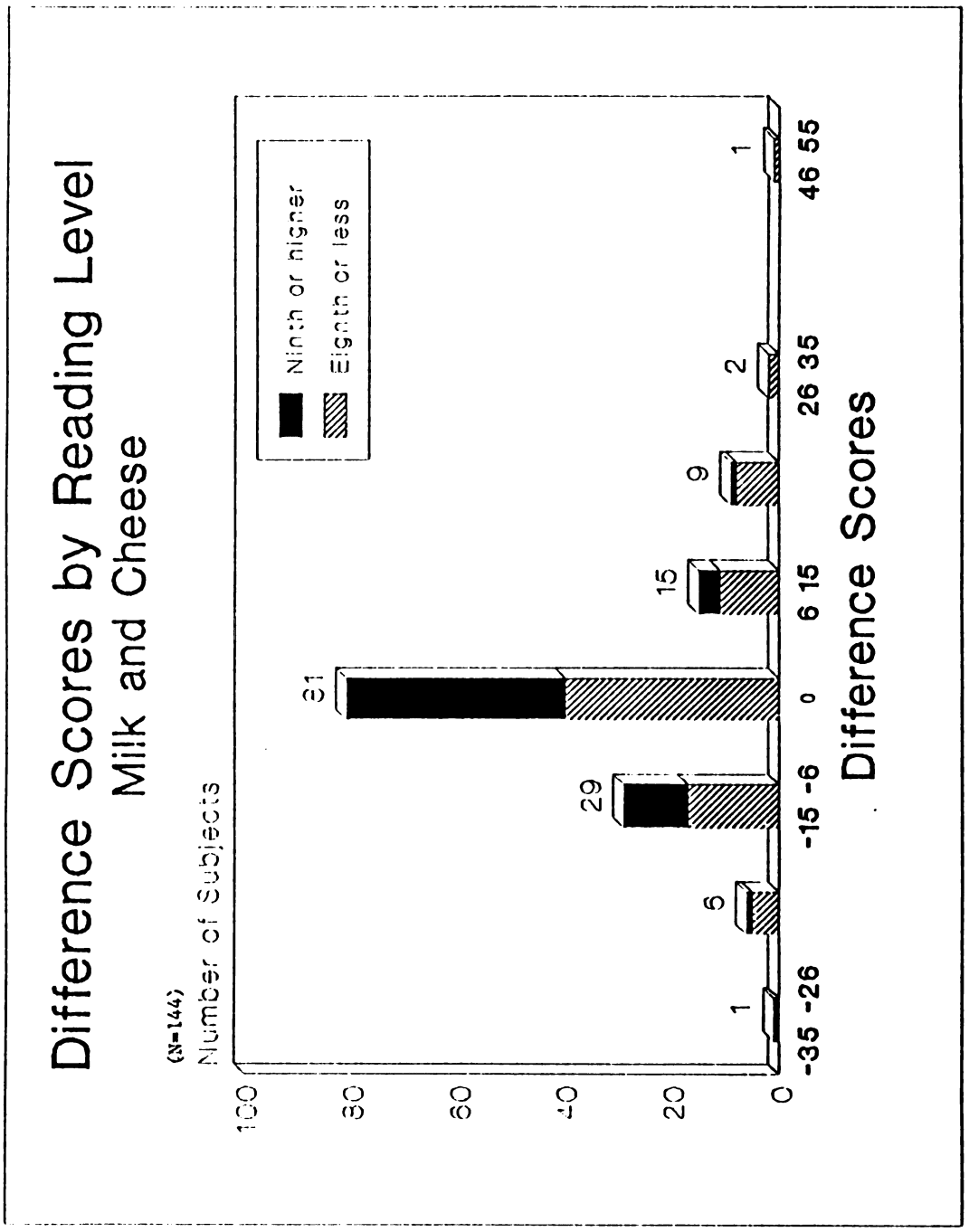

Figure 1. Difference scores by reading level: milk and cheese.

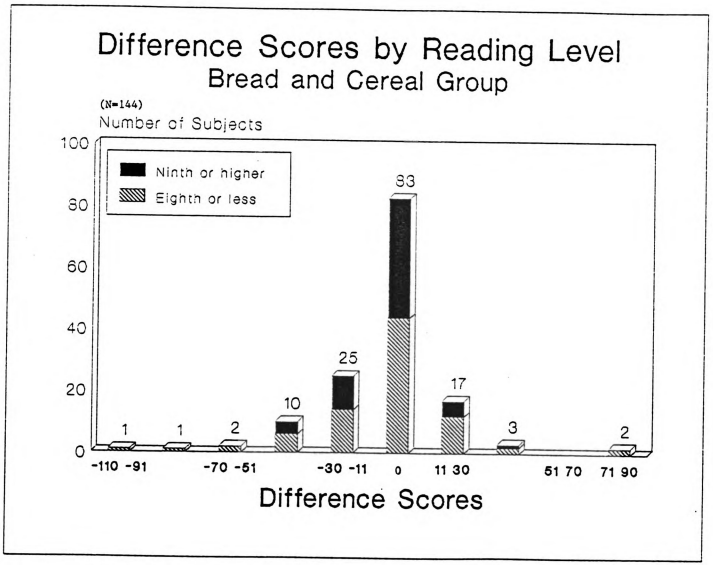

Figure 2a. Difference scores by reading level: bread and cereal.

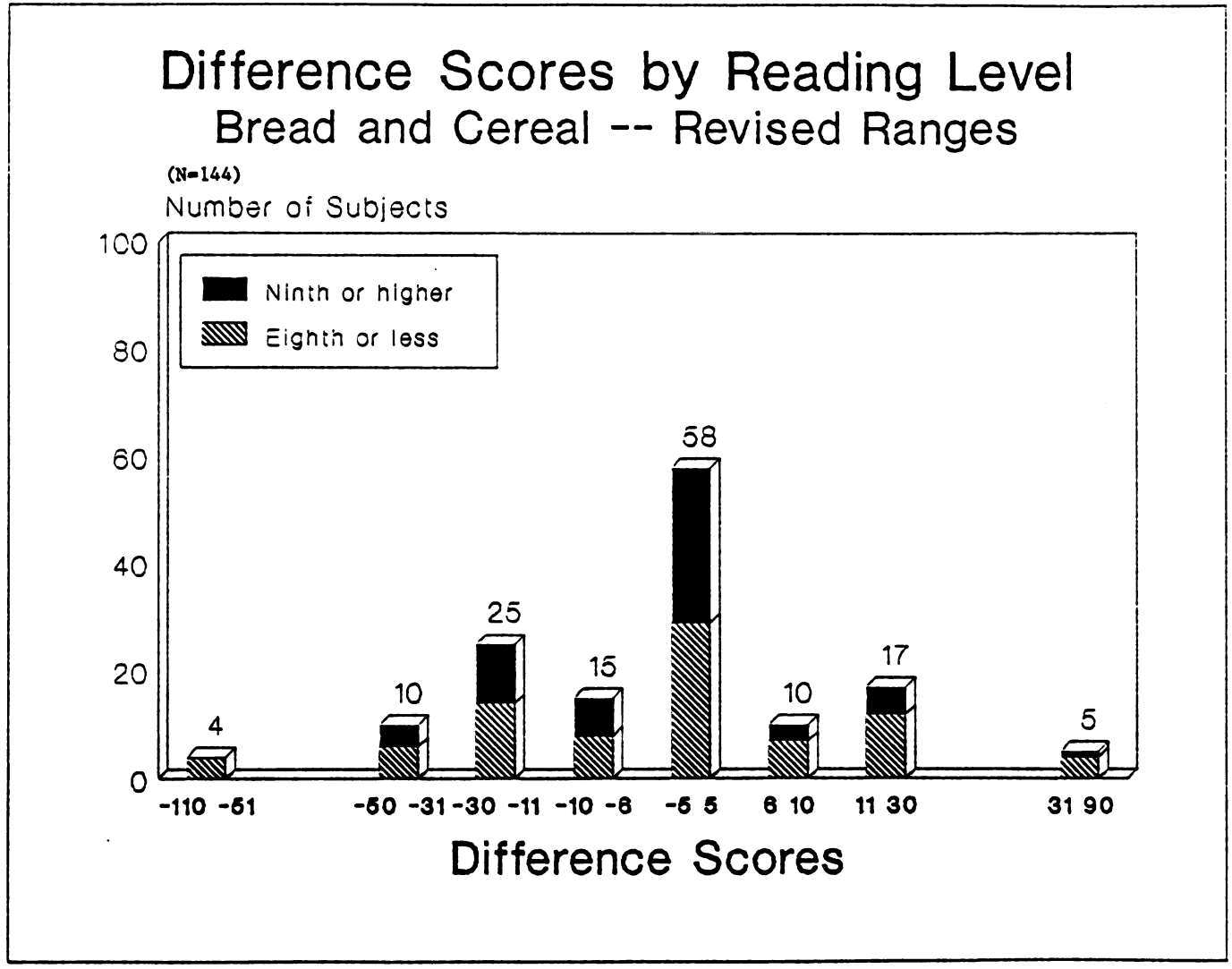

Figure 2b. Difference scores by reading level: bread and cereal - revised ranges.

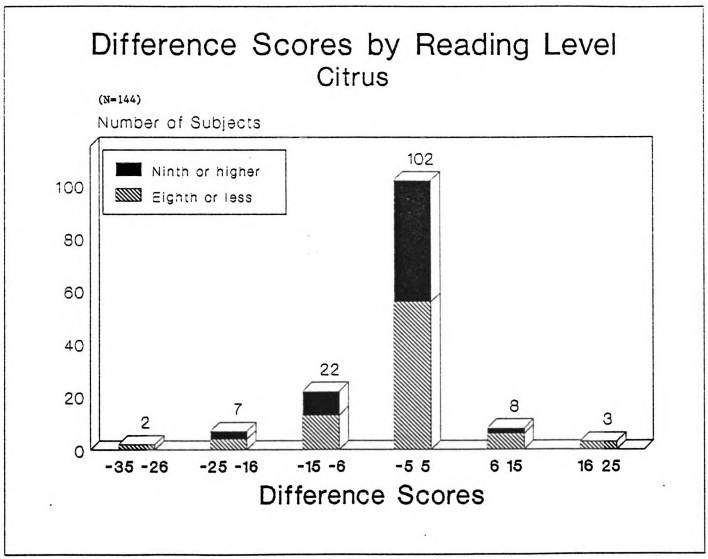

Figure 3. Difference scores by reading level: citrus.

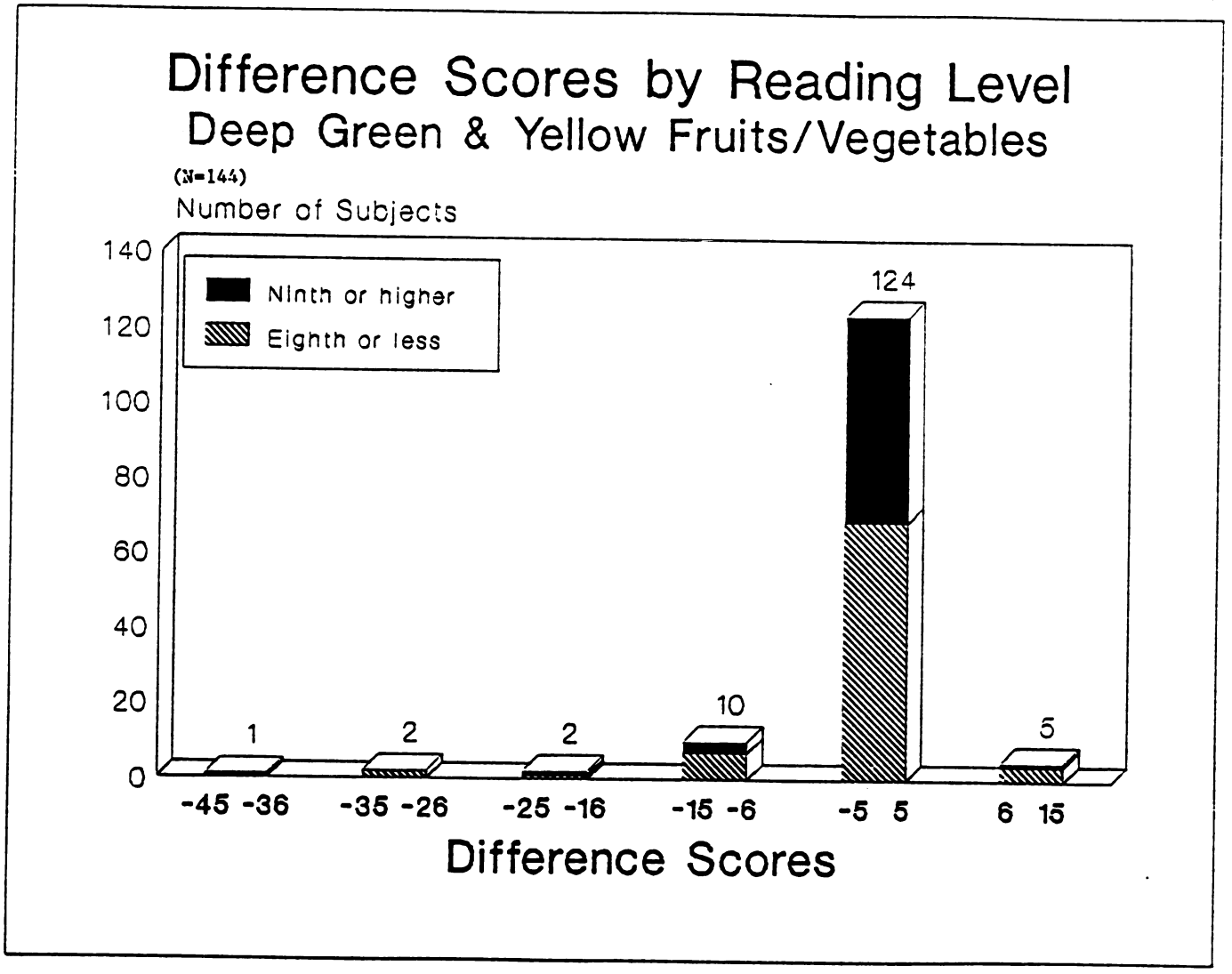

Figure 4. Difference scores by reading level: deep green and yellow fruits and vegetables.

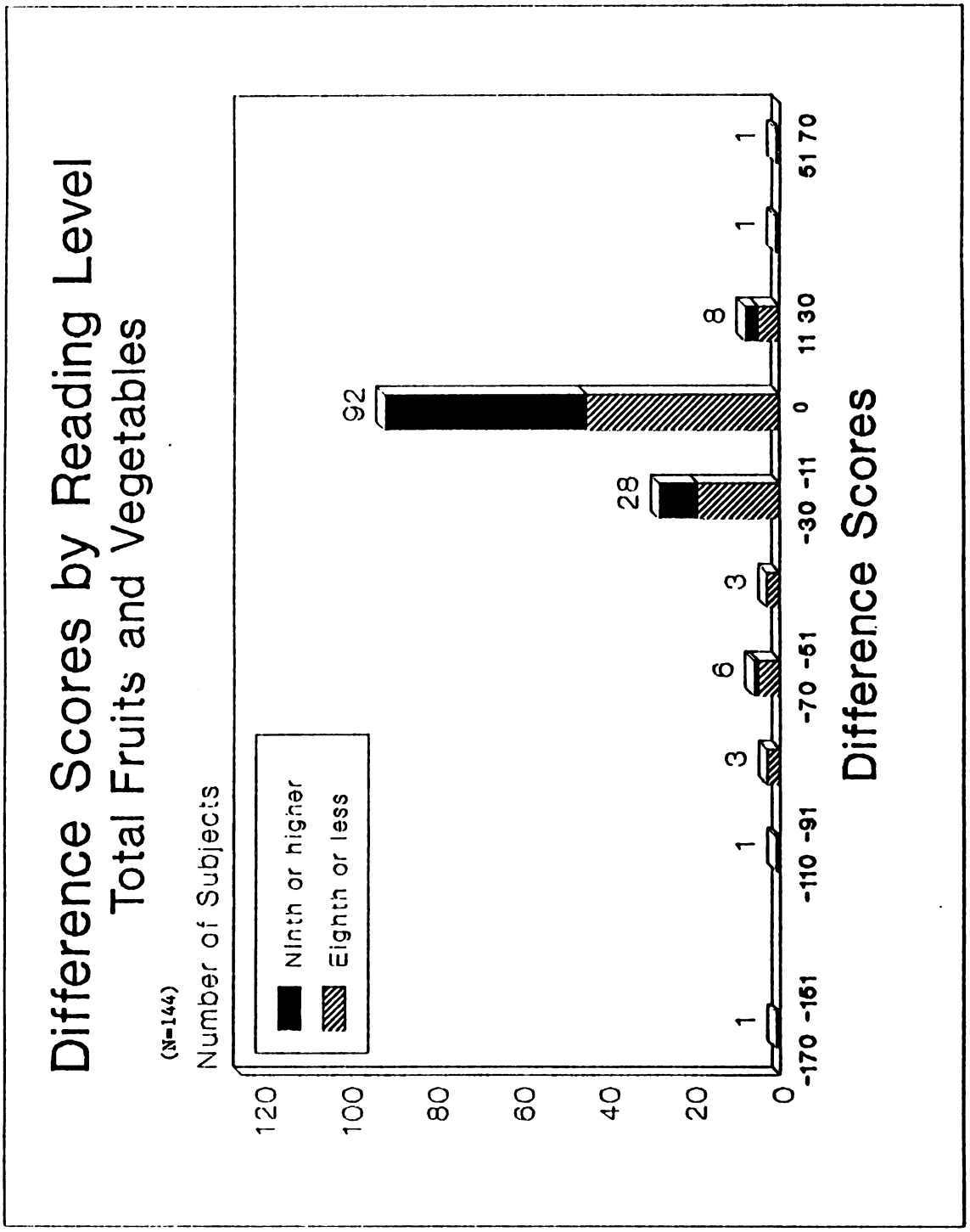

Figure 5a. Difference scores by reading level: total fruits and vegetables.

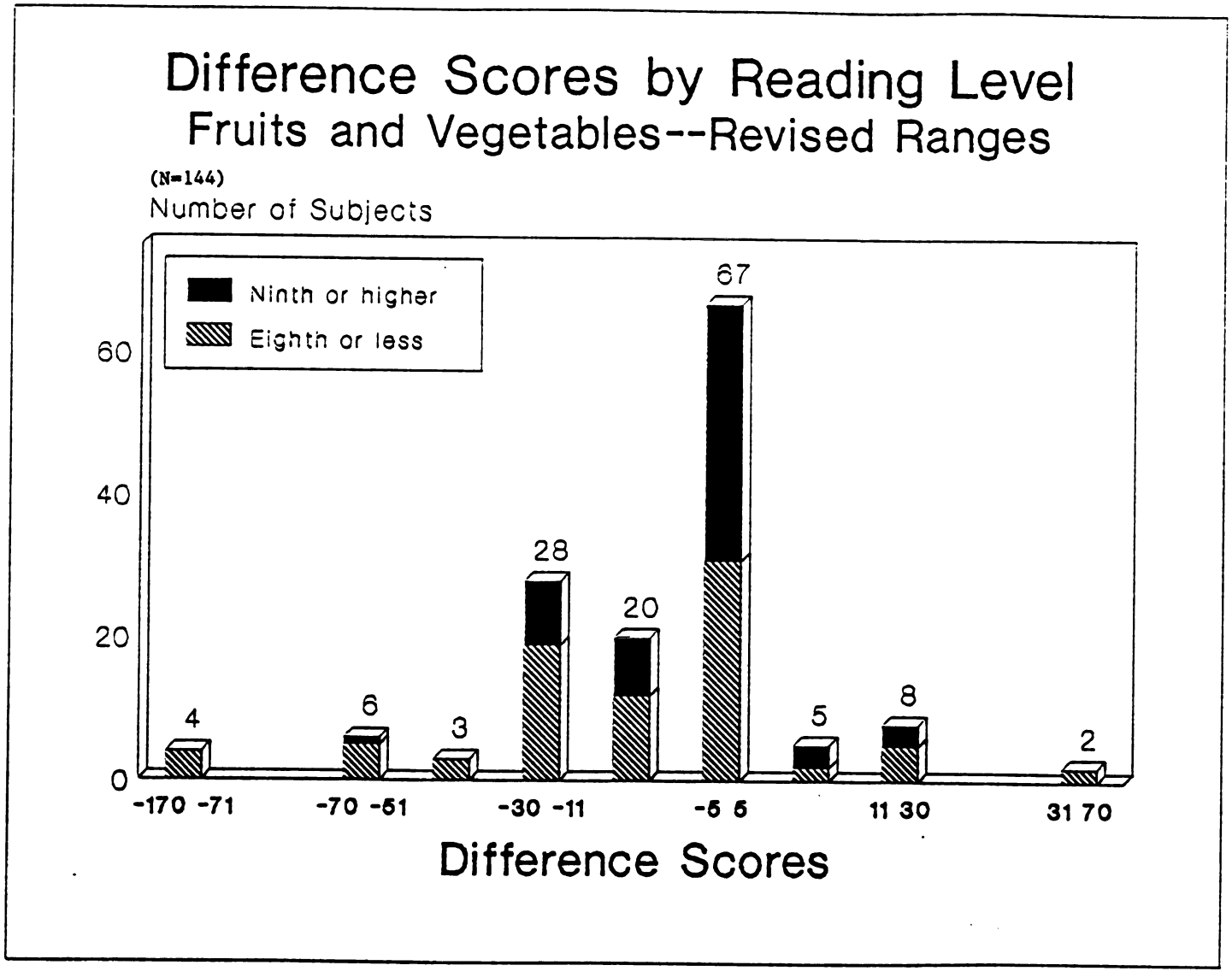

Figure 5b. Difference scores by reading level: fruits and vegetables — revised ranges.

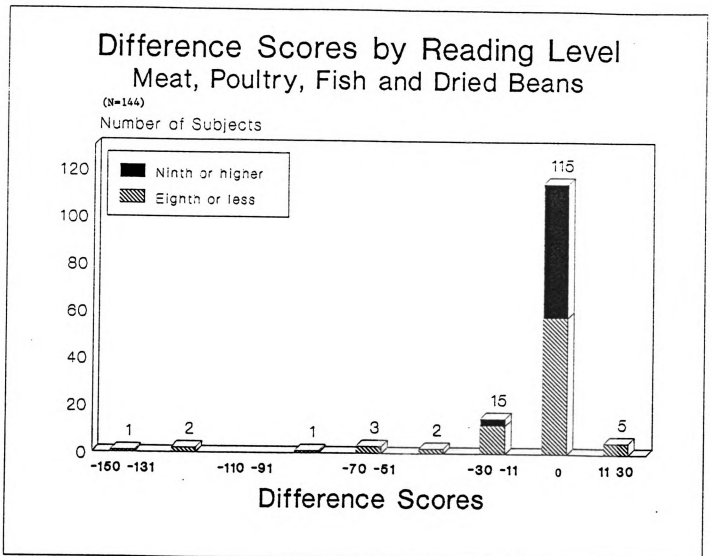

Figure 6a. Difference scores by reading level: meat, poultry, fish and dried beans.

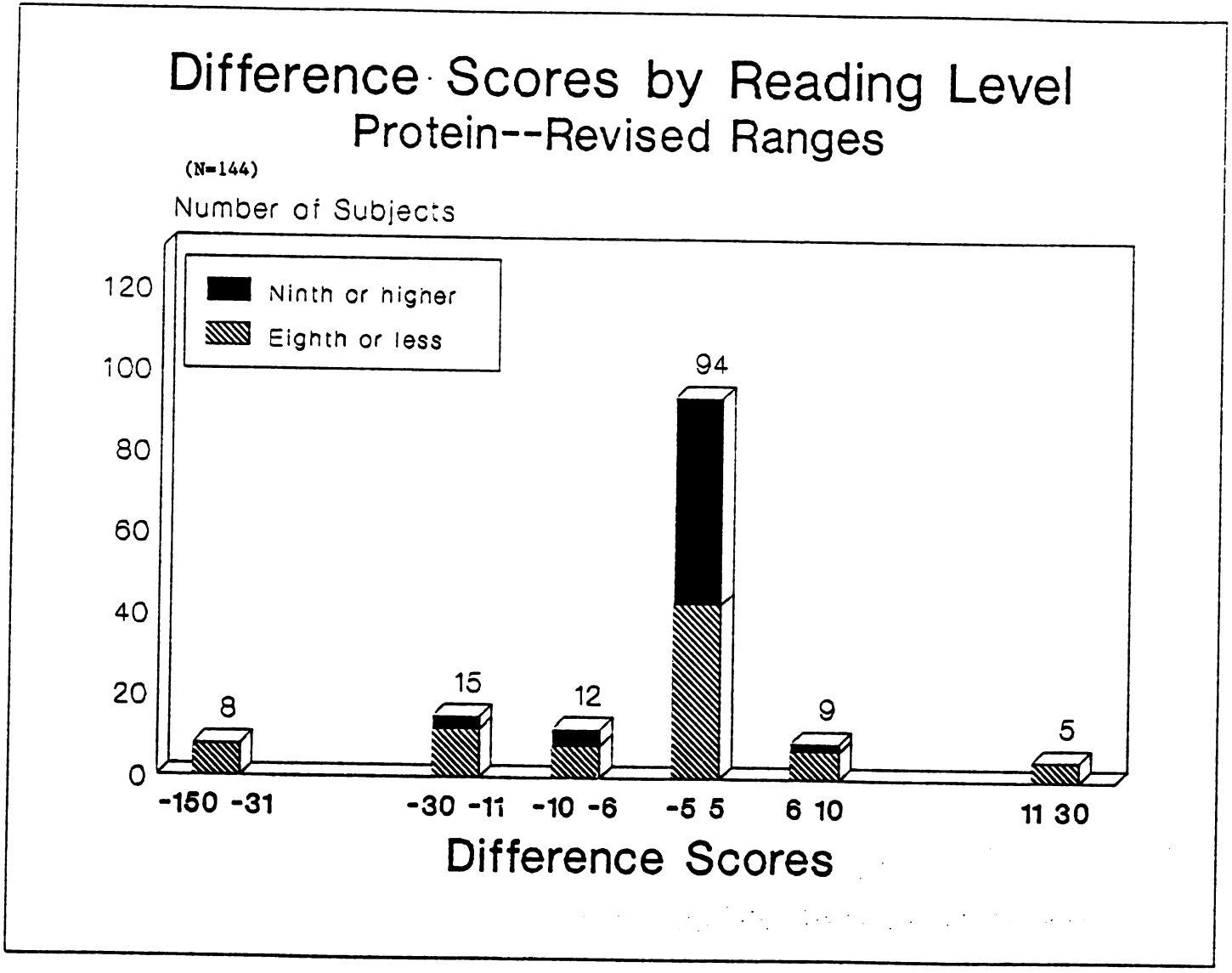

Figure 6b. Difference scores by reading level: meat, poultry, fish and dried beans — revised ranges.

fruits and vegetables, 53%; and meat, poultry, fish and dried beans, 35%. The majority of subjects outside the -5 to 5 range had an estimated reading level of eighth grade or less, but several higher readers were also included in this group.

How does the subject's eligibility classification for the WIC program compare when the actual food category scores from the self-administered FFQ are measured against the interviewed FFQ? To determine this, an index rating was computed for each food category of every treatment group (Table 7). The index represents the performance of a self-administered FFQ treatment in avoiding false eligibility determinations or the ability of the treatment to accurately identify individuals truly eligible for the WIC program as compared to the interviewed FFQ. The mark-verbal treatment and the circle-written treatment were both 100% accurate in correctly identifying eligible individuals for the milk category and citrus category respectively.

Treatment indexes by food category were compared to each other to determine if one treatment in a comparison was statistically more accurate in correctly identifying eligible individuals than the other treatment (Table 8). As an example, for the bread category, write written (treatment #1), statistically was more accurate in correctly determining WIC eligibility than mark verbal (treatment #6) at (Z-score, $p < .01$). Comparing recording methods only,

Table 7. Index Rating of the Six Treatments in Avoiding False Eligibility Results*

Food Category	Treatment Group					
	Write Written	Write Verbal	Circle Written	Circle Verbal	Mark Written	Mark Verbal
Milk	.49	.39	.44	.85	.50	1.00
Bread	.75	.62	.51	.29	.95	.09
Citrus	.61	.88	1.00	.95	.55	.29
Deep Green Fruit & Veg	.56	.45	.83	.44	.83	.75
Total Fruit & Veg	.38	.89	.49	.50	.66	.35
Meat	.64	.74	.83	.83	.49	.63

* For each of the six treatments, a subject's self-administered FFQ scores by food category were compared to the scores on the interviewed FFQ standard based on the proposed WIC eligibility criteria. An index rating of 1.00 = the self-administered FFQ perfectly classified the subject's eligibility status as compared to the interviewed FFQ standard. An index rating of .50 = half of the subjects in the treatment group were misclassified leading to false eligibility results.

Table 8. Accuracy in determining WIC eligibility by treatment comparisons.*

Food Category	Treatment Group					
	Write Written(1)	Write Verbal(2)	Circle Written(3)	Circle Verbal(4)	Mark Written(5)	Mark Verbal(6)
Milk				$1^{d}2^{c}3^{c}5^{d}$		$1^{a}2^{a}3^{a}4^{a}5^{a}$
Bread	6^{b}	6^{c}	6^{b}		$3^{c}4^{c}6^{b}$	
Citrus		6^{c}	$1^{a}2^{a}4^{a}5^{a}6^{a}$	$1^{d}5^{d}6^{b}$		
Deep Green Fru&Veg			$2^{d}4^{d}$		$2^{d}4^{d}$	
Total Fru&Veg		$1^{a}3^{c}4^{d}6^{c}$				
Meat			5^{d}			

[a]Accurate index = 1.0 (i.e. perfect score)
[b](Z-score, $p<.01$)
[c](Z-score, $p<.05$)
[d](Z-score, $p<.10$)
*The index rating of a treatment group food category was compared to the index rating of the other treatment groups for the same food category. The number of a treatment group a particular treatment statistically out performed in correctly classifying subjects is listed. For example, in the bread category, write-written treatment (1) was statistically better than mark-verbal treatment (6) at the $p \leq .01$ level, but did not statistically out perform treatments 2, 3, 4 and 5.

the food frequency questionnaires requiring the subject to circle a number statistically performed better in more comparisons than mark the box and write the number. Comparing the circle the number questionnaires, if the number of times each FFQ out-performed the other is considered, the FFQ administered with written only instructions was successful at making accurate determinations in one more instance than the FFQ given with verbal instructions.

Overall, 51% of the subjects used the straight edge when completing the form (Table 9). Users of the straight edge had statistically fewer errors than non-users. The obtained $X^2 = 4.55$, df = 1, was significant at the .03 level (Table 10).

Table 10. Comparison of straight edge use and errors.

Variable		Errors		
		No	Yes	Total
Use of Straight Edge	No	53	17	70
	Yes	66	8	74
Total		119	25	144

$X^2 = 4.55$ ($p < .03$)

Subjects who received written plus verbal instructions statistically used the straight edge more often than subjects given written only instructions at the .10 level ($X^2 = 2.71$, df=1). The written plus verbal instructed

Table 9. FFQ Completion: Errors, Use of Straight Edge and Completion Time

Variable	Treatment Group: Write Written	Write Verbal	Circle Written	Circle Verbal	Mark Written	Mark Verbal	Total
Errors							
None	19	22	19	23	17	19	119
1 or more	5	2	5	1	7	5	25
Type of Errors#							
skip 1-NAS	-	-	1	1	2	2	6
skip 1-A	2	1	1	-	2	1	7
skip 2 or 3-A	-	-	1	-	-	-	1
dble-A	1	-	-	-	-	-	1
skip/dble 2 or 3-A	1	1	1	-	1	2	6
skip/dble $\geq$ 4x-A	-	-	-	-	2	-	2
circle 2 numbers-A	-	-	1	-	-	-	1
chk vs. use no.-A	1	-	-	-	-	-	1

# Legend
skip = response not recorded for a food line(s)
dble = two responses marked for the same food line
chk vs. use no. = used a check mark when a number was required
circle 2 numbers = one circle surrounded 2 adjacent numbers
NAS= error did not affect score
A = error affected score

Table 9. (continued)

Variable	Treatment Group						
	Write Written	Write Verbal	Circle Written	Circle Verbal	Mark Written	Mark Verbal	Total
Use of Straight Edge (%)							
Yes	46	58	38	62	50	54	51
No	54	42	62	38	50	46	49
FFQ Completion Time							
Mean	8±3[a]	6±2[b]	7±3[a]	6±2[b]	6±2[a]	7±3[b]	7±3
Range	(3-14)	(4-14)	(3-15)	(3-13)	(3-11)	(3-13)	(3-15)

[a]Includes time it took subject to read the instuctions.
[b]Does not include the time it took to for verbal instructions.

subjects statistically had fewer errors than subjects completing the same type of FFQ after written-only instructions at the .05 level (X^2 = 3.84, df=1).

Comparing the three recording techniques, a greater number of subjects made errors using the mark the box recording technique (12 errors) than write the number (7 errors) and circle the number (6 errors). These differences were not significant (X^2 = 3.00, df=2).

Interviewers estimated the verbal portion of the written only instructions took 30 seconds to administer, whereas the verbal portion of the written plus verbal instructions took approximately two minutes to cover.

Completion time for treatment groups self-administering the FFQ after written only instructions included the time it took subjects to read the instructions (Table 9). The time recorded for treatment groups receiving verbal instructions does not include the time the interviewer administered the instructions. On the average, it took subjects 7 $\pm$ 3 minutes to complete the FFQ, but subjects varied from 3 to 15 minutes. A one way analysis of variance on minutes to self-administer the FFQ by treatment group did not yield a significant difference between the groups.

The typical amount of time it took the interviewer to score the three types of subject self-administered FFQs was 5 $\pm$ 1 minutes (Table 11), with a range of 2 to 8 minutes.

Table 11. Time to Score the Food Frequency Questionnaires (n=134)*.

Variable	Treatment Group Write	Circle	Mark	Total
Minutes to Score#				
Mean ± SD	4 ± 1	5 ± 1	5 ± 1	5 ± 1
Range	(2-8)	(3-6)	(2-8)	(2-8)

* Scoring time data missing for 10 subjects.

One way analysis of variance was used to test the differences between scoring time for the three types of food frequency questionnaires with a critical F-value = 3.07, (df=2, 131). The F-value = .45 revealing no statistical difference in scoring time between the FFQs.

Based on one-way analysis of variance, the differences in scoring between the treatments were not significant.

DISCUSSION

Influence of Recording Techniques and Instructions on Response Accuracy

The type of instructions, the type of recording technique and the interaction between these two variables did not significantly affect the accuracy in which subjects self-administered the food frequency questionnaires.

This study did not test the difference between a poor FFQ design and a better one. It started with a design that best reflected the recommendations in the literature and of low literacy experts. Consequently, modifications such as the font and point type, shading on every other line, the white space created by spreading the questionnaire over four pages, omission of the scoring aid directly on the FFQ, and availability of the straight edge all likely contributed to ease in reading and understanding by subjects.

The two instruction types developed for this study, "written only" and "written plus verbal" were intentionally designed to be effective. The 30 second introduction to the FFQ provided with written only instruction focused on the key points needed to complete

the questionnaire, except how to record a response (Appendix G). The written instructions on the FFQ covered the key points, how to record a response and an example. The "written plus verbal" instructions also included a verbal review of the example and subject practice with feedback. So the two types of instructions varied in comprehensiveness rather than as poor and better instructions.

Controls for Biases and Errors

Several steps were taken to control preventable biases and errors in the study. An Interviewer's Guide was developed outlining the correct procedures for all aspects of the 30 minute interview and subsequent scoring procedures.

During the several days of interview training, the procedures were reviewed and practiced by the interviewers. Practice interviews on volunteers unfamiliar with the study were tape recorded and the investigator provided feedback as needed to provide consistency in the administration of the interviews. A tape recorded interview of each interviewer during pilot testing revealed this consistency continued after several interviews were completed.

Before and after pilot testing, interrater reliability was checked on the information recorded

during the interview administered FFQ and the reading test. At both times, the interrater reliability was above 80% for all food categories and closer to 95% for the reading test. According to Green et al. (1986), scores 80% or higher are acceptable.

Interrater differences in the recorded food group information were mainly due to the different way the interviewers probed when subjects responded "not very often" or "never". Even though the interviewers subsequently established a line of questioning to improve consistency, accuracy in these two categories was not of much concern because these categories were not used to compute a food group score. The "not very often or never" column was included on the questionnaire to assure items were not skipped. The yearly column was added after pre-pilot testing when respondents reported a need to record answers for foods they often consume, but on a seasonal basis.

Interrater differences on the reading test occurred on the more difficult words toward the end of the word list. For example, if a subject was able to pronounce the difficult words, their raw score placed them in the twelfth grade or above category, the highest category on the reading test. Thus, interrater differences on the most difficult words did not affect the reading level estimate of the subject.

During subject selection and assignment to a treatment group, a blocking technique was used on race. This was done to evenly distribute interactions or biases that might occur between a subject and interviewer because of cultural differences.

Random selection procedures for approaching subjects were modified to reach the sample size, but assignment to treatment groups was followed as planned. This was successful at producing treatment groups with similar characteristics, such as age, race, gestation, previous exposure to the WIC Program, school grade completed and reading grade equivalent.

Because the R.D.-interview immediately followed the subject's self-administration of the FFQ, completing the first questionnaire may have influenced how the subjects responded when the R.D. asked the frequency of the same foods. Since the food frequencies were administered in the same order to all subjects, random assignment and selection should have evenly spread any effect throughout all treatment groups. Interviewers reported a few instances where subject's stated they were trying to remember what they recorded on the first FFQ. For this study, consistently following the self-administration of the FFQ by the R.D. interview FFQ was helpful to determine if the act of recording the answer interfered with the response the subject intended to record.

Periodically subject charts were randomly selected by the investigator to check scoring calculations. This study required many calculations including scoring both food frequency questionnaires of a subject and subsequently computing the difference scores for the various food categories. As a consequence of the chart reviews, the calculations made by one interviewer were all double checked once it was determined calculation errors were occurring in approximately every subject chart. After bringing the calculation errors to the interviewer's attention, she reported having vision problems. Calculations in her subsequent charts improved, but were double checked regardless.

Thus many efforts were made to control preventable biases and errors that could have influenced the study results.

High Frequency of Large Difference Scores

A lack of statistical difference between the six treatments may have occurred because the questionnaires and instructions were designed to be effective with a low literacy population. On the other hand, the lack of statistical difference may have some relationship to the many large difference scores as evidenced in Table 6 and Figures 1 through 6. That is the high difference between the subject's food category scores from the R.D.

interview administered FFQ and the self-administered FFQ. Given the frequency of large difference scores, a conservative interpretation of the study results would be the results are inconclusive.

Suiter et al. (1989), discovered a similar phenomena when developing a self-administered FFQ for a low-income population of pregnant women in Massachusetts. Of the 295 subjects who completed an initial FFQ, 53 (18%) had caloric intakes in excess of 4,500 kcal per day. According to Suiter et al. (1989, page 1793),

> A high percentage of implausibly high caloric intakes . . . resulted from checking (a) high frequency of many food items rather than from problems with just a few items... Low literacy may have been closely linked to questionable intakes, but was not equivalent to educational attainment. Forty-nine percent of those with suspect data were high school graduates.

Subject literacy was not measured in Suiter's study.

When regression analysis was used to determine if reading level explained the difference scores, only 4-7% of the variability was accounted for. Subject comments may provide a few clues to potential interfering factors. Because interviewers did not extensively probe subjects for comments, it is not known how representative each of the following factors is within the total study population.

Not reading the instructions may have contributed to large difference scores by some subjects receiving written only instructions. Interviewers recorded six

instances where subjects that were given written only instructions started to record answers on the example on the instruction page or asked if they were to start there or on the second page. Three of these subjects were reading at the 3rd grade level and one each at grades 4, 5 and 6. Two subjects reading at the 4th grade level, one at the 9th and another at the 12th grade level, asked for clarifications to the instructions when the answer could have been found in the instructions. Working with a population similar to the WIC target population, Suiter et al. (1989) tested whether women would be able to complete the FFQ following simple written rather than oral directions. These researchers found the simple written instructions were not well accepted by subjects and were judged to be an unworkable approach.

If a number of subjects recorded the number of servings they usually eat of a food, rather than simply how often the food is eaten, this could also explain some of the large difference scores for women at the higher reading levels. Four subjects, three reading at the 12th grade level and one at grade 9, asked if bread should be recorded by the slice.

During the R.D. interview, an interviewer found one subject providing responses which would answer the question "If you had food in the house how often do you eat it?", rather than the actual question, "How often do

you eat it?". The question the subject thought they were to answer may have been a factor.

Subject interpretations of food items that varied from the R.D. standard interpretation may have played a factor in some of the large difference scores. Subjects made comments on or asked questions about 23 (48%) of the 48 food items. Some subjects thought an item meant something it did not mean. For example, nine subjects confused cooked greens in the item, "spinach or cooked greens" as either green beans or peas, even though these items were listed a few lines down. Six subjects wondered if the food item, "Bun: Hamburger or Hotdog" which was listed in the bread category, included the meat. Three subjects were unsure whether they should consider both the raw and cooked/canned forms of fruits and vegetables in their response. Another three subjects asked if the cheese added to other foods should be included when answering how often they eat hard cheese. The item "Soup: Tomato or Vegetable" was questioned by five subjects who wanted to include other types of soup.

Some subjects may have been thinking about other things when they were completing the FFQ. During the administration of written plus verbal instructions, the interviewer observed a subject record answers to the first three items on the FFQ, including milk on cereal. A subject completing the write-verbal FFQ recorded 7 per

day for milk on cereal. The interviewer asked if she had cereal seven times a day to which the subject replied, "Yes". When the interviewer asked if that meant she had cereal every few hours each day, the subject again replied, "Yes". The subject sometimes had cereal in the morning and other times at night. At that point the interviewer knew she did not mean 7 per day, but she kept quiet. The interviewer noted when the subject was completing the bread category, the subject caught herself and asked how to record her answer. Subsequently, the subject changed her answers in the milk category. This instance points to the fact human error is always possible in self-reported questionnaires.

Another set of subject questions centered around judgments dietitians are trained to routinely make when recording responses during diet interviews. Questions arising from situations, such as:

- "Usually I eat cereal daily, but I haven't lately. How do I record that?"
- "I eat cantaloupe, but it's not in season. Should I put not very often?"
- "What if I don't eat ice cream on a daily basis, do I use not very often?"
- "I had chocolate milk today, but I only have it a few times a year. What should I do?"
- "What if I eat something whenever I can. What would I put down?"

When situations such as these arose, interviewers were instructed to tell the subject to record their best

estimate. Thus, lack of agreement between the R.D. and the subject score may relate to these judgment calls.

Diet assessment is generally plagued by problems with subject memory. To better understand respondent memory as a limitation of dietary recall, Dwyer and Krall (1987) reviewed theories of memory. Study findings consistently demonstrated: 1) individuals sometimes fail to report consumption of foods that were actually eaten, 2) individuals sometimes recall foods that were never eaten, 3) reported estimates of amounts and kinds of foods are often inaccurate, and 4) an individual's current diet can influence recall of diet in the distant past. A few subject comments point to the fact that remembering how often a food is eaten is not an exact science:

- "I don't really know accurately about how I eat that stuff unless I eat it everyday."
- "You know this is a hard form to fill out because basically you're just guessing on it."
- "Some weeks I eat differently than others. It depends on how much money I have to buy fruits and vegetables."
- "It's confusing to figure an average for seasonal foods."

The difference scores may be reflective of the difficulty people in general have when self-reporting dietary intake information.

Some of the large differences may be the result of the order in which the FFQs were administered. Because the self administered FFQ was followed by the interview

administered FFQ, the subject may have learned something by completing the first FFQ and consequently changed her response during the interviewed FFQ. Specific evidence of this occurred during training practice sessions. Tape recordings were made of the three volunteers as they were interviewed separately by each interviewer. Responses a volunteer made during each interview were compared and it was discovered that each person responded differently for at least one food item. The change in responses contributed to inter-interviewer scoring differences. Response changes might have resulted from a learning effect because the subject had a longer opportunity to reflect on how often they ate a food by the time they completed the second interview. Since this occurred when comparing two interviews to each other, it is likely to occur between completing a self-administered FFQ and interview administered FFQ.

There are a number of ideas that may begin to explain the large differences between food category scores from a subject's interviewed FFQ and self-administered FFQ. Because the percent of subjects with difference scores outside the range of -5 to 5 varied from 14% to 60% based on food category, this study should to be reproduced before accepting the results are not due to chance.

Food Frequency Design for the WIC Program

With the number of factors that may be contributing to the number of large difference scores, there is some doubt about whether or not a self-administered FFQ is feasible for this population.

The study sample included 58% of subjects reading at the 8th grade level or lower. This was slightly higher than the 50% estimated for this population (Mills, 1989). Interviewers expressed surprise to discover that many subjects reading at a low level were able to self-administer the FFQ with success as depicted by small difference scores. However, if factors leading to the large difference scores could be better identified and measures could be taken to reduce them without adding additional staff time, a self-administered FFQ for a low income low literacy population may still be plausible.

The questionnaires tested in this study can be compared to the guidelines of a questionnaire needed by the Michigan WIC Program (U.S. Department of Agriculture, 1989). The questionnaires met the requirement of being self-administered in 5-10 minutes, because the average completion time was 7 $\pm$ 3 minutes. Four subjects took longer than most (6, 8, 10 and 11 minutes), because their children required their attention for part of the time. A woman who took 9 minutes was interrupted to receive a prescription from the nurse. An interviewer reported a

sixth woman had extremely long fingernails which was attributed for taking her 10 minutes to complete the FFQ. Finally, one of the women who took 13 minutes was observed rereading the instructions twice and taking a long time to think of how often she ate foods.

The FFQ did not appear to overwhelm most applicants. One person did drop out after starting the study complaining the shading on every other line was bothering her and the straight edge made it worse. Clinic staff reported later that the woman has diagnosed schizophrenia and they should have warned the interviewer ahead of time.

The scoring technique used did not appear on the questionnaire reducing unnecessary distractions for the respondent. Hand scoring took 4 $\pm$ 2 minutes which is longer than the 1-2 minutes desired for the WIC program. If a single health professional was to evaluate the diets of 30 applicants in a single day, this would be a difference of 3 hours spent scoring at the longest and 1 hour at the shortest.

The interviewers reported difficulty scoring on the circle the number and mark the box FFQs because of limited space to record results when multiplying values across a line. The scoring method does have many calculations that required a calculator. Overlays appeared to work out but do require at least one set for

every person scoring the questionnaire. It is not known if the cost of the overlays will be an issue.

Given the inaccuracies as evidenced by the huge difference scores, analysis of the data to describe an individual's dietary intake has to proceed with caution. Assessing frequency of intake from food categories seems to be a reasonable expectation of the questionnaires used in this study rather than using them to a measure actual nutrient intake.

Accuracy in determining eligibility for the WIC program is extremely important. Many WIC agencies have caseload limits, so applicants must be prioritized and only those at highest nutritional risk added to the program. Of the three recording techniques tested, the circle the number technique appeared to be most successful for accurately determining when someone was eligible for the WIC program using the interview administered FFQ as the standard. It is not clear if circle the number recording technique performed better on more comparisons because the preprinted numbers on the FFQ made it easier for a subject to pick out a response, i.e. omitting the step of formulating a plausible response, and consequently increasing recall of the number during the interview administered FFQ.

As suggested by Talmage (1981), designing a FFQ with the target population in mind is likely to result in a

tool which has greater reliability and validity. It must be noted that this study was not an attempt to determine the validity or reliability of the food frequency questionnaires. The purpose was to test different designs of recording methods and instruction with a self-administered FFQ to determine which design would result in more accurate responses from a low literacy population, such as the WIC population. It should be noted that even though a tool is tested and found to have good reliability and validity with one population does not mean it will have the same with other populations.

RECOMMENDATIONS

Results of this study imply that if a FFQ is designed using recommendations for low-literacy print materials, any of the three recording techniques commonly used on FFQs (write the number, circle the number and mark the box) are workable for a low literacy population.

It also appears instructions similar to either the "written only" or "written plus verbal" type can be used to achieve the same affect on subject accuracy in self-administering the FFQ. For the WIC setting, a self-administered FFQ with "written only" instructions would be more cost effective to administer, than the verbal plus written type. Providing "written only" instructions will save approximately 1 1/2 minutes of staff time considering it takes 2 minutes to cover the "written plus verbal" instructions, and only 30 seconds for the "written only" instructions. The verbal portion of the "written only" instructions could be improved by mentioning the method to use when recording a response (i.e. write a number, circle a number of mark the box) and to suggest the respondent review the example and start on the following page.

A procedure for answering an applicant's questions when she is self-administering a FFQ would be useful.

Although not always feasible, a trained staff person, such as a clerk, diet technician or volunteer, could be available in the waiting room to answer questions when they arise as the respondent is completing the questionnaire. This person would need to know how to reexplain the question respondents are to answer as they complete the FFQ, which foods can be included for a food item and how to help the respondent think through how often they consume a food item. If a trained staff person would not be feasible, possibly respondents could be instructed to leave items blank when they have a question. Then the WIC professional could identify these items and discuss them with the applicant during the interview portion of the application process.

Prior to the WIC program instituting any of the questionnaires developed for this study on a statewide basis, the food list needs to be modified. Rearranging some of the food items may lessen some of the confusion expressed by subjects. For example, miscellaneous fruits and vegetables could be placed at the top of the list, followed by the citrus items and then the deep green and dark yellow items, so intake of green beans and peas is recorded prior to spinach and cooked greens. Rewording items, such as milk options, bun: hamburger or hotdog and various fish choices may also be beneficial.

The scoring method should be improved upon before it is seriously considered for use in a WIC clinic. A scoring method which takes 1-2 minutes per FFQ rather than 2-6 minutes is critical for maintaining adequate WIC clinic flow. If the scoring method used in this study is pursued, it may be beneficial to determine if scoring for only two time periods would continue to reflect the respondent's usual intake. For example, day and week for the milk and cheese category, and week and month for the meat, poultry, fish and dried beans category. Eliminating the scoring for unnecessary columns may decrease the overall scoring time.

There are several other ways in which the scoring system used in this study may be improved. The directions for scoring could be printed on the overlay. For example, the lines where the scorer is to multiply across the line could be color coded. Foods could be grouped together in a category that required similar multiplication steps, so that the items are multiplied by one-half or 2. Print 0.5 rather than 1/2 since the 0.5 is the actual number punched into the calculator. At times, both interviewers complained they experienced difficulty with glare from the shiny surface of the overlay due to the lighting in certain rooms. The glare problem could be eliminated if instead of laminating the overlays, the overlays were printed on material similar

to Ross's Accuplot. The scoring method was based on average portion sizes. The portion sizes need further verification before this scoring method is used to determine eligibility for the WIC program.

It appears the straight edge is useful for decreasing the number of errors. These colored paper strips are very inexpensive and easy to make. Making the straight edges available with the self-administered FFQ seems to be a cost effective tool for decreasing errors.

Once modifications are made, pretesting should occur to determine if the instructions and basic procedures are clear and if food items are understood by respondents from the target population. The final step is to test the reliability and validity of the questionnaire to determine if the information recorded truly reflects how often the subject eats the various food items.

CONCLUSIONS

1) Food frequency validation studies do not often include an example of the FFQ tested. In the future, it would be helpful if a sample of the FFQ used in a study was published along with the results, especially if a self-administered tool was used. An explanation about how the tool was designed and administered would give the reader some basis to estimate whether or not the study results were justified, based on the questionnaire design.

2) Because of the high percentage of large difference scores in this study, it is unclear if subject accuracy on a self-administered FFQ is affected by the type of instructions and recording technique. Further research is needed on the affect of recording technique and instructions on subject accuracy in recording a response before the results of this study can be accepted.

3) The skills of the population that will be self-administering the FFQ should be the primary consideration when designing a FFQ, followed by the staff who will score and use the data. Since 58% of the study population was reading at or below an 8th grade reading level, it is suggested programs serving a low income

population include recommendations from the low literacy literature when designing a self-administered FFQ.

4) This study illustrates that in addition to developing a food list, a self-administered FFQ provides other design challenges. Considerations include page layout, instructions, appearance of the recording technique, ease of subject completion, a reasonable length so the FFQ does not appear overwhelming, but requests enough information to obtain the data that is needed. Feedback directly from subjects in the target population who will be self-administering the FFQ should aid in developing such a tool.

5) Future research on self-administered food frequency questionnaires should focus on ways to lessen error in respondent interpretations and judgements. It would be helpful if future research could include additional questions at the end of an interview which addressed:

a) Food items the subject was confused about.

b) Issues the subject was confused about.

c) Did the subject read the instructions? If not, why not?

d) Did the subject think about the portion size of food they ate and include this in their answer?

6) A FFQ that is used in a WIC clinic has a an impact on the respondent different from that of a respondent completing a FFQ for a large epidemiological study. If the subject in the epidemiological study has a lot of questions or finds the questionnaire difficult to complete she may not fill it out and return it. In the WIC setting, a review of dietary intake patterns is a requirement whenever an applicant is screened for the WIC program. The responses an applicant provides may be the difference between receiving or not receiving WIC benefits. Thus, the FFQ in this situation directly impacts the life and health of the respondent.

7) Although the FFQ is the best dietary assessment tool to estimate a respondents usual dietary patterns, the self-administered FFQ tool has major limitations when used with a low income low literacy population to determine eligibility for program benefits. This study has sensitized the researcher to the variability of data gathered during dietary assessment. There are many limitations to self reported data. There are even more limitations to data gathered from a subject on a self-administered questionnaire. When a subject self-administers a FFQ, this adds a layer of subject interpretation which can increase the variability of the data more then when it is gathered by R.D. interview. Thus, we must be very careful in how we interpret the

data and must try not to make more of it than is reasonably possible. For example, even if a computer is available, scoring by food groups may be all that is reasonably possible rather than generating amounts of nutrients.

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APPENDICES

APPENDIX A

Sampling Technique

SUBJECT SELECTION FOR THE STUDY

Blocking on Race

At each study site, an Interviewer must conduct an interview with 12 WIC participants who meet the subject eligibility criteria and who sign the Consent Form. An equal number of white and black subjects must be exposed to the six treatments. To assure this happens:

> If the first seven consenting subjects are White, then the remaining five subjects must be White. If the first seven subjects are Black, then the remaining five subjects must be Black.
>
> If both races, White and Black, are represented within the first six consenting subjects, subject selection for the study proceeds to result in a total of six White and six Black subjects.

Use the ID# and Treatment Assignment Log to keep track of the number of subjects by race. Randomly approach subjects according to the procedures outlined below.

Random Selection Procedures

Subjects are to be randomly selected for the study using the following criteria for clinics with appointment slots and drop-in clinics:

A. USING APPOINTMENT SLOTS:

1. Using the clinic schedule book for WIC, select subjects from designated time slots using the randomized order for that day (see attached).

2. For each time slot, the Interviewer approaches the first randomly selected woman and asks the prescreening questions.

3. Pregnant women who meet the prescreening criteria will be informed about the study by the Interviewer. If an eligible woman is willing to participate, have them sign the consent form.

   If the first woman in the time slot is not eligible or does not wish to participate in the study, the next randomly selected woman will be approached. Continue this process until a woman agrees to participate during the time slot and signs the consent form.

Subject Selection for the Study (continued)

B. FOR DROP-IN CLINICS:

1. When the Interviewer is available to interview subjects, approach every woman and ask the prescreening questions.

2. If a large clinic (i.e. Detroit, Washtenaw or Ingham), ask every second eligible woman to participate in the study.

   If a small clinic (i.e. Branch or St. Joseph, Midland or Shiawassee), ask every woman who meets the eligibility criteria while you are available to interview.

3. If the woman agrees to participate, have her complete the consent form.

   If this woman does not agree, then ask the next eligible woman. Continue this process until a woman who meets the criteria agrees to participate and signs the consent form.

Using the ID# and Treatment Log

There are six ID# and Treatment Logs - one for each study site. Each log lists twelve ID#s to be used with the twelve subjects interviewed at the site. Each ID# is to be consecutively assigned to WIC participants who meet the criteria above and who have signed the consent form.

The order the six treatments are to be administered has been randomly determined by race, White and Black. As discussed on the previous page, this study blocks on race. To use the log as a guide in adhering to the blocking procedure, if the first six subjects include both White and Black subjects, cross off the bottom treatment row for each of the categories. If the first seven subjects are Black, cross off both treatment rows for the White category as a reminder to not include White subjects from that clinic. If the first seven subjects are White, cross off both treatment rows under the Black category.

To complete the log, find the appropriate race category for the subject. Begin in Row 1 and assign the subject to the treatment coded in the first box on the left. Record the subject's ID number below the code number. If treatments have been previously assigned, proceed across the row until you come across the next unused treatment. This continues until the row is complete. Then start with the first box in the next row, if appropriate, based on the blocking procedure.

Transfer the subject's ID number and treatment information to the Participant Information Summary page. Be sure to record the subject's ID number on all other forms related to the subject, including the consent form.

SAMPLE

I.D. LOG

R.D. #3

WIC SITE: Washtenaw SITE ID NUMBERS: 161-172

WHITE: TREATMENT NUMBERS

6	4	3	1	2	5
4	2	6	1	3	5

BLACK: TREATMENT NUMBERS

2	6	4	1	5	3
5	2	1	3	6	4

Treatment Codes:

1 = Write, Written 3 = Circle, Written 5 = Mark, Written

2 = Write, Verbal 4 = Circle, Verbal 6 = Mark, Verbal

APPENDIX B

Procedures for Interviewers

PROCEDURES FOR INTERVIEWERS

1. Interviewer approaches a woman WIC Participant according to the random selection procedure and asks the prescreening questions.

2. If at any time one of the answers to the prescreening questions falls into the right hand column, stop the questioning and thank the woman for her time.

   If all of the answers fall into the left hand column and this subject is the next person to be approached according to the random selection procedure, proceed to tell the woman about the study. Ask if the woman is interested in participating. If yes, have the woman sign the consent form. If the woman refuses, thank her for her time. (For woman who refuses, indicate on the prescreening form that she refused and the reason.)

4. Assign the subject to the next FFQ treatment from the random assignment log for the clinic and record the subject ID# and the treatment on the participant information sheet.

5. Administer the assigned self-administered FFQ according to protocol.

   a. Time how long it takes the subject to complete the FFQ using the scoring sheet. Record final time on the Participant Information Summary Sheet.

   b. Record on the "Contents of Participant File" page:

      1) Use of the straight edge.
      2) Subject's questions about the questionnaire.
      3) Observations that may relate to clues about the subject's reading ability.

      4) When the subject has completed the questionnaire, ask if she has any comments about the questionnaire and the instructions.

6. Interview administer the same version of the FFQ to gather frequency data following the standard probing procedures. Use the food portion visual to gather portion size information and record the portion size code on the interview administered FFQ.

   After each food category, ask the subject if there are foods she eats which are not listed on the questionnaire. Record answer by that food category. For foods added, include information about typical portion size.

7. Ask the subject the remaining three questions on the Participant Information Form: grades of school, month of pregnancy, and how long been on WIC.

8. Administer the word pronunciation test.

Procedures for Interviewers (continued)

9. Thank the subject for their time and provide $5 bill. Print subject's name on receipt. Subject places signature and date on the receipt.

10. Make sure questions #1 through #11 are completed on the "Participant Information Summary" and all comments are recorded on the "Contents of Participant File" page.

11. Double check the subject's ID# is on the top of the following:

    a. "Contents of Participant File"
    b. "Participant Information Summary"
    c. "Scoring Sheet"
    d. Self-Administered FFQ
    e. Interview-Administered FFQ
    f. Word Pronunciation Test
    g. Consent Form

THE PROCEDURES MAY BE INTERRUPTED AT THIS POINT

12. Score the subjects self-administered and interview administered questionnaires and record on the "Scoring Sheet". Calculate the difference between the scores and record on the "Participant Information Summary" for each of the food groups.

13. Score the word pronunciation test. Use the "Scoring Sheet" to calculate the raw reading score. Record the raw score and grade-equivalent score on the "Participant Information Summary".

14. Place the Consent Form in the Consent Form File Folder.

15. Place receipt in the receipt envelope.

16. Place all other information about subject into the subject's file folder. Place in a secure place.

PRESCREENING QUESTIONS

On coupon pickup days, women WIC participants will be randomly selected for this study. The prescreening questions will determine if a woman is eligible to be in the study.

Instructions:

1. For each time slot, you will ask the first woman who has been randomly selected for the study the prescreening questions and record her response on the form.

   The woman is eligible for the study if her responses to the questions are all on the left side of the line down the answer column. Eligible women are referred to the INTERVIEWER who will determine if the woman is willing to take part in the study.

   If the woman is not eligible or does not want to participate in the study, then the next randomly selected woman is asked the questions. This continues until a woman agrees to participate during that time slot.

2. Ask the respondent only what is in CAPITAL LETTERS. If a question is not printed in captials, it is for you to answer without asking the participant. Because question #3 is not in captial letters, you will not ask this question. Thus, the participant will only be asked four of the five prescreening questions.

   It is important that you ask the questions using the exact words printed. And ask the questions in the exact order in which they appear.

3. Completed prescreening question forms are returned to the INTERVIEWER.

PRESCREENING QUESTIONS

Fill-in:

Clinic _____ Date _____ Initials _____ Time_____

Randomly Selected Respondent# _____

	Record Answers Here	
Race-ethnicity:	White ___	Other ___
	Black ___	
**********	**********	**********
QUESTIONS:		
1. ARE YOU PREGNANT?	Yes ___	No ___
2. HOW OLD ARE YOU? Age: _____	18 years or older___	17 years or younger __
3. DO YOU SPEAK ANY LANGUAGE OTHER THAN ENGLISH?	No ___	
If yes, WHICH ONE DO YOU USE MORE?	English ___	Other ___
4. SINCE YOU'VE BEEN PREGNANT, HAVE YOU BEEN ABLE TO EAT YOUR USUAL DIET?	Yes ___	
If no, HAVE YOU NOT BEEN ABLE TO EAT YOUR USUAL DIET BECAUSE YOU'VE BEEN SICK OR HAVE HAD NO APPETITE?	No ___	Yes ___
This respondent is	eligible ____ (all marks this side)	not eligible ____ (one mark this side)

CONSENT PROCEDURES

Prior to starting the interview, a participant's consent to participate in the study will be obtained using the following procedures:

1. The Interviewer will have a private discussion with each potential participant to inform about the study.

2. The Interview will then read the consent form. The potential participant will be informed of both the details of the project and their rights as participants. These rights include:

    a) the right to freely participate or not participate in any phase of the project,

    b) the right to confidentiality, and

    c) the right to terminate participation at any time.

3. A participant's questions about the study will be answered by the Interviewer.

    If a participant has any questions or concerns related to participating in the study that cannot be answered by the Interviewers, the Interviewers will have information on who this person can contact. The contact person will be the Project Investigator.

4. A participant's willingness to participate in the study will be demonstrated by their signing of the consent form (see attached).

Study Part. ID #_____

Improving the Diet Questionnaire for Women

WIC Division, Michigan Department of Public Health
Lansing, Michigan 48909

Consent Form

The purpose of this study, "Improving the Diet Questionnaire for Women", is to gather information to revise the diet questionnaire used by the WIC Program.

As a participant in this study, you will be involved in several tasks:

1. You will be asked to complete a diet questionnaire.
2. The interviewer will then ask how often you eat the same foods and ask about portion sizes.
3. You will be asked to read a list of words.
4. You will be asked to answer questions about your month of pregnancy, grades completed in school and the amount of time you've received WIC benefits.

The interview session will take approximately 30-40 minutes. After you complete all of the tasks, you will be given $5.00.

Information you provide will be kept confidential. Your participation in the study will not affect your eligibility for the WIC Program or your WIC benefits. This will also be true if you decide not to participate once the study is started. Reports written about this study will not include your name.

- -

I, _____ agree to take part in this diet questionnaire study. I was allowed to ask questions regarding this study. I understand that I may withdraw my consent and stop participating at any time.

I understand that the study results may be used in a written report without my identity being revealed in any way. The data from individuals will be treated with strict confidence.

_____ _____

Interviewer signature Participant signature

Date _____ Date _____

SUBJECT SELF-ADMINISTERED FFQ

PROCEDURES

1. Determine the treatment procedure for the subject from the random assignment log. Record ID# next to the assigned treatment.

2. Record the treatment type on the "Participant Information Summary".

3. Give the subject the assigned FFQ.

4. Administer the appropriate instructions.

5. On the "Scoring Sheet" record:

   TIME: Subject's Starting and Ending Time

6. While observing the subject complete the FFQ, record the following on the "Contents of Participant File" form:

   a. Did they use the straight edge?

   b. Subject behavior that may relate to reading ability, such as -

      1) quickly completed the FFQ

      2) took an extra long time

      3) drawing on the questionnaire

      4) stare off into space

      5) looked busy, but really wasn't filling out the questionnaire

      6) questions raised about _____

7. After the subject has indicated they are finished. Ask if they have any comments a) about the questionnaire, b) about the instructions. Record subject response on the "Contents of Participant File" form.

INTERVIEW ADMINISTERING THE FFQ

PROCEDURES

1. Explain to the subject you need to reask them the same information, but this time you will be recording their answers on a copy of the questionnaire they just completed.

   In addition, explain that you also need to ask about the usual amounts of the foods they eat.

2. Using a clean copy of the FFQ the subject just completed, for each food item(s) listed on a line, use the standard probing procedures to,

   a. ask for the frequency the food(s) is eaten and record the answer on the FFQ using the recording method for that questionnaire.

   b. ask the subject to indicate the amount of the food they usually consume by pointing to the picture on the chart that is closest to the portion size. Record the code number for the portion size picture on the FFQ next to the food item.

3. After each food category is completed, ask the subject if there are any foods from that category they eat, but were not mentioned or listed on the questionnaire.

   If there is a food(s) missing, record the name of the food(s) and the typical portion size(s). NOTE: Only one portion size per food item.

PROBING

1) Do you eat (name food)?

2) How often do you eat (name food)? (Daily, Weekly, Monthly, etc.)

3) When you eat (name food) each (Day, etc.), how many times do you eat it? (# per that Day, etc.)

   [Record this number on the FFQ using the recording technique appropriate for the questionnaire.]

4) Point to the chart and show me which picture is closest to the amount you usually (eat, drink) when you have (name food).

   [Record the code number corresponding to the picture on the chart the subject pointed to on the FFQ to the right of the food name.]

FOOD PORTION VISUAL REFERENCE SHEET

Introduction to Food Portion Visual:

1. This chart has various models on it that will help me know the amount of different foods you eat or beverages you drink.

2. For example, on Side A:

   a. You see spoons (A1, A2, A3).

   b. Three glasses with 1/4, 1/2, 3/4 and full marks. These will help me get an idea of the amounts you drink.

   c. The bowls can be used to describe anything eaten in a bowl.

   d. The three mounds will give me an idea of portions of food on your plate. Here they are shown without the plate.

   e. We also have a cup, a mug, a shot glass and a wine glass.

   f. The three wedges can be used to describe a portion of pizza.

3. On Side B, you see many different shapes.

   a. I know these don't look like any meat you've ever eaten, but we will use them to estimate the amount of meat, fish, cheese, etc. you ate.

   b. What I'll want you to do is to picture the meat on your plate as though you're looking down on it. Select the model that best represents the size of your meat portion, then we'll use these ruler measures (point to measures on the left) to get an idea of how thick the meat was.

APPROPRIATE MODELS FOR VARIOUS FOODS

	Side or Std	Food Model
MILK AND CHEESE		
Use Side A, except for Cheese:	A or B	Disc, Square, Rectangle, Cups
American Cheese	Std. Unit	
BREAD AND CEREAL		
Cereals	A	Mounds
Noodles, Macaroni, Spagetti, Rice	A	Mounds, Cups, Spoons
Biscuits, Muffins	B	
Crackers	Std. Unit	
Rolls or Buns	Std. Unit	
Cornbread	Std. Unit	
Bagels	Std. Unit	
Tortillas	Std. Unit	
FRUIT AND VEGETABLE		
Canned	A	Mounds, Cups, Spoons
Cooked	A	Mounds, Cups, Spoons
Lettuce	A	
Soups	A	
Juice	A	
Fresh Fruit	Std. Unit	
Raw Vegetables	Std. Unit	
Tomatoes	Std. Unit	
Potatoes	Std. Unit	
MEAT, POULTRY, FISH AND BEANS		
Peanut Butter	A or B	Spoons or Rectangle to est. PB thickness
Beans	A	
Stews, Casseroles	A	
Canned Tuna	A	
Beef, Pork, Fish	B	Disc, Squ, Rectangl
Cold Cuts	B	
Sliced Chicken or Turkey	B	
Chicken parts	Std. Unit	
Eggs	Std. Unit	
Fish Sandwich	Std. Unit	
Hot Dog	Std. Unit	

NOTATION HINTS:

Between "=": A6 = A8

Subtract "-": A8 - A4

Add "+": A11 + A15;

PARTICIPANT INFORMATION SUMMARY

1. Study Part. ID# ________ 2. Agency/Clinic: ____________

3. Date completed ____ ____ 19____ (mo. day year) 4. Data Collector's ID# ________

5. Race-Ethnicity a. White ___ b. Black ___

6. Age: ______ (yrs.)

7. FFQ: a. Write-written ___ Write-verbal ___

   b. Circle-written ___ Circle-verbal ___

   c. Mark-written ___ Mark-verbal ___

8. Time to self-administer the FFQ: ___________ (minutes)

- -

9. HOW MANY GRADES OF SCHOOL HAVE YOU COMPLETED?

   None 00

   Elementary . . . 01 02 03 04 05 06 07 08

   High School . . . 09 10 11 12

   College 13 14 15 16

   Graduate . . . . . .17 18+

10. WHAT MONTH OF PREGNANCY ARE YOU IN?

    1 2 3 4 5 6 7 8 9 10

11. HOW LONG HAVE YOU BEEN ON THE WIC PROGRAM FOR YOURSELF OR A CHILD? ____________ (months)

    First exposure to WIC ____

    Previously exposed to WIC ____

- -

12. Difference in scores by food group:

    a. Milk and Cheese ______

    b. Bread and Cereal ______

    c. Citrus ______

    d. Deep Green Deep Yellow Vegetables and Fruit ______

    e. Fruit and Vegetable ______

    f. Meat, Poultry, Fish and Dried Beans ______

13. Reading Raw Score: ______

    Reading Grade-equivalent score: ______

Study Participant ID#: _____

CONTENTS OF PARTICIPANT FILE

A. Subject ID# on the forms underlined below? _____

B. Are the following forms in the Participant Chart?

1. Participant Information Summary Sheet _____

Each question completed? _____

2. Scoring Sheet _____

3. Participant's Self-Administered FFQ _____

4. R.D.-Interview FFQ _____

5. Word Pronunciation Test _____

C. Consent Form filed in the Consent Form file folder? _____

D. Receipt in receipt envelope? _____

Comments:

1. Straight Edge: USED_____ DID NOT USE _____

2. Questions subject asked while completing the FFQ:

3. Subject behavior that may relate to reading ability:

a. ____ Quickly completed the FFQ
b. ____ Took extra long time to complete FFQ
c. ____ Looked busy (e.g. drawing) but really wasn't filling out the questionnaire
d. ____ Stared off into space
e. ____ Other (type of questions asked - specify):

4. Subject's comments about the FFQ and the instructions:

a. Foods Missing from FFQ? No ___ Yes ____ (see FFQ)

b. Foods subject not familiar with were:

c. Originally thought _____ meant:

Study Participant ID# _____

SCORING SHEET

CALCULATION OF TIME TO COMPLETE FFQ:

Time Subject Started FFQ _____ - Time Finished _____ =
Total time to complete FFQ: _____

CALCULATION OF FOOD GROUP SCORE DIFFERENCES:

		TIME to score subject's FFQ: _____				Differ in Scores
		R.D. FFQ		Subject FFQ		
a.	Milk and Cheese	_____	-	_____	=	_____
b.	Bread and Cereal	_____	-	_____	=	_____
c.	Citrus	_____	-	_____	=	_____
d.	Deep Green and Yellow Fruit and Vegetables	_____	-	_____	=	_____
e.	Other Fruit & Vegetables	_____		_____		
	Subtotal (c + d + e)	= _____		= _____		
	Cantaloup/wk + Brocolli/wk	- _____		- _____		
	Total Fruits & Vegetable	= _____	-	_____	=	_____
f.	Meat, Poultry, Fish and Dried Beans	_____	-	_____	=	_____

CALCULATION OF GRADE-EQUIVALENT READING LEVEL:

1. Number of words correctly pronounced = _____

2. If eleven (11) or more words correctly pronounced, add 15 points.

   OR

   If ten (10) or less words correctly pronounced, add points from prereading section. (Maximum of 15 points.) + _____

RAW SCORE = _____

Study Participant's Reading Level Grade-Equivalent = _____

APPENDIX C

Application for Review of a Project Involving Human Subjects

APPLICATION FOR REVIEW OF A PROJECT INVOLVING HUMAN SUBJECTS

Submit your proposal for UCRIHS review to: #: _____

Dr. John K. Hudzik, Chair
UCRIHS
Michigan State University
206 Berkey Hall
East Lansing, MI 48824-1111

If you have questions, or wish to check the status of your proposal, call: (517) 353-9738

DIRECTIONS: COMPLETE QUESTIONS 1 - 11:

Attach additional material only as requested or if the space available for response to a given question has been exhausted.

---

1. **RESPONSIBLE PROJECT INVESTIGATOR:** (faculty or staff supervisor)

   Karen Scrimger

   NAME OF INVESTIGATOR: (if different)

2. **CAMPUS ADDRESS:** (faculty or staff supervisor)

   Dr. Judith Anderson

   165 S. Anthony

   PHONE #: 335-0285

   CAMPUS ADDRESS: (or address where approval letter is to be sent)

   5568 VanAtta Road

   Haslett, MI 48840

   PHONE #: 339-8481 (H)
   335-8957 (O)

3. **TITLE OF PROPOSAL:**

   Guidelines on Designing a Food Frequency Questionnaire for Low Income Pregnant Women with Low Literacy Skills

4. **NOTIFICATION.** Does the research described in this proposal require that notification be given to the FDA or the NIH or another agency? [ ]Yes [x]No If yes, specify:

5. **EXEMPT/EXPEDITED.** If applying for Exempt or Expedited status, state which category. (i.e. 1-A, 2-D,etc.) **SEE INSTRUCTIONS - ITEM 1**

   Category: 1-C

For Office Use

Subcommittee: _____ Comments to PI: _____
Agenda: _____ Comments to REV: _____
Comments: _____

(5/88)

6. **ABSTRACT. Summarize the research (its purpose and general design) to be conducted. This can be identical or similar to the summary required when submitting to the NIH (200 words or less). Briefly outline, in particular, what will be done to research subjects. Also, indicate if you are associated with the research subjects (e.g., are they your patients, students or employees?)**

(See attached - 6. Abstract)

7. **SUBJECT POPULATION. Will any of the following be subjects:**

	Yes	No		Yes	No
Minors	[ ]	[x]	Incompetent persons	[ ]	[x]
Pregnant Women	[x]	[ ]	Students	[ ]	[x]
Women of Child-bearing age	[x]	[ ]	Low Income Persons	[x]	[ ]
Institutionalized Persons	[ ]	[x]	Minorities	[x]	[ ]

7a. Number of subjects (including controls)? 144

7b. How will subjects be contacted and selected?

(See attached - 7b. How will subjects be contacted and selected?)

7c. Will research subjects be compensated? [x]Yes [ ]No
If yes, all information concerning payment, including the amount and schedule of payment must be set forth in the informed consent.

7d. Will you be advertising for research participants? [ ]Yes [x]No
If yes, attach a copy of the advertisement you will use. **SEE INSTRUCTIONS - ITEM 2**

6. ABSTRACT

The purpose of this project is to develop guidelines for designing a self-administered food frequency questionnaire (FFQ) for pregnant women with poor reading skills. It is estimated 50% of the population served by the Special Supplemental Food Program for Women, Infants and Children (WIC) is reading below an 8th grade level. For the majority of WIC participants to self-administer the required FFQ, the tool must be designed at a 5th-6th grade reading level. Although such an instrument is desirable, one does not appear to exist.

A FFQ has three major parts: food list, recording method and instructions. The literature has guidance on developing the food list and the instructions, but information is lacking about the recording technique and type of instructions to use with the low literacy population. This study will test two types of instruction (written only or written plus verbal), and three types of recording techniques (write the number; circle the number; and mark the box) for a total of six treatments. Comparing subjects' food group scores from the self-administration of the questionnaires to the interview-administration will determine which FFQ treatment provides information closest to the interview standard.

The six FFQ treatments will be randomly assigned to a total of 144 pregnant women WIC participants from six WIC clinics, three urban and three rural. After one of the instruction methods is provided, a subject will complete a FFQ with one of the three recording techniques. Next, a registered dietitian will ask the subject how often the same foods are eaten and ask about usual portion size. A reading level test and questions about months of gestation, previous exposure to the WIC program and grades completed in school will conclude the interview session. A subject will recieve $5 if they complete all interview tasks.

Neither the principal investigator, nor the two hired interviewers have any association with the research subjects.

7b. HOW WILL SUBJECTS BE CONTACTED AND SELECTED?

Permission will be obtained from six WIC clinic sites, three urban and three rural, to carry out the study on location. During designated time slots, subjects will be randomly selected from the clinic schedule book using the randomized

7b. (continued)

order for that day. For each time slot, the clinic clerk approaches the first randomly selected woman and asks the prescreening questions (see attached copy of the prescreening questions and administration instructions). Pregnant women who meet the prescreening criteria will be informed about the study by the Interviewer. If an eligible woman is willing to participate, they will sign the consent form.

If the first woman in the time slot is not eligible or does not wish to participate in the study, the next randomly selected woman will be approached. This process will continue until a woman agrees to participate during the time slot.

8. **ANONYMITY/CONFIDENTIALITY. Describe procedures and safeguards for insuring confidentiality or anonymity. SEE INSTRUCTIONS - ITEM 3**

(See attached - 8. Anonymity/Confidentiality)

9. **RISK/BENEFIT RATIO. Analyze the risk/benefit ratio. SEE INSTRUCTIONS - ITEM 4. Completely answer items A, B, and C listed in the instructions.**

(See attached - 9. Risk/Benefit Ratio)

8. ANONYMITY AND CONFIDENTIALITY

Given the methodology to be used in this study (interviewing), no attempt will be made to provide anonymity. The following steps will be taken to insure confidentiality:

1. The consent form will be the only place where the name of a subject is linked to the subject's ID#. At all times, the consent form will be stored in a file folder separate from the other information about a subject.

2. During the data collection phase, the two interviewers will have access to the data they have collected until it is turned over to the principal investigator. Once a subject's information is given to the principal investigator, only the principle investigator will have access to the consent form which links the participant ID# to the subject name.

3. Interviewers will remove study files from the clinic every evening and store in the trunk of their car until the completed files are delivered to the principal investigator.

4. The principal investigator will store consent forms and study information in different locked file cabinets at the State Health Department.

5. Reports, articles and presentations about this study will not specify any subject by name. All of the subject information will be kept confidential. Results will be reported only in summary format.

9. RISK/BENEFIT RATIO

Since Interviewers are not clinic staff persons who normally determine eligibility for the WIC Program, a subject will not be at any risk of losing their WIC eligibility nor WIC benefits by participating in this study. This will also apply to any subject who starts the study but decides to withdraw at any time.

By participating in the study, individual subjects will benefit monetarily and may potentially benefit by becoming more aware of the frequency they consume certain foods.

In the long term, pregnant women applying to the WIC Program will benefit from a food frequency questionnaire that can be self-administered by the majority of WIC participants because of the reduction in the amount of time it takes for WIC Program certifications. Also, because the food frequency

9. (continued)

will be designed with the low literacy population in mind using the most effective method of instructions and recording technique, the tool is likely to have greater reliability and validity than the tool currently used by the Michigan WIC Program. In addition, the revised tool is likely to have more sensitivy and specificity than the current food frequency questionnaire. Thus, the applicants at highest dietary risk will have a greater likelyhood of being identified and provided services.

10. **CONSENT PROCEDURES. Describe consent procedures to be followed, including how and where informed consent will be obtained. SEE INSTRUCTIONS - ITEM 5 on what needs to be included in your consent form. Include a copy of your consent form with your proposal.**

(See attached - 10. Consent Procedures)

11. CHECKLIST. **Check off that you have included each of these items with your proposal. If not applicable, state n/a.**

[X] Provide six (6) copies of all information - gathering instruments (questionnaires, tests, forms, etc.) - to be used in the project. Provide two (2) copies if applying for exempt or expedited.
(See attached)

[X] Proposed graduate and undergraduate student research projects submitted to UCRIHS for review should be accompanied by a signed statement from the student's major professor stating that he/she has reviewed and approves the proposed project.
(See attached)

[X] Provide one complete copy of the full research proposal. Graduate students should furnish one copy of the "Methods" chapter of their thesis/dissertation (if available) in lieu of a research proposal.
(See attached)

[X] Questions 1 - 10 have been filled out completely.

[X] Consent form is included in proposal (or for those projects where signed consent is not possible or feasible the consent procedure is included in proposal.)
(See attached)

N/A [ ] Advertisement included if applicable

YOUR PROPOSAL WILL BE ASSIGNED AN IRB NUMBER. REFER TO THIS NUMBER AND THE TITLE OF YOUR PROPOSAL ON ANY CORRESPONDENCE OR INQUIRIES.

10. CONSENT PROCEDURES

The project will require the informed consent of several types of participants. Consent will first be obtained from administrators and staff of the clinics involved. Following this, consent will be obtained from individual participants.

Consent procedures with individual participants will include the following:

1. The Interviewer will have a private discussion with each potential participant to inform about the study.

2. The Interview will then read the consent form. The potential participant will be informed of both the details of the project and their rights as participants. These rights include 1) the right to freely participate or not participate in any phase of the project, 2) the right to confidentiality, and 3) the right to terminate participation at any time.

3. Questions about the study will be answered by the Interviewer.

4. The participant's willing to participate in the study will demonstrate this by signing the consent form. The attached consent form will be provided to all participants.

If participants have any questions or concerns related to participating in the study that cannot be answered by the Interviewers, the Interviewers will have information on who this person can contact. The contact person will be the Project Investigator.

APPENDIX D

Food Frequency Questionnaires Designed for This Study

1. Write the Number
2. Circle the Number
3. Mark the Box

(Please note: The food frequency questionnaires appear in a reduced size.)

Diet Questionnaire for Women

Instructions: This is about your usual eating habits. Think about how often you usually eat foods.

For each food listed, put a number under the day, week, month or year heading to show how often you eat the food. Put only one number for each food.

For example, if you eat hamburger or meatloaf twice a week, put a "2" in the box under each week.

Please be careful your "2" is in the right box. It will make a big difference if you show hamburger or meatloaf "twice each day" when you mean "twice each week".

If you never eat hamburger or meatloaf, check (√) the box under Not very often or Never.

EXAMPLE:

If you 1) eat bread once a day,
2) eat hamburger or meatloaf about two times a week,
3) eat grapefruit about six times a year,
4) never eat ice cream.

For each food, you would put a number in only one box to show how often you eat it.

		How Often?				
		each Day	each Week	each Month	each Year	Not very often or Never
1)	Bread (including Sandwiches)	1				
2)	Hamburger or Meatloaf		2			
3)	Grapefruit				6	
4)	Ice Cream					✓

Please turn to the next page →

H-1013 12/89 Michigan Department of Public Health

Authority: Act 368, P.A. 1978

For each food below, please show how often you usually eat the food. Put only one number for each food. MAKE SURE YOU FILL IN EVERY LINE.

Milk and Cheese	How Often? each Day	each Week	each Month	each Year	Not very often or Never
Chocolate Milk or Milk Shake					
Milk on Cereal					
Glass or Cup of White Milk					
Hard Cheese: American, Cheddar or Colby					
Meals with Cheese: Pizza, Macaroni and Cheese					
Ice Cream					

Bread and Cereal	How Often? each Day	each Week	each Month	each Year	Not very often or Never
Spaghetti, Pasta, Macaroni or Noodles					
Bread (including Sandwiches)					
Bun: Hamburger or Hot Dog					
Bagels					
Crackers					
Rice					
Biscuits, Muffins or Corn Bread					
Tortilla					
Cold or Hot Cereal					

Please go on to the next page ⟶

Fruit and Vegetable	How Often? each Day	each Week	each Month	each Year	Not very often or Never
Juice: Orange, Grapefruit or WIC Juice					
Oranges or Grapefruit					
Tomatoes or Tomato Juice					
Cantaloupe					
Broccoli					
Spinach or Cooked Greens					
Carrots: Cooked or Raw					
Soup: Vegetable or Tomato					
Sweet Potatoes or Yams					
French Fries or Fried Potatoes					
Potato: Baked, Mashed, Boiled or Potato Salad					
Corn or Peas					
Green Beans					
Cauliflower					
Green Salad					
Coleslaw or Cabbage					
Apples, Applesauce or Pears					
Peaches, Apricots or Nectarines					
Bananas					
Grapes					
Raisins or Prunes					

Please go on to the next page →

Meat, Poultry, Fish and Beans	How Often? each Day	each Week	each Month	each Year	Not very often or Never
Peanut Butter					
Baked Beans, Pintos, Limas, Kidney, Chili or Refried Beans					
Hamburger or Hamburger in Meals					
Steak or Roast					
Beef Stew					
Liver					
Pork Chops, Pork Roast or Ham					
Chicken or Turkey					
Fish or Fish Sandwich					
Lunch Meats or Hot Dogs					
Tuna Salad or Tuna Casserole					
Eggs					

Thank you very much for completing this form!

Diet Questionnaire for Women

Instructions: This is about your usual eating habits. Think about how often you usually eat foods.

For each food listed, circle the number under the day, week, month or year heading to show how often you eat the food. Circle only one number for each food.

For example, if you eat hamburger or meatloaf twice a week, put a circle around the 2 under each week.

If you never eat hamburger or meatloaf, check (√) the box under Not very often or Never.

Please be careful your circle is around the right number. It will make a big difference if you circle hamburger or meatloaf "twice each day" when you mean "twice each week".

EXAMPLE:

If you
1) eat bread once a day,
2) eat hamburger or meatloaf about two times a week,
3) eat grapefruit about six times a year,
4) never eat ice cream.

For each food, you would circle the one number that shows how often you eat it.

		How Often?				
		each Day	each Week	each Month	each Year	Not very often or Never
1)	Bread (including Sandwiches)	(1) 2 3 4 5+	1 2 3 4 5 6 7+	1 2 3	2 4 6 8 10	
2)	Hamburger or Meatloaf	1 2 3 4 5+	1 (2) 3 4 5 6 7+	1 2 3	2 4 6 8 10	
3)	Grapefruit	1 2 3 4 5+	1 2 3 4 5 6 7+	1 2 3	2 4 (6) 8 10	
4)	Ice Cream	1 2 3 4 5+	1 2 3 4 5 6 7+	1 2 3	2 4 6 8 10	✓

Please turn to the next page →

II-1013 12/89 Michigan Department of Public Health

Authority: Act 368, P.A. 1978

For each food below, please show how often you usually eat the food. (Circle) only one number for each food. MAKE SURE YOU FILL IN EVERY LINE.

Milk and Cheese	How Often?				
	each Day	each Week	each Month	each Year	Not very often or Never
Chocolate Milk or Milk Shake	1 2 3 4 5+	1 2 3 4 5 6 7+	1 2 3	2 4 6 8 10	
Milk on Cereal	1 2 3 4 5+	1 2 3 4 5 6 7+	1 2 3	2 4 6 8 10	
Glass or Cup of White Milk	1 2 3 4 5+	1 2 3 4 5 6 7+	1 2 3	2 4 6 8 10	
Hard Cheese: American, Cheddar or Colby	1 2 3 4 5+	1 2 3 4 5 6 7+	1 2 3	2 4 6 8 10	
Meals with Cheese: Pizza, Macaroni and Cheese	1 2 3 4 5+	1 2 3 4 5 6 7+	1 2 3	2 4 6 8 10	
Ice Cream	1 2 3 4 5+	1 2 3 4 5 6 7+	1 2 3	2 4 6 8 10	

Bread and Cereal	How Often?				
	each Day	each Week	each Month	each Year	Not very often or Never
Spaghetti, Pasta, Macaroni or Noodles	1 2 3 4 5+	1 2 3 4 5 6 7+	1 2 3	2 4 6 8 10	
Bread (including Sandwiches)	1 2 3 4 5+	1 2 3 4 5 6 7+	1 2 3	2 4 6 8 10	
Bun: Hamburger or Hot Dog	1 2 3 4 5+	1 2 3 4 5 6 7+	1 2 3	2 4 6 8 10	
Bagels	1 2 3 4 5+	1 2 3 4 5 6 7+	1 2 3	2 4 6 8 10	
Crackers	1 2 3 4 5+	1 2 3 4 5 6 7+	1 2 3	2 4 6 8 10	
Rice	1 2 3 4 5+	1 2 3 4 5 6 7+	1 2 3	2 4 6 8 10	
Biscuits, Muffins or Corn Bread	1 2 3 4 5+	1 2 3 4 5 6 7+	1 2 3	2 4 6 8 10	
Tortilla	1 2 3 4 5+	1 2 3 4 5 6 7+	1 2 3	2 4 6 8 10	
Cold or Hot Cereal	1 2 3 4 5+	1 2 3 4 5 6 7+	1 2 3	2 4 6 8 10	

Please go on to the next page ⟶

Fruit and Vegetable	How Often? each Day	each Week	each Month	each Year	Not very often or Never
Juice: Orange, Grapefruit or WIC Juice	1 2 3 4 5+	1 2 3 4 5 6 7+	1 2 3	2 4 6 8 10	
Oranges or Grapefruit	1 2 3 4 5+	1 2 3 4 5 6 7+	1 2 3	2 4 6 8 10	
Tomatoes or Tomato Juice	1 2 3 4 5+	1 2 3 4 5 6 7+	1 2 3	2 4 6 8 10	
Cantaloupe	1 2 3 4 5+	1 2 3 4 5 6 7+	1 2 3	2 4 6 8 10	
Broccoli	1 2 3 4 5+	1 2 3 4 5 6 7+	1 2 3	2 4 6 8 10	
Spinach or Cooked Greens	1 2 3 4 5+	1 2 3 4 5 6 7+	1 2 3	2 4 6 8 10	
Carrots: Cooked or Raw	1 2 3 4 5+	1 2 3 4 5 6 7+	1 2 3	2 4 6 8 10	
Soup: Vegetable or Tomato	1 2 3 4 5+	1 2 3 4 5 6 7+	1 2 3	2 4 6 8 10	
Sweet Potatoes or Yams	1 2 3 4 5+	1 2 3 4 5 6 7+	1 2 3	2 4 6 8 10	
French Fries or Fried Potatoes	1 2 3 4 5+	1 2 3 4 5 6 7+	1 2 3	2 4 6 8 10	
Potato: Baked, Mashed, Boiled or Potato Salad	1 2 3 4 5+	1 2 3 4 5 6 7+	1 2 3	2 4 6 8 10	
Corn or Peas	1 2 3 4 5+	1 2 3 4 5 6 7+	1 2 3	2 4 6 8 10	
Green Beans	1 2 3 4 5+	1 2 3 4 5 6 7+	1 2 3	2 4 6 8 10	
Cauliflower	1 2 3 4 5+	1 2 3 4 5 6 7+	1 2 3	2 4 6 8 10	
Green Salad	1 2 3 4 5+	1 2 3 4 5 6 7+	1 2 3	2 4 6 8 10	
Coleslaw or Cabbage	1 2 3 4 5+	1 2 3 4 5 6 7+	1 2 3	2 4 6 8 10	
Apples, Applesauce or Pears	1 2 3 4 5+	1 2 3 4 5 6 7+	1 2 3	2 4 6 8 10	
Peaches, Apricots or Nectarines	1 2 3 4 5+	1 2 3 4 5 6 7+	1 2 3	2 4 6 8 10	
Bananas	1 2 3 4 5+	1 2 3 4 5 6 7+	1 2 3	2 4 6 8 10	
Grapes	1 2 3 4 5+	1 2 3 4 5 6 7+	1 2 3	2 4 6 8 10	
Raisins or Prunes	1 2 3 4 5+	1 2 3 4 5 6 7+	1 2 3	2 4 6 8 10	

Please go on to the next page ⟶

Meat, Poultry, Fish and Beans	How Often? each Day	each Week	each Month	each Year	Not very often or Never
Peanut Butter	1 2 3 4 5+	1 2 3 4 5 6 7+	1 2 3	2 4 6 8 10	
Baked Beans, Pintos, Limas, Kidney, Chili or Refried Beans	1 2 3 4 5+	1 2 3 4 5 6 7+	1 2 3	2 4 6 8 10	
Hamburger or Hamburger in Meals	1 2 3 4 5+	1 2 3 4 5 6 7+	1 2 3	2 4 6 8 10	
Steak or Roast	1 2 3 4 5+	1 2 3 4 5 6 7+	1 2 3	2 4 6 8 10	
Beef Stew	1 2 3 4 5+	1 2 3 4 5 6 7+	1 2 3	2 4 6 8 10	
Liver	1 2 3 4 5+	1 2 3 4 5 6 7+	1 2 3	2 4 6 8 10	
Pork Chops, Pork Roast or Ham	1 2 3 4 5+	1 2 3 4 5 6 7+	1 2 3	2 4 6 8 10	
Chicken or Turkey	1 2 3 4 5+	1 2 3 4 5 6 7+	1 2 3	2 4 6 8 10	
Fish or Fish Sandwich	1 2 3 4 5+	1 2 3 4 5 6 7+	1 2 3	2 4 6 8 10	
Lunch Meats or Hot Dogs	1 2 3 4 5+	1 2 3 4 5 6 7+	1 2 3	2 4 6 8 10	
Tuna Salad or Tuna Casserole	1 2 3 4 5+	1 2 3 4 5 6 7+	1 2 3	2 4 6 8 10	
Eggs	1 2 3 4 5+	1 2 3 4 5 6 7+	1 2 3	2 4 6 8 10	

Thank you very much for completing this form!

Diet Questionnaire for Women

Instructions: This is about your usual eating habits. Think about how often you usually eat foods.

For each food listed, put an (X) in the box under the day, week, month or year heading to show how often you eat the food. Put only one (X) for each food.

For example, if you eat hamburger or meatloaf twice a week, put an (X) in the box under 2-4 each week.

If you never eat hamburger or meatloaf, mark (X) in the box under Not very often or Never.

Please be careful your (X) is in the right box. It will make a big difference if you (X) hamburger or meatloaf "2-3 each day" when you mean "2-4 each week".

EXAMPLE:

If you
1) eat bread once a day,
2) eat hamburger or meatloaf about two times a week,
3) eat grapefruit about six times a year,
4) never eat ice cream.

For each food, you would choose the one box that shows how often you eat it.

		How Often?									
		Day				Week			Month	Year	
		1 each day	2-3 each day	4-5 each day	6+ each day	1 each week	2-4 each week	5-6 each week	1-3 each month	2-10 each year	Not very often or never
1)	Bread (including Sandwiches)	X									
2)	Hamburger or Meatloaf						X				
3)	Grapefruit									X	
4)	Ice Cream										X

Please turn to the next page ⟶

II-1013 12/89 Michigan Department of Public Health

Authority: Act 368, P.A. 1978

For each food below, please show how often you usually eat the food. Put only one (X) for each food. MAKE SURE YOU FILL IN EVERY LINE.

Milk and Cheese

	How Often?									
	Day				Week			Month	Year	
	1 each day	2-3 each day	4-5 each day	6+ each day	1 each week	2-4 each week	5-6 each week	1-3 each month	2-10 each year	Not very often or Never
Chocolate Milk or Milk Shake										
Milk on Cereal										
Glass or Cup of White Milk										
Hard Cheese: American, Cheddar or Colby										
Meals with Cheese: Pizza, Macaroni and Cheese										
Ice Cream										

Bread and Cereal

	How Often?									
	Day				Week			Month	Year	
	1 each day	2-3 each day	4-5 each day	6+ each day	1 each week	2-4 each week	5-6 each week	1-3 each month	2-10 each year	Not very often or Never
Spaghetti, Pasta, Macaroni or Noodles										
Bread (including Sandwiches)										
Bun: Hamburger or Hot Dog										
Bagels										
Crackers										
Rice										
Biscuits, Muffins or Corn Bread										
Tortilla										
Cold or Hot Cereal										

Please go on to the next page ⟶

Fruit and Vegetable	How Often?									
	Day				Week			Month	Year	
	1 each day	2-3 each day	4-5 each day	6+ each day	1 each week	2-4 each week	5-6 each week	1-3 each month	2-10 each year	Not very often or Never
Juice: Orange, Grapefruit or WIC Juice										
Oranges or Grapefruit										
Tomatoes or Tomato Juice										
Cantaloupe										
Broccoli										
Spinach or Cooked Greens										
Carrots: Cooked or Raw										
Soup: Vegetable or Tomato										
Sweet Potatoes or Yams										
French Fries or Fried Potatoes										
Potato: Baked, Mashed, Boiled or Potato Salad										
Corn or Peas										
Green Beans										
Cauliflower										
Green Salad										
Coleslaw or Cabbage										
Apples, Applesauce or Pears										
Peaches, Apricots or Nectarines										
Bananas										
Grapes										
Raisins or Prunes										

Please go on to the next page ⟶

Meat, Poultry, Fish and Beans	How Often?									
	Day				Week			Month	Year	
	1 each day	2-3 each day	4-5 each day	6+ each day	1 each week	2-4 each week	5-6 each week	1-3 each month	2-10 each year	Not very often or Never
Peanut Butter										
Baked Beans, Pintos, Limas, Kidney, Chili or Refried Beans										
Hamburger or Hamburger in Meals										
Steak or Roast										
Beef Stew										
Liver										
Pork Chops, Pork Roast or Ham										
Chicken or Turkey										
Fish or Fish Sandwich										
Lunch Meats or Hot Dogs										
Tuna Salad or Tuna Casserole										
Eggs										

Thank you very much for completing this form!

APPENDIX E

Proposed Dietary Eligibility Criteria for Pregnant Women - Michigan WIC Program

Proposed Dietary Eligibility Criteria for Pregnant Women
Michigan WIC Program

PREGNANT WOMAN INADEQUATE DIET - CODE SERIES 400

401 Inadequate Milk/Cheese

Less than 21 milk/cheese servings per week. A milk/cheese serving equals one of the following:

8 oz. milk
1 C. yogurt
1 1/2 oz. hard cheese
1 1/2 C. ice cream

402 Inadequate Meat/ Fish/ Poultry/ Dried Beans

Less than 21 meat/fish/poultry/dried beans servings per week. A meat/fish/ poultry/dried beans serving equals one of the following:

2 oz. cooked meat, fish or poultry
2 eggs
4 Tbsp. peanut butter
1 c. cooked dried beans
2 slices of lunchmeat

403 Inadequate Bread/Cereal

Less than 21 servings of enriched or whole grain breads or cereals servings per week. One serving equals one of the following:

1 slice bread
1 tortilla
1/2-3/4 c. cooked rice, spaghetti, pasta, noodles, etc.
1 medium bowl cold or hot cereal
4 - 2" square crackers

404 Inadequate Fruit/Vegetable

Less than 21 servings of fruit and/or vegetables per week. One serving equals one of the following:

Vegetables	(Cooked 1/2 cup, Raw 1/2 cup)
Fruit	(Canned 1/2 cup, Raw 1 piece, Juice 1/2 cup)

Proposed Dietary Eligibility Criteria for Pregnant Women
Michigan WIC Program
page 2 of 2

405 Inadequate Citrus Fruits

Less than 7 servings of a citrus fruit or fruit juice per week.

406 Inadequate Dark Green or Deep Yellow Vegetables and Fruits

Less than 3 servings of dark green or deep yellow vegetables or fruit on a weekly basis.

APPENDIX F

Brief Version of the Health Habits and Diet Questionnaire
National Cancer Institute

"Block Diet Questionnaire"

Reference: National Cancer Institute, Division of Cancer Prevention and Control, National Institute of Health. January, 1989.

HEALTH HABITS AND DIET QUESTIONNAIRE

This form asks you a variety of questions about your background, environment, and habits, which may affect or be related to your health. The information you provide will help scientists to understand more about the causes of disease. This questionnaire will take about 12-15 minutes to complete. Please fill in the information requested, or place a check in the appropriate space. If you are not sure about an answer, please estimate.

THIS SPACE FOR OFFICE USE

TODAY'S DATE: Month ___ - Day ___ - Year ___ (11–16)

Please PRINT YOUR NAME (name of study participant)

LAST (17–30) FIRST (31–39) MIDDLE (40–48)

ADDRESS: (11–34) STREET

(35–49) CITY (50–51) STATE (52–61) ZIP

TELEPHONE: ( ) ___ - ___ (64–73)

A 79 80

1-10

62 State Code

B 79 80

1. When were you born? ___/___/___ Month Day Year

11

2. How old are you? ___ years

18

3. Sex: 1 __ Male 2 __ Female

20

4. Race or ethnic background:
   1 __ White, not of Hispanic origin
   2 __ Black, not of Hispanic origin
   3 __ Hispanic
   4 __ American Indian/Alaskan native
   5 __ Asian
   6 __ Pacific Islander

21

5. Please circle the highest grade in school you have completed:
   1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17+

22

6. How tall are you? ___ feet ___ inches 7. How much do you weigh? ___ pounds

24

8. Do you smoke cigarettes now? 1 __ No 2 __ Yes

30

IF YES: On the average, about how many cigarettes a day do you smoke now? ___ cigarettes

31

9. During the past year, have you taken any vitamins or minerals?
1 ___ No 2 ___ Yes, fairly regularly 3 ___ Yes, but not regularly If Yes, → 33 ___

What do you take fairly regularly?	# of PILLS per DAY, WEEK, etc.		
Multiple Vitamins			
One-a-day type	_____ pills per _____		34 ___
Stress-tabs type	_____ pills per _____		37 ___
Theragran type	_____ pills per _____	How many milligrams or IUs per pill?	40 ___
Other Vitamins			
Vitamin A	_____ pills per _____	_____ IU per pill	43 ___
Vitamin C	_____ pills per _____	_____ mg per pill	47 ___
Vitamin E	_____ pills per _____	_____ IU per pill	51 ___
Calcium or dolomite	_____ pills per _____	_____ mg per pill	55 ___

Other (What?) 1 ___ Yeast 2 ___ Selenium 3 ___ Zinc 4 ___ Iron 5 ___ Beta-carotene
6 ___ Cod liver oil 7 ___ Other _____ 59 ___

Please list the brand of multiple vitamin/mineral you usually take: _____

C
79 80

10. This section is about your *usual* eating habits. Thinking back over the past year, how often do you usually eat the foods listed on the next page?

First, check (✓) whether your usual serving size is small, medium or large. (A small portion is about one-half the medium serving size shown, or less; a large portion is about one-and-a-half times as much, or more.)

Then, put a *NUMBER* in the most appropriate column to indicate *HOW OFTEN*, on the average, you eat the food. You may eat bananas *twice a week* (put a *2 in the "week"* column). If you never eat the food, check "Rarely/Never." Please DO NOT SKIP foods. And please BE CAREFUL which column you put your answer in. It will make a big difference if you say "Hamburger once a day" when you mean "Hamburger once a week"!

One item says "in season." Indicate how often you eat this just in the 2-3 month time when that food is in season. (Be careful about overestimating here.)

Please look at the *example* below. This person
1) eats a medium serving of cantaloupe once a week, in season.
2) has ½ grapefruit about twice a month.
3) has a small serving of sweet potatoes about 3 times a year.
4) has a large hamburger or cheeseburger or meat loaf about four times a week.
5) never eats liver.

EXAMPLE:

	Medium Serving	Your Serving Size			How often?				
		S	M	L	Day	Week	Month	Year	Rarely/ Never
Cantaloupe (in season)	½ medium		✓			1			
Grapefruit	(½)		✓				2		
Sweet potatoes, yams	½ cup	✓						3	
Hamburger, cheeseburger, meat loaf	1 medium			✓		4			
Liver	4 oz.								✓

FOR OFFICE USE
Q 9, mg or IU: 1 = 50-100 2 = 200-250 3 = 400-500 4 = 1000 5 = 5000 6 = 10,000 7 = 20,000-25,000 8 = 50,000 9 = Unk.

On the following two pages, code the four characters for each food as follows:

___ S-1 M-2 L-3 NS-9

___ ___ No Times NS-99

___ Da-1 Wk-2 Mo-3 Yr-4 Nev-5 NS-9

If respondent places a checkmark in the "How often" columns, do not impute "01", once. Instead, code "99", Not Stated. If respondent does not check a portion size, do not impute medium, but code "9".

	Medium Serving	Your Serving Size			How often?					OFFICE USE
					Day	Week	Month	Year	Rarely/ Never	
FRUITS & VEGETABLES		S	M	L						
EXAMPLE – Apples, applesauce, pears	(1) or ½ cup		✓			4				
Apples, applesauce, pears	(1) or ½ cup									11 ____
Cantaloupe (in season)	¼ medium									15 ____
Oranges	1 medium									19 ____
Orange juice or grapefruit juice	6 oz. glass									23 ____
Grapefruit	(½)									27 ____
Other fruit juices, fortified fruit drinks	6 oz. glass									31 ____
Beans such as baked beans, pintos, kidney, limas, or in chili	½ cup									35 ____
Tomatoes, tomato juice	(1) or 6 oz.									39 ____
Broccoli	½ cup									43 ____
Spinach	½ cup									47 ____
Mustard greens, turnip greens, collards	½ cup									51 ____
Cole slaw, cabbage, sauerkraut	½ cup									55 ____
Carrots, or mixed vegetables containing carrots	½ cup									59 ____
Green salad	1 med. bowl									63 ____
Salad dressing, mayonnaise (including on sandwiches)	2 Tblsp.									67 ____
French fries and fried potatoes	¼ cup									71 ____
Sweet potatoes, yams	½ cup									75 ____ D 79 80
Other potatoes, incl. boiled, baked, potato salad, mashed	(1) or ½ cup									11 ____
Rice	¾ cup									15 ____
MEAT, MIXED DISHES, LUNCH ITEMS		S	M	L	Da	Wk	Mo	Yr	Nv	
Hamburgers, cheeseburgers, meat loaf	1 medium									19 ____
Beef—steaks, roasts	4 oz.									23 ____
Beef stew or pot pie with carrots, other vegetables	1 cup									27 ____
Liver, including chicken livers	4 oz.									31 ____
Pork, including chops, roasts	2 chops or 4 oz.									35 ____
Fried chicken	2 sm. or 1 lg. piece									39 ____
Chicken or turkey, roasted, stewed or broiled	2 sm. or 1 lg. piece									43 ____
Fried fish or fish sandwich	4 oz. or 1 sand.									47 ____
Other fish, broiled, baked	4 oz.									51 ____
Spaghetti, lasagna, other pasta with tomato sauce	1 cup									55 ____
Hot dogs	2 dogs									59 ____
Ham, lunch meats	2 slices									63 ____
Vegetable soup, vegetable beef, minestrone, tomato soup	1 med. bowl									67 ____
BREADS / SALTY SNACKS / SPREADS		S	M	L	Da	Wk	Mo	Yr	Nv	
White bread (including sandwiches), bagels, etc., crackers	2 slices, 3 cracks									71 ____
Dark bread, including whole wheat, rye, pumpernickel	2 slices									75 ____ E 79 80
Corn bread, corn muffins, corn tortillas	1 med. piece									11 ____
Salty snacks (such as chips, popcorn)	2 handfuls									15 ____
Peanuts, peanut butter	2 Tblsp.									19 ____
Margarine on bread or rolls	2 pats									23 ____
Butter on bread or rolls	2 pats									27 ____
BREAKFAST FOODS		S	M	L	Da	Wk	Mo	Yr	Nv	
High fiber, bran or granola cereals, shredded wheat	1 med. bowl									31 ____
Highly fortified cereals, such as Product 19, Total, or Most	1 med. bowl									35 ____
Other cold cereals, such as Corn Flakes, Rice Krispies	1 med. bowl									39 ____
Cooked cereals	1 med. bowl									43 ____
Eggs (1 egg = small, 2 eggs = medium)										47 ____
Bacon	2 slices									51 ____
Sausage	2 patties or links									55 ____

	Medium Serving	Your Serving Size			How often?					OFFICE USE
					Day	Week	Month	Year	Rarely/ Never	
SWEETS		S	M	L						
Ice cream	1 scoop									59 ____
Doughnuts, cookies, cakes, pastry	1 pc. or 3 cookies									63 ____
Pies	1 med. slice									67 ____
Chocolate candy	small bar, 1 oz.									71 ____
DAIRY PRODUCTS, BEVERAGES		S	M	L	Da	Wk	Mo	Yr	Nv	
Cheeses and cheese spreads, not including cottage	2 slices or 2 oz.									75 ____ F 79 80
Whole milk and bevs. with whole milk (not incl. on cereal)	8 oz. glass									11 ____
2% milk and bevs. with 2% milk (not incl. on cereal)	8 oz. glass									15 ____
Skim milk, 1% milk or buttermilk (not incl. on cereal)	8 oz. glass									19 ____
Regular soft drinks (not diet)	12 oz. can or bottle									23 ____
Beer	12 oz. can or bottle									27 ____
Wine	1 med. glass									31 ____
Liquor	1 shot									35 ____
Milk or cream in coffee or tea	1 Tblsp.									39 ____
Sugar in coffee or tea, or on cereal	2 teaspn.									43 ____

	1 Seldom/Never	2 Sometimes	3 Often/Always	
11. How often do you eat the skin on chicken?	_____	_____	_____	47 ___
How often do you eat the fat on meat?	_____	_____	_____	48 ___
How often do you add salt to your food?	_____	_____	_____	49 ___
How often do you add pepper to your food?	_____	_____	_____	50 ___

12. Not counting salad or potatoes, about how many servings of vegetables do you eat per day or per week? _____ vegetables per _____ day, week — 51 ___

13. Not counting juices, how many servings of fruits do you usually eat per day or per week? _____ fruits per _____ day, week — 54 ___

G 79 80

THANK YOU VERY MUCH for taking the time to fill out this information.

Reviewed by _____

APPENDIX G

Verbal Instructions

FFQ: ALL TYPES #1, 3, 5

INSTRUCTIONS: WRITTEN ONLY

1. I'm going to ask you to complete this questionnaire to show how often you usually eat certain foods.

2. The foods that you'll need to think about are: (point to the section on the questionniare as you mention it)

   - o Milk and Cheese
   - o Bread and Cereal
   - o Fruit and Vegetable
   - o Meat, Poultry, Fish and Beans.

3. You'll need to think about how often you typically eat a food.

   a. Do you usually eat it every day?
   b. Do you usually eat it every week?
   c. Do you usually eat it a few times a month?
   d. OR less often?

4. If you eat a food every week, record how many times you eat the food during a week.

   If you eat a food a few times every month, record how many times you eat the food during a month.

5. Only record one answer for each food.

6. You're going to want to read the instructions carefully before you start. The instructions show how you should record your answer.

7. Because there are lots of lines, this strip of paper may be helpful to keep your place.

   (Demonstrate using the colored strip of paper.)

8. Let me know when you are finished.

FFQ: WRITE - #2
INSTRUCTIONS: VERBAL

1. I'm going to ask you to complete this questionnaire to show how often you eat certain foods.

2. (Point to the section on the questionnaire as you mention the food category.) The foods that you'll need to think about are:

   - o Milk and Cheese
   - o Bread and Cereal
   - o Fruit and Vegetable
   - o Meat, Poultry, Fish and Beans

3. You'll need to think about how you typically eat a food. (Point to the "how often" headings as you mention them.)

   a. Do you usually eat it every day?
   b. Do you usually eat it every week?
   c. Do you usually eat it a few times a month?
   d. Or less often?

4. For each food, you will put a number under the day, week, month or year heading to show how often you eat the food. Only put one number for each food.

5. If you eat a food a few times a week put a number under the week heading to record how many times you eat the food during a week.

   For example, if you eat hamburger or meatloaf "twice" a week, put a "2" in the box under "Week".

6. If you never eat hamburger or meatloaf, check ( ) in the box under "Not very often or Never".

7. Please be careful to put your number in the right box. It will make a big difference if you write hamburger or meatloaf "twice each day" when you mean "twice each week".

8. Let's take a look at the foods listed in the example at the bottom of the page.

   a. The first food listed is "Bread (including sandwiches)".

   Because there are lots of lines, it may be helpful to use this strip of paper under the line to make it easier to follow as we go through each of the items.

   Let's say you eat bread once a day. Follow the line across to the day heading, and put "1" in the box.

Write - Verbal Instructions (continued)

b. Now go on to the next item. Let's say you eat hamburger or meatloaf about two times a week. To show you eat hamburger or meatloaf two times each week, follow the line over to the week heading, and put a "2" in the box.

c. Okay, the next item is grapefruit. Let's say you eat grapefruit six times a year. Follow the line across to the year heading, and put a 6 in the box.

d. Okay, the last item is ice cream. Let's say you never eat ice cream. Follow the line to the last heading "Not very often or Never", and put a check ( ) in the box.

9. Are there any questions so far?

10. Please turn to the next page.

11. For each food below, show how often you usually eat the food.

12. Put only one number for each food.

13. Make sure you fill in every line.

14. Let's try a few together.

a. Start with the first item, "Chocolate milk or milk shake". How often do you usually have chocolate milk or milk shakes? (Subject responds.)

To record you answer, find the (State the appropriate heading) heading, and put a (State the number) in the box. Good.

b. Tell me how you would do the next one. (Subject responds.) Now go ahead and mark your answer.

c. Why don't you try one more.

15. Do you have any questions?

16. Now keep going. Let me know when you are finished.

FFQ: CIRCLE - #1
INSTRUCTIONS: VERBAL

1. I'm going to ask you to complete this questionnaire to show how often you eat certain foods.

2. (Point to the section on the questionnaire as you mention the food category.) The foods that you'll need to think about are:

   - o Milk and Cheese
   - o Bread and Cereal
   - o Fruit and Vegetable
   - o Meat, Poultry, Fish and Beans

3. You'll need to think about how you typically eat a food. (Point to headings as you mention them.)

   a. Do you usually eat it every day?
   b. Do you usually eat it every week?
   c. Do you usually eat it a few times a month?
   d. Or less often?

4. For each food listed you will circle the number under the day, week, month or year heading to show how often you eat the food. Only circle one number for each food.

5. If you eat a food a few times a week, put a circle around the number under the week heading to record how many times you eat the food during a week.

   For example, if you eat hamburger or meatloaf "twice" a week, put a circle around the 2 under "Each week".

6. If you never eat hamburger or meatloaf, check ( ) the box under "Not very often or Never".

7. Please be careful to put your circle around the right number. It will make a big difference if you circle hamburger or meatloaf "Twice each day" when you mean "Twice each week".

8. Let's take a look at the foods listed in the example at the bottom of the page.

   a. The first food listed is "Bread (including sandwiches)".

      Because there are lots of lines, it may be helpful to use this strip of paper under the line to make it easier to follow as we go through each of the items.

      Let's say you eat bread once a day. Follow the line across to the day heading. Find the one (1), and circle it.

Circle - Verbal Instructions

b. Now go on to the next item. Let's say you eat hamburger or meatloaf about two times a week. To show you eat hamburger or meatloaf 2 times each week, follow the line over to the week heading and circle the two (2).

c. Now the next item is grapefruit. Let's say you eat grapefruit six times a year. Follow the line across to the year heading, and circle the six (6).

d. Okay, the last item is ice cream. Let's say you never eat ice cream. Follow the line to the last heading "Not very often or Never", and put a check ( ) in the box.

9. Are there any questions so far?

10. Please turn to the next page.

11. For each food below, show how often you usually eat the food.

12. Circle only one number for each food.

13. Make sure you fill in every line.

14. Let's try a few together.

a. Start with the first item, "Chocolate milk or milk shake". How often do you usually have chocolate milk or milk shakes? (Subject responds.)

To record you answer, find the (State the appropriate heading) heading, and put a circle around the (State the number). Good.

b. Tell me how you would do the next one. (Subject responds.) Now go ahead and mark your answer.

c. Why don't you try one more.

15. Do you have any questions?

16. Now keep going. Let me know when you are finished.

FFQ: MARK - #6
INSTRUCTIONS: VERBAL

1. I'm going to ask you to complete this questionnaire to show how often you eat certain foods.

2. (Point to the section on the questionnaire as you mention the food category.) The foods that you'll need to think about are:

   - o Milk and Cheese
   - o Bread and Cereal
   - o Fruit and Vegetable
   - o Meat, Poultry, Fish and Beans

3. You'll need to think about how you typically eat a food. (Point to the "how often" headings as you mention them.)

   a. Do you usually eat it every day?
   b. Do you usually eat it every week?
   c. Do you usually eat it a few times a month?
   d. Or less often?

4. For each food, you will put an (X) in the box under the day, week, month or year heading to show how often you eat the food. Only put one (X) for each food.

5. If you eat a food a few times a week put an (X) under one of the week headings to record how many times you eat the food during a week.

   For example, if you eat hamburger or meatloaf "twice" a week, put an (X) in the box under "2-4 each week".

6. If you never eat hamburger or meatloaf, mark an (X) in the box under "Not very often or Never".

7. Please be careful to put your (X) in the right box. It will make a big difference if you (X) hamburger or meatloaf "2-3 each day" when you mean "2-4 each week".

8. Let's take a look at the foods listed in the example at the bottom of the page.

   a. The first food listed is "Bread (including sandwiches)".

   Because there are lots of lines, it may be helpful to use this strip of paper under the line to make it easier to follow as we go through each of the items.

   Let's say you eat bread once a day. Follow the line across to the day heading. Find "1 each day", and mark an (X) in the box.

Mark - Verbal Instructions (continued)

b. Now go on to the next item. Let's say you eat hamburger or meatloaf about two times a week. Follow the line over to the week headings. The choices are "1 each week, 2-4 each week" and "5-6 each week". To show you usually eat hamburger or meatloaf 2 times each week, mark an (X) under "2-4 each week".

c. Now the next item is grapefruit. Let's say you eat grapefruit six times a year. Follow the line across to the year heading. Since it says "2-10 each year", put an (X) in the box.

d. Okay, the last item is ice cream. Let's say you never eat ice cream. Follow the line to the last heading "Not very often or Never", and put an (X) in the box.

9. Are there any questions so far?

10. Please turn to the next page.

11. For each food below, show how often you usually eat the food.

12. Put only one (X) for each food.

13. Make sure you fill in every line.

14. Let's try a few together.

a. Start with the first item, "Chocolate milk or milk shake". How often do you usually have chocolate milk or milk shakes? (Subject responds.)

To record you answer, find the (State the appropriate heading) heading, and put an (X) in the box. Good.

b. Tell me how you would do the next one. (Subject responds.) Now go ahead and mark your answer.

c. Why don't you try one more.

15. Do you have any questions?

16. Now keep going. Let me know when you are finished.

APPENDIX H

Scoring Procedure

SCORING PROCEDURE

A. On both the subject completed and interview completed FFQ, a score is to be computed for each of the six food categories:

- o Milk and Cheese
- o Bread and Cereal
- o Citrus
- o Deep Green and Deep Yellow Fruit and Vegetable
- o Fruit and Vegetable
- o Meat, Poultry, Fish and Dried Beans

B. Overlays developed for each questionnaire are to be used when figuring the servings per week scores.

C. General steps to computing a score for a food category:

1. Place overlay over the food category.

2. Convert frequencies to servings. (i.e. Multiply the response by the number to right of the food. Record next to the response.)

3. Add up daily frequencies and convert to weekly frequencies (i.e. multiply by number below the column.)

4. Add up weekly frequencies.

5. Add up monthly frequencies and convert to weekly frequencies (i.e. divide by number below the column.)

6. Total the three numbers and record in the highlighted box in the right hand margin.

NOTE: Calculations for the citrus category are based on Juice: orange or grapefruit juice through the broccoli line. The numbers are recorded below the broccoli line.

NOTE: Calculations for the deep green and deep yellow fruits and vegetables are based on the frequency of intake of cantaloupe through the sweet potato line. Computed numbers are recorded below the sweet potato line.

7. Scoring <u>Missing Items</u> or <u>Items With More Than One Response</u>

When a subject has skipped a line or has recorded more than one answer, score the food item as zero "0" frequency (i.e. do not score these food items.)

SCORING PROCEDURES: CIRCLE FFQ AND WRITE FFQ

Use the following procedures for the CIRCLE FFQ and WRITE FFQ to determine the food category score.

1. Place the appropriate overlay on top of the food category to be scored.

2. Check for missing responses or more than one response for an item.

   If more than one response is given, write a zero in the box. When calculate the score for the food item, score as a zero.

3. Convert frequencies to servings.

   a. Multiply the response for applicable food items, by the number to right of the food.
   b. Record product next to the original response. Use this number when doing further calculations for the food item.

   For example, milk on cereal has 1/2 in the portion size column. If a respondent indicates they have milk on cereal three times a day, record "1/2" next to the answer.

4. Add up daily frequencies and convert to weekly frequencies.

   a. Add the numbers circled (recorded) under the day heading.
   b. Multiply this subtotal by 7 (number below the column) and record the new number in the space provided below the day column.

5. Add up weekly frequencies.

   a. Add the numbers circled (recorded) under the week heading.
   b. Record this number in the space provided under the week column.

6. Add up monthly frequencies and convert to weekly frequencies.

   a. Add the numbers circled (recorded) under the month heading.
   b. Divide the subtotal by 4 (number below the column) and record the new number in the space provided below the day column.

7. Total the three numbers and record in the highlighted box in the right hand margin.

   a. Add together the numbers recorded under the day, week and month columns.
   b. Record the sum of the three numbers in the highlighted box in the right hand margin.

   EXCEPTION: Divide Protein total by 2 before placing in box.

SCORING PROCEDURES: MARK FFQ

Use the following procedures for the MARK FFQ to determine the food category score.

1. Place the appropriate overlay on top of the food category to be scored.

2. Check for missing responses or more than one response for an item.

   If more than one response is given, write a zero in the box. When calculate the score for the food item, score as a zero.

3. Convert frequencies to servings.

   a. Each mark (X) in a box represents one. Thus, when applicable, record the number to the right of the food next to the mark (X).

   b. Use this number when doing further calculations for the food item.

      For example, milk on cereal has 1/2 in the portion size column. If a respondent indicates they have milk on cereal "two to three times each day", record "1/2" next to the mark (X) in the box.

4. For each day, week and month column: Add down the column and multiply by the number below.

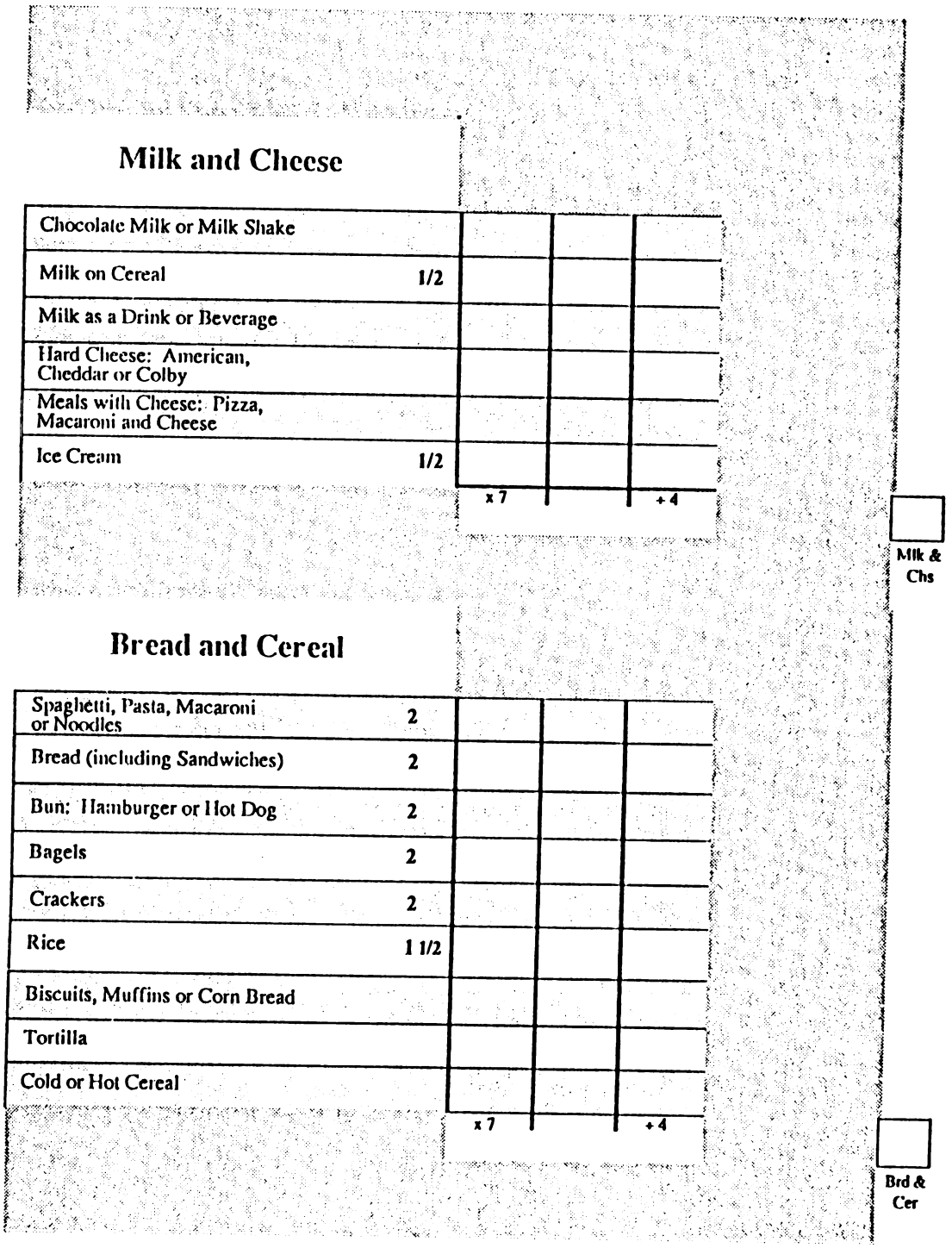
   a. For every day, week and month column, total the number of marks (X). If a number is written next to a mark (from step #2), include this number in the calculation and not the mark.

   b. Multiply the total (marks (X) plus numbers) by the number below the column and record the new number in the space provided underneath the column.

5. Total all of the numbers written below the day, week and month columns and record in the highlighted box in the right hand margin.

   a. Add together the numbers recorded under the day, week and month columns.
   b. Record the sum in the highlighted box in the right hand margin.

   EXCEPTION: Divide Protein Total by 2 before placing in the box.



Milk and Cheese

Chocolate Milk or Milk Shake				
Milk on Cereal	1/2			
Milk as a Drink or Beverage				
Hard Cheese: American, Cheddar or Colby				
Meals with Cheese: Pizza, Macaroni and Cheese				
Ice Cream	1/2			
		x 7		+ 4

Milk & Chs

Bread and Cereal

Spaghetti, Pasta, Macaroni or Noodles	2			
Bread (including Sandwiches)	2			
Bun: Hamburger or Hot Dog	2			
Bagels	2			
Crackers	2			
Rice	1 1/2			
Biscuits, Muffins or Corn Bread				
Tortilla				
Cold or Hot Cereal				
		x 7		+ 4

Brd & Cer

Fruit and Vegetable

Juice: Orange, Grapefruit or WIC Juice			
Oranges or Grapefruit			
Tomatoes or Tomato Juice			
Cantaloupe			
Broccoli			
	x 7		+ 4

☐ Citrus

French Fries or Fried Potatoes			
Potato: Baked, Mashed, Boiled or Potato Salad			
Corn or Peas			
Green Beans			
Cauliflower			
Green Salad			
Coleslaw or Cabbage			
Apples, Applesauce or Pears			
Peaches, Apricots or Nectarines			
Bananas			
Grapes			
Raisins or Prunes			
	x 7		+ 4

☐ Other

Fruit and Vegetable

Cantaloupe			
Broccoli			
Spinach or Cooked Greens			
Carrots: Cooked or Raw			
Soup: Vegetable or Tomato			
Sweet Potatoes or Yams			
	x 7		+ 4

Dk Grn & Yel

Meat, Poultry, Fish and Beans

Peanut Butter				
Baked Beans, Pintos, Limas, Kidney, Chili or Refried Beans	1 1/2			
Hamburger or Hamburger in Meals	3			
Steak or Roast	4			
Beef Stew	2			
Liver	4			
Pork Chops, Pork Roast or Ham	4			
Chicken or Turkey	3			
Fish or Fish Sandwich	4			
Lunch Meats or Hot Dogs	2			
Tuna Salad or Tuna Casserole				
Eggs	2			
		x 7		+ 4

+2 ☐ Protein

Milk and Cheese

Chocolate Milk or Milk Shake		1 2 3 4 5+	1 2 3 4 5 6 7+	1 2 3
Milk on Cereal	1/2	1 2 3 4 5+	1 2 3 4 5 6 7+	1 2 3
Milk as a Drink or Beverage		1 2 3 4 5+	1 2 3 4 5 6 7+	1 2 3
Hard Cheese: American, Cheddar or Colby		1 2 3 4 5+	1 2 3 4 5 6 7+	1 2 3
Meals with Cheese: Pizza, Macaroni and Cheese		1 2 3 4 5+	1 2 3 4 5 6 7+	1 2 3
Ice Cream	1/2	1 2 3 4 5+	1 2 3 4 5 6 7+	1 2 3
		x 7		+ 4

Mlk & Chs

Bread and Cereal

Spaghetti, Pasta, Macaroni or Noodles	2	1 2 3 4 5+	1 2 3 4 5 6 7+	1 2 3
Bread (including Sandwiches)	2	1 2 3 4 5+	1 2 3 4 5 6 7+	1 2 3
Bun: Hamburger or Hot Dog	2	1 2 3 4 5+	1 2 3 4 5 6 7+	1 2 3
Bagels	2	1 2 3 4 5+	1 2 3 4 5 6 7+	1 2 3
Crackers	2	1 2 3 4 5+	1 2 3 4 5 6 7+	1 2 3
Rice	1 1/2	1 2 3 4 5+	1 2 3 4 5 6 7+	1 2 3
Biscuits, Muffins or Corn Bread		1 2 3 4 5+	1 2 3 4 5 6 7+	1 2 3
Tortilla		1 2 3 4 5+	1 2 3 4 5 6 7+	1 2 3
Cold or Hot Cereal		1 2 3 4 5+	1 2 3 4 5 6 7+	1 2 3
		x 7		+ 4

Brd & Chs

Fruit and Vegetable

Juice: Orange, Grapefruit or WIC Juice	1 2 3 4 5+	1 2 3 4 5 6 7+	1 2 3
Oranges or Grapefruit	1 2 3 4 5+	1 2 3 4 5 6 7+	1 2 3
Tomatoes or Tomato Juice	1 2 3 4 5+	1 2 3 4 5 6 7+	1 2 3
Cantaloupe	1 2 3 4 5+	1 2 3 4 5 6 7+	1 2 3
Broccoli	1 2 3 4 5+	1 2 3 4 5 6 7+	1 2 3
	x 7		+4

Citrus

French Fries or Fried Potatoes	1 2 3 4 5+	1 2 3 4 5 6 7+	1 2 3
Potato: Baked, Mashed, Boiled or Potato Salad	1 2 3 4 5+	1 2 3 4 5 6 7+	1 2 3
Corn or Peas	1 2 3 4 5+	1 2 3 4 5 6 7+	1 2 3
Green Beans	1 2 3 4 5+	1 2 3 4 5 6 7+	1 2 3
Cauliflower	1 2 3 4 5+	1 2 3 4 5 6 7+	1 2 3
Green Salad	1 2 3 4 5+	1 2 3 4 5 6 7+	1 2 3
Coleslaw or Cabbage	1 2 3 4 5+	1 2 3 4 5 6 7+	1 2 3
Apples, Applesauce or Pears	1 2 3 4 5+	1 2 3 4 5 6 7+	1 2 3
Peaches, Apricots or Nectarines	1 2 3 4 5+	1 2 3 4 5 6 7+	1 2 3
Bananas	1 2 3 4 5+	1 2 3 4 5 6 7+	1 2 3
Grapes	1 2 3 4 5+	1 2 3 4 5 6 7+	1 2 3
Raisins or Prunes	1 2 3 4 5+	1 2 3 4 5 6 7+	1 2 3
	x 7		+4

Other

Fruit and Vegetable

Cantaloupe	1 2 3 4 5+	1 2 3 4 5 6 7+	1 2 3
Broccoli	1 2 3 4 5+	1 2 3 4 5 6 7+	1 2 3
Spinach or Cooked Greens	1 2 3 4 5+	1 2 3 4 5 6 7+	1 2 3
Carrots: Cooked or Raw	1 2 3 4 5+	1 2 3 4 5 6 7+	1 2 3
Soup: Vegetable or Tomato	1 2 3 4 5+	1 2 3 4 5 6 7+	1 2 3
Sweet Potatoes or Yams	1 2 3 4 5+	1 2 3 4 5 6 7+	1 2 3
	x 7		+ 4

Dk Grn & Yel

Meat, Poultry, Fish and Beans

Peanut Butter		1 2 3 4 5+	1 2 3 4 5 6 7+	1 2 3
Baked Beans, Pintos, Limas, Kidney, Chili or Refried Beans	1 1/2	1 2 3 4 5+	1 2 3 4 5 6 7+	1 2 3
Hamburger or Hamburger in Meals	3	1 2 3 4 5+	1 2 3 4 5 6 7+	1 2 3
Steak or Roast	4	1 2 3 4 5+	1 2 3 4 5 6 7+	1 2 3
Beef Stew	2	1 2 3 4 5+	1 2 3 4 5 6 7+	1 2 3
Liver	4	1 2 3 4 5+	1 2 3 4 5 6 7+	1 2 3
Pork Chops, Pork Roast or Ham	4	1 2 3 4 5+	1 2 3 4 5 6 7+	1 2 3
Chicken or Turkey	3	1 2 3 4 5+	1 2 3 4 5 6 7+	1 2 3
Fish or Fish Sandwich	4	1 2 3 4 5+	1 2 3 4 5 6 7+	1 2 3
Lunch Meats or Hot Dogs	2	1 2 3 4 5+	1 2 3 4 5 6 7+	1 2 3
Tuna Salad or Tuna Casserole		1 2 3 4 5+	1 2 3 4 5 6 7+	1 2 3
Eggs	2	1 2 3 4 5+	1 2 3 4 5 6 7+	1 2 3
		x 7		+ 4

+ 2 ☐ Protein

Milk and Cheese

Chocolate Milk or Milk Shake								
Milk on Cereal 1/2								
Milk as a Drink or Beverage								
Hard Cheese: American, Cheddar or Colby								
Meals with Cheese: Pizza, Macaroni and Cheese								
Ice Cream 1/2								
	x 7	x 14	x 28	x 42	x 1	x 3	x 5	+2

Milk & Chs

Bread and Cereal

Spaghetti, Pasta, Macaroni or Noodles 2								
Bread (including Sandwiches) 2								
Bun: Hamburger or Hot Dog 2								
Bagels 2								
Crackers 2								
Rice 1 1/2								
Biscuits, Muffins or Corn Bread								
Tortilla								
Cold or Hot Cereal								
	x 7	x 14	x 28	x 42	x 1	x 3	x 5	+2

Brd & Crl

Fruit and Vegetable

Juice: Orange, Grapefruit or WIC Juice								
Oranges or Grapefruit								
Tomatoes or Tomato Juice								
Cantaloupe								
Broccoli								
	x 7	x 14	x 28	x 42	x 1	x 3	x 5	+2

Citrus

French Fries or Fried Potatoes								
Potato: Baked, Mashed, Boiled or Potato Salad								
Corn or Peas								
Green Beans								
Cauliflower								
Green Salad								
Coleslaw or Cabbage								
Apples, Applesauce or Pears								
Peaches, Apricots or Nectarines								
Bananas								
Grapes								
Raisins or Prunes								
	x 7	x 14	x 28	x 42	x 1	x 3	x 5	+2

Other

Fruit and Vegetable

Cantaloupe								
Broccoli								
Spinach or Cooked Greens								
Carrots: Cooked or Raw								
Soup: Vegetable or Tomato								
Sweet Potatoes or Yams								
	x 7	x 14	x 28	x 42	x 1	x 3	x 5	+2

Dk Gr
& Yel

Meat, Poultry, Fish and Beans

Peanut Butter										
Baked Beans, Pintos, Limas, Kidney, Chili or Refried Beans	1 1/2									
Hamburger or Hamburger in Meals	3									
Steak or Roast	4									
Beef Stew	2									
Liver	4									
Pork Chops, Pork Roast or Ham	4									
Chicken or Turkey	3									
Fish or Fish Sandwich	4									
Lunch Meats or Hot Dogs	2									
Tuna Salad or Tuna Casserole										
Eggs	2									
		x 7	x 14	x 28	x 42	x 1	x 3	x 5	+2	

+2

Protein

APPENDIX I

Procedures for Administering the Reading Test (WRAT-R^2)

DIRECTIONS FOR THE READING TEST (WRAT-R^2)

1. Before administering, study the pronunciation guide included on the next page.

2. The reading part should be administered with as few interuptions as possible.

3. Point to the first word "milk" of the reading list and say:

   LOOK AT EACH WORD CAREFULLY AND SAY IT ALOUD. BEGIN HERE (point) AT THE TOP OF THE CARD AND READ THE WORDS TO THE BOTTOM OF THE PAGE SO I CAN HEAR YOU. WHEN YOU FINISH, GO ON TO THE NEXT CARD, AND THEN THE NEXT, ETC.

   In the case of limited individuals, each word may have to be pointed to with a pencil while the subject attempts to read.

4. Time limit: 10 seconds per word. Silently count: one and two and, etc. up to ten. If you have reached 10 seconds, ask the subject to skip the word and go on to the next one. Refusals to read within the time limit should not always be accepted as evidence of failure. If subject hesitates or says "I don't know that", the examiner should encourage the subject to "TRY THE WORD ANYWAY" or "TAKE A GUESS AT IT".

5. The first time a reading error occurs, the subject is asked to say the word again. The response is scored right if subject corrects herself on the second trial. From then on, the first response is scored as either right or wrong, unless subject spontaneously corrects the error she has made.

6. If the response is vague or not clearly scorable, examiner may ask subject to repeat the word. There should be no questioning or probing in regard to the correct answer. The examiner's attitude should remain as objective as possible throughout the test.

7. Stop the test if the subject has 10 consecutive errors. Otherwise, allow the subject to complete the entire test regardless of the number of errors.

WRAT-R2 — PRONUNCIATION GUIDE FOR READING TEST*

1. milk ..... mĭlk
2. city ..... sĭt'ē
3. in ..... ĭn
4. tree ..... trē
5. animal ..... an'ə-məl
6. himself ..... hĭm-sĕlf'
7. between ..... bĭ-twēn'
8. chin ..... chĭn
9. split ..... splĭt
10. form ..... fôrm
11. grunt ..... grŭnt
12. stretch ..... strĕch
13. theory ..... thē'ə-rē, thĭr'ē
14. contagious ..... kən-tā'jəs
15. grieve ..... grēv
16. toughen ..... tŭf'ən
17. aboard ..... ə-bôrd', ə-bōrd'
18. triumph ..... trī'əmf
19. contemporary ..... kən-tĕm'pə-rĕr'ē
20. escape ..... ē-skāp', ĭ-skāp'
21. eliminate ..... ĭ-lĭm'ə-nāt'
22. tranquillity ..... trăn-kwĭl'ə-tē
23. conspiracy ..... kən-spir'ə-sē
24. image ..... ĭm'ĭj
25. ethics ..... ĕth'ĭks
26. deny ..... dĭ-nī'
27. rancid ..... răn'sĭd
28. humiliate ..... hyōō-mĭl'ē-āt'
29. bibliography ..... bĭb'lē-ŏg'rə-fē
30. unanimous ..... yōō-năn'ə-məs
31. predatory ..... prĕd'ə-tôr'ē, prēd'ə-tōr'ē
32. alcove ..... al'kōv'
33. scald ..... skôld
34. mosaic ..... mō-zā'ĭk
35. municipal ..... myōō-nĭs'ə-pəl
36. decisive ..... dĭ-sī'sĭv
37. contemptuous ..... kən-tĕmp'chōō-əs
38. deteriorate ..... dĭ-tĭr'ē-ə-rāt'
39. stratagem ..... străt'ə-jəm
40. benign ..... bĭ-nīn'
41. desolate ..... dĕs'ə-lĭt
42. protuberance ..... prō-tōō'bər-əns, prō-tyōō'bər-əns
43. prevalence ..... prĕv'ə-ləns
44. regime ..... rā-zhēm', rĭ-shēm'
45. irascible ..... ĭ-răs'ə-bəl, ī-răs'ə-bəl
46. peculiarity ..... pĭ-kyōō'lē-ăr'ə-tē
47. pugilist ..... pyōō'jə-lĭst
48. enigmatic ..... ĕn'ĭg-măt'ĭk
49. predilection ..... prĕd'ə-lĕk'shən, prē'də-lĕk'shən
50. covetousness ..... kŭv'ə-təs-nĕs
51. soliloquize ..... sə-lĭl'ə-kwīz'
52. longevity ..... lŏn-jĕv'ə-tē
53. abysmal ..... ə-bĭz'məl
54. ingratiating ..... ĭn-grā'shē-āt'-ĭng
55. oligarchy ..... ŏl'ə-gär'kē
56. coercion ..... kō-ûr'shən
57. vehemence ..... vē'ə-məns
58. sepulcher ..... sĕp'əl-kər
59. emaciated ..... ĭ-mā'shē-āt-ĕd
60. evanescence ..... ĕv'ə-nĕs'əns
61. centrifugal ..... sĕn-trĭf'yə-gəl, sĕn-trĭf'ə-gəl
62. subtlety ..... sŭt' l-tē
63. beatify ..... bē-ăt'ə-fī'
64. succinct ..... sək-sĭngkt'
65. regicidal ..... rĕj'ə-sīd'l
66. schism ..... sĭz'əm, skĭz'əm
67. ebullience ..... ĭ-bŭl'yəns
68. misogyny ..... mĭ-sŏj'ə-nē
69. beneficent ..... bə-nĕf'ə-sənt
70. desuetude ..... dĕs'wə-tōōd, dĕs'wə-tyōōd
71. egregious ..... ĭ-grē'jəs, ĭ-grē'jē-əs
72. heinous ..... hā'nəs
73. internecine ..... ĭn'-tər-nēs'ēn', ĭn'-tər-nēs'-ən, ĭn'-tər-nē'sĭn'
74. synecdoche ..... sĭ-nĕk'də-kē

Pronunciation guide from **The American Heritage Dictionary of the English Language,** *Houghton Mifflin Company, Boston, 1980.*

WRAT Instructions (continued)

8. RECORDING DIRECTIONS:

   a. Underline the first letter if the word is correctly pronounced.
      Example: cat, cliff

   b. Cross out the first letter if the word is mispronounced.

      Example: cat, cliff Score as incorrect.

   c. If subject first mispronounces the word, then corrects her error, cross out the first letter and underline the second letter of the word.

      Example: cat, cliff. Score as correct.

   d. If subject first pronounces the word correctly, then misprounces it, underline the first letter and cross out the second letter of the word.

      Example: cat, cliff Score as incorrect.

9. Some subjects may tend to skim over the words or produce a response that sounds superficially correct. The examiner should be alert to these near successes and score them wrong, or ask the subject to repeat the word if no clear-cut decision can be made.

10. DIRECTIONS FOR PRE-READING SECTION

    If subject obtains a score of 10 points or less in the formal reading part, she should be asked to name 2 letters in her name and to name the 13 capital letters printed above the word list. The subject receives 1 point for each letter correctly named. Total score for the pre-reading section is 15 points.

11. FIND THE RAW SCORE. (Make calculations on the Scoring Sheet.) The maximum raw score is 89 points (74 formal reading points and 15 pre-reading points).

    a. Score 1 point for each word correctly pronounced, making a possible score of 74 points.

    b. If eleven (11) or more words correctly ADD 15 points to the score on the reading test. OR

       If ten (10) or less words pronounced correctly, add points from the prereading section (Maximum of 15 points.)

       i.e. RAW SCORE = # of words pronounced correctly + prereading score

WRAT Instructions (continued)

12. Refer to the "Raw Score to Grade Equivalents" Chart on the scoring sheet. Find the subject's raw score on the reading line and identify the grade equivalent which is scaled beneath the variable line. Mark on "Scoring Sheet", then transfer grade equivalent to the "Participant Information Summary" page. Put subject's ID# Code in the top right hand corner of the reading test form.

APPENDIX J

Rating Diagnostic Tests From 2 x 2 Contingency Tables

RATING DIAGNOSTIC TESTS FROM 2X2 CONTINGENCY TABLES

A diagnostic test for a specific disease may give "false negatives" (failure to detect disease that exists) and "false positives" (results that indicate disease in a healthy individual, i.e. one of the control group). It is helpful to have an index that rates the overall performance of a diagnostic test in avoiding both kinds of false results, and enables one to compare a test with a modified (hopefully, improved) version of the test or with an alternative test.

Let A = classification given by the test (i=1=positive, i=2=negative).

B = Incidence of a specific disease (j=1=diseased, j=2=non-diseased control).

	B_1(D)	B_2(C)	
A_1 (+)	y_{11}	y_{12}	← Numbers of individuals
A_2 (-)	y_{21}	y_{22}	
Totals	$y_{\cdot 1}$	$y_{\cdot 2}$	

Youden (Cancer 3:32-35, 1950) developed the following index.

Correctly minus incorrectly-classified diseased individuals: $(y_{11} - y_{21})/y_{\cdot 1} = y_D$

Correctly minus incorrectly-classified control individuals: $(y_{22} - y_{12})/y_{\cdot 2} = y_C$

Index = $J = (y_D + y_C)/2$ [1]

The index has the following desirable properties:

(1) $0 \leq J \leq 1$; zero is achieved if the test gives the same proportion of positives for both diseased and control groups, and unity is achieved only if the test gives no false results of either kind.

(2) The index is independent of the relative sizes of the two groups $(y_{\cdot 1}, y_{\cdot 2})$.

(3) The index is independent of the absolute sizes of the two groups $(y_{\cdot 1}, y_{\cdot 2})$.

(4) All diagnostic tests that have the same index make the same percentages of misclassifications (calculated separately for each group).

The index has standard error

$$SE_J = [(y_{11}y_{21}/y_{\cdot 1}^3) + (y_{12}y_{22}/y_{\cdot 2}^3)]^{1/2} \quad [2]$$

The standard error is not accurate if the groups are too small (say, $y_{.1}$, $y_{.2} < 20$). A 95% confidence interval for the true index is

$$J \pm 1.96\ SE_J, \qquad [3]$$

where 1.96 is $Z_{0.975}$, from Table A.2. The interval is not accurate if J is "too close" to unity; i.e., it is acceptably accurate only if the number of false positives and negatives is not too small. Accuracy should be acceptable if

$(y_{12} + y_{21}) \geq 3$, for $y_{.1}$, $y_{.2}$ between 20 and 30,

$(y_{12} + y_{21}) \geq 2$, for $y_{.1}$, $y_{.2}$ between 30 and 60,

or $(y_{12} + y_{21}) \geq 1$, for $y_{.1}$, $y_{.2}$ larger than 60.

Two diagnostic tests may be compared by using test statistics

$$Z = (J_1 - J_2)/[(SE_{J1})^2 + (SE_{J2})^2]^{1/2} \qquad [4]$$

versus critical values $\pm Z_{1-\alpha/2}$, from Table A.2, for Type I error = α.

Accuracy limitations are the same as indicated for the confidence interval.

As an example, consider first sample results for a test to diagnose a specific type of cancer:

	Disease	Control	
+	95	75	$y_D = (95-6)/101 = 0.8812$
-	6	33	$y_C = (33-75)/108 = -0.3889$
	101	108 .	$J_1 = (0.8812 - 0.3889)/2 = \underline{0.246}$

$SE_{J1} = \{[(95)(6)/(101)^3] + [(75)(33)/(108)^3]\}^{1/2} = \underline{0.050}$

95% C.I.: $0.246 \pm 1.96(0.050) = 0.246 \pm 0.098$, or [0.148, 0.344]

Because of the large number of false positives (75 among 108 controls), the diagnostic procedure was modified, and the following results were obtained in a second sample:

	Disease	Control	
+	40	7	$y_D = (40-11)/51 = 0.5686$
-	11	23	$y_C = (23-7)/30 = 0.5333$
	51	30	$J_2 = (0.5686 + 0.5333)/2 = \underline{0.551}$

$SE_{J2} = \{[(40)(11)/(51)^3] + [(7)(23)/(30)^3]\}^{1/2} = \underline{0.096}$

95% C.I.: $0.551 \pm 1.96(0.096) = 0.551 \pm 0.188$, or [0.363, 0.739]

$Z = (0.551 - 0.246)/[(0.096)^2 + (0.050)^2]^{1/2} = 2.818$

$\pm Z_{0.995} = \pm 2.576$