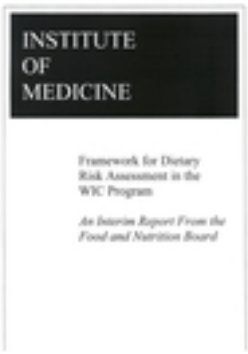

Framework for Dietary Risk Assessment in the WIC Program: An Interim Report from the Food and Nutrition Board

Committee on Dietary Risk Assessment in the WIC Program, Food and Nutrition Board

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Framework for Dietary Risk Assessment in the WIC Program: Interim Report

Committee on Dietary Risk Assessment in the WIC Program
Food and Nutrition Board
INSTITUTE OF MEDICINE

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Willing is not enough; we must do.
—Goethe

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Many individuals volunteered significant time and effort to address and educate the committee at its workshop and public meeting. Workshop speakers included Jean Anliker, Ph.D., R.D. of the University of Maryland; Valerie Tarasuk, Ph.D. of the University of Toronto; Cutberto Garza, M.D., Ph.D. of Cornell University; Kristin Marcoe, M.B.A., R.D. of the United States Department of Agriculture; Amy Subar, Ph.D., M.P.H., R.D. of the National Cancer Institute; Gladys Block, Ph.D. of the University of California, Berkeley; Graham Colditz, M.D., Dr.P.H. of Harvard University; Anna Maria Siega-Riz, Ph.D. of the University of North Carolina; Jill Leppert of the North Dakota State Department of Health; Amanda Watkins, M.S., R.D. of the Arizona Department of Health Services; Ann Barone of the Rhode Island Department of Health; Carol Rankin, M.S., R.D., L.D. of the Mississippi Department of Health; Bob Greenstein of the Center on Budget and Policy Priorities, Washington, D.C.; and Lynn Parker of the Food Research and Action Center, Washington, D.C.

In addition, the following organizations provided oral testimony to the committee during its public meeting: National Association of WIC Directors and the Food and Nutrition Service, United States Department of Agriculture.

The report was also reviewed in draft form by individuals chosen for their diverse perspectives and technical expertise, in accordance with procedures approved by the NRC's Report Review Committee. The purpose of this independent review is to provide candid and critical comments that will assist the institution in making its published report as sound as possible and to ensure that the report meets institutional standards for objectivity, evidence, and responsiveness to the study charge. The review comments and draft manuscript remain confidential to protect the integrity of the deliberative process. We wish to thank the following individuals for their review of this report: Janet Allen, M.A., R.D., North Central Florida Maternal & Infant Care Project, WIC; Barbara A. Dennison, M.D., Associate Professor of Clinical Pediatrics, Columbia University and Attending Pediatrician and Research Scientist, Research Institute, Bassett Healthcare; Dr. Bernard Dreyer, Associate Chair of Pediatrics, Department of Pediatrics, New York University and Bellevue Hospital Center; Gail G. Harrison, Ph.D., Professor and Chair, Department of Public Health and Community Health Science, UCLA Center for Human Nutrition; Maxine Hayes, M.D., M.P.H., Assistant Secretary of Community & Family Health, Washington State Department of Health and University of Washington School of Medicine; and Michele Lawler, Public Health Analyst, Department of Health and Human Services, Health Resources and Services Administration, Maternal and Child Health Bureau.

Although the reviewers listed above provided many constructive comments and suggestions, they were not asked to endorse the conclusions or recommendations nor did they see the final draft of the report before its release. The review of this report was overseen by Richard E. Behrman, M.D., J.D., Vice President for Medical Affairs, Lucile Packard Foundation for Children's Health, appointed by the Institute of Medicine, who was responsible for making certain that an independent examination of this report was carried out in accordance with institutional procedures and that all review comments were carefully considered. Responsibility for the final content of this report rests entirely with the authoring committee and the institution.

Contents

Assessing Dietary Risk Among WIC Program Applicants

Summary

The Food and Nutrition Board of the Institute of Medicine (IOM), part of the National Academies, was asked to evaluate the use of various dietary assessment tools and to make recommendations for the assessment of inadequate or inappropriate dietary patterns. These assessments should accurately identify dietary risk of individuals and thus eligibility for participation in the Special Supplemental Nutrition Program for Women, Infants, and Children (WIC). The Committee on Dietary Risk Assessment in the WIC Program was appointed for the 2-year study and directed to develop an interim report which was to include (1) a framework for assessing inadequate diet or inappropriate dietary patterns, (2) a summary of a workshop on methods to assess dietary risk, and (3) the results of literature searches conducted to date.

This interim report includes these three components. Building on the approach used in the 1996 IOM report, *WIC Nutrition Risk Criteria,* the framework proposed by the committee identifies characteristics of dietary assessment tools that can identify dietary patterns or behaviors for which there is scientific evidence of increased nutrition or health risk in either the short or long-term. The proposed framework consists of eight characteristics that a food intake and/or behavior-based tool should have when used to determine eligibility to participate in WIC programs. In order to be considered useful and effective, tools should:

- use specific criteria that are related to health, growth, or disease
- allow prioritization within the category of dietary risk
- have acceptable performance characteristics
- be suitable for the culture and language of the population served
- be suitable for the skill level of the population served
- be appropriate for age and physiological condition
- be responsive to operational constraints
- be standardized across states/agencies.

This interim report also includes authored summaries of the presentations at the workshop (Appendix A), along with the results of literature searches conducted in the initial phase of the study (Appendix B).

The committee's review of dietary assessment tools currently in use in WIC agencies has not been exhaustive, but it did not find any tools that have all eight characteristics. The committee's final report will provide recommendations for tools to assess dietary risk in potential WIC participants and give the scientific basis for those recommendations. It will also address the remaining tasks requested by the Food and Nutrition Service of the U.S. Department of Agriculture (see tasks 2 through 6 in the box).

BOX 1 SCOPE OF WORK FOR ASSESSING INADEQUATE DIETS OR INAPPROPRIATE DIETARY PATTERNS TO ASCERTAIN ELIGIBILITY TO RECEIVE WIC SERVICES BASED ON DIETARY RISK

1. Propose a framework for assessing dietary risk among WIC program applicants, focusing on “Failure to Meet Dietary Guidelines” as a risk criterion;
2. Identify and prioritize areas of greatest concern when the U.S. Dietary Guidelines are incorporated into WIC programs;
3. Examine the use of food-based and behavior-based approaches in assessing “Failure to Meet Dietary Guidelines” requirements;
4. Evaluate possible approaches for use specifically in the WIC setting;
5. Provide specific cut-offs for establishing WIC eligibility using the identified approaches; and
6. Identify needed research and tools necessary to implement the approaches identified as having the greatest potential for identifying those at nutrition risk.

Assessing Dietary Risk Among WIC Program Applicants

BACKGROUND

Dietary risk is one of several categories of nutrition risk criteria used, together with low income, to establish eligibility for program benefits from the Special Supplemental Nutrition Program for Women, Infants, and Children (WIC). Dietary risk refers to *dietary deficiencies that impair or endanger health, such as inadequate dietary patterns assessed by a 24-hour dietary recall, dietary history, or food frequency checklist* (7CFR Subpart C, Section 246.7(e)(2)(iii)). WIC eligibility based on the category of *dietary risk* is intended to prevent the occurrence of malnutrition or other overt problems of dietary origin due to suboptimal dietary patterns, and result in improved outcomes in terms of the health of the pregnant woman, mother, fetus, infant, and young child.

In the event that a WIC agency has reached its maximum caseload given funding constraints, nutrition risk criteria provide the basis for a priority system in which program applicants can be placed on an eligibility waiting list. As openings become available, applicants from the waiting list may enter the program according to priority level. In general, priority is first accorded to individuals with nutrition risk conditions detectable by biochemical or anthropometric measurements, followed by other documented medical conditions, dietary risk, and lastly, homelessness or migrancy (IOM, 1996). Pregnant women, lactating women, and infants (birth to 12 months) are given priority over children (>12 months through 5 years), and children are given priority over nonlactating postpartum women. The current seven-level priority system can be found in Table 1. Many states have set subpriority levels within these seven priority categories.

The federal definition for dietary risk focuses on underconsumption of essential nutrients. However, the health risks associated with unbalanced dietary patterns, overconsumption, and excess body weight call for an expanded definition of dietary risk—one that considers balance and moderation in food intake. Data suggest that high weight for height is a significant and

growing concern among women and children enrolled in WIC (Mei et al., 1998; USDA, 2000). This is consistent with recent CDC reports that obesity rates among children and adolescents have doubled over the past 20 years (Troiano and Flegal, 1998)

TABLE 1 WIC Priority System

Priority	
I	Pregnant and breastfeeding women and infants at nutrition risk as demonstrated by anthropometric or hematologic measurements or by other documented nutrition-related medical condition.
II	Infants up to 6 months of age of mothers who participated in WIC during pregnancy or who would have been eligible to participate under Priority I documented medical condition. This priority may also be assigned to a breastfeeding mother of an infant who is classified as Priority II.
III	Children at nutrition risk, as demonstrated by anthropometric or hematological assessment or other documented medical condition. At State option, this priority can also include high-risk postpartum women.
IV	Pregnant and breastfeeding women and infants at nutrition risk as demonstrated by inadequate dietary pattern. At State option, this priority can also include homeless and migrant pregnant and breastfeeding women and infants and high-risk postpartum women.
V	Children at nutrition risk because of inadequate dietary pattern. At State option, this priority can also include homeless and migrant children and high-risk postpartum women.
VI	Postpartum women, not breastfeeding, at nutrition risk either medical or dietary criteria unless they are assigned to higher priorities at State discretion. At State option, this priority may also include homeless and migrant postpartum women.
VII	Previously certified participants likely to regress in nutritional status without continuation of supplemental foods. At State option, this priority can also include homeless and migrant participants.

Dietary risk includes two major types of risk through which individuals may become eligible for participation in the WIC program. *Inadequate diet* as a risk criterion includes reported food intakes that are identified to be potentially low in nutrients. *Inappropriate dietary pattern* includes descriptors of dietary intake or habits, developmentally or age-inappropriate patterns of feeding, and the ingestion of specific inappropriate substances. Dietary inadequacy has been defined (IOM, 1996) as food or nutrient intake insufficient to meet a specified percentage of the Recommended Dietary Allowances (RDAs) (NRC, 1989) for one or more nutrients. Determination of inadequate diets usually involves estimating nutrient intakes using some method of dietary recall or food frequency, and then comparing the intake with a specified percentage of the RDAs for the individual (often between 70 and 100 percent of the RDA) (IOM, 1996). Examples of inappropriate dietary patterns include inappropriate infant or child feeding practices, pica, high caffeine intakes, and reported food intakes that do not meet one or more of the Dietary Guidelines for Americans (USDA/DHHS, 2000). The latter may include consumption of less than the recommended number of servings from food groups of the Food Guide Pyramid, unsupplemented vegan diets, or other highly restrictive diets.

In 1998, approximately 49 percent of all WIC enrollees (47 percent of women, 13 percent of infants, and 68 percent of children over the age of 1 year) were certified for participation on the basis of dietary risk, either alone or in conjunction with other nutritional risks

(USDA/DHHS, 2000). While many applicants to the WIC program are eligible for program benefits based on identification of other nutrition risks, for some dietary risk is the only nutrition criterion upon which they can be certified as eligible for program benefits.

EVOLUTION OF NUTRITION RISK CRITERIA

From the inception of the WIC program, state agencies were permitted to develop nutrition risk criteria using broad federal guidelines to determine a participant's eligibility for the program. However, prompted by concern over the variation among state agencies in determining eligibility, in 1989 Congress mandated a review of nutrition risk criteria and the priority system.

In 1993, the Food and Nutrition Service (FNS) of the U.S. Department of Agriculture (USDA) contracted with the Food and Nutrition Board (FNB) of the Institute of Medicine (IOM) to conduct a comprehensive scientific assessment of the nutrition risk criteria for use as eligibility criteria in the WIC program. In 1996, an FNB committee released its recommendations in the report *WIC Nutrition Risk Criteria: A Scientific Assessment* (IOM, 1996). With regard to the dietary risk classifications, the committee reviewed three major categories: inappropriate dietary patterns, inadequate diets, and food insecurity. The committee found *clear health and nutrition risks associated with selected inappropriate dietary patterns.*

They concluded that individuals with these inappropriate dietary patterns had high potential to benefit from participation in the WIC program. The committee also found evidence to support the use of *dietary patterns that fail to meet the Dietary Guidelines* as an indicator of both health risk and health benefit in the WIC program. Consequently, it recommended the use of the 1995 U.S. Dietary Guidelines for Americans (USDA/DHHS, 1995) [1] as a risk criterion for identifying inappropriate diets for women and children over 2 years of age (Table 2). The committee did not, however, find evidence for an effective method to assess an individual's usual intake in comparison with the Dietary Guidelines, nor did it specify cut-off points.

The 1996 FNB committee recommended discontinuing the use of the criterion *inadequate diets.* Although it concluded that individuals in this category would benefit greatly from the supplemental food provided through participation in the WIC program, it also concluded that currently available assessment tools have inherent limitations that make them unacceptable for determining which income-eligible individuals consume inadequate diets.

Lastly, with regard to food insecurity, the committee concluded that those at risk would likely benefit from participation in the WIC program. However, while the committee recommended that food insecurity be included as a risk criterion, they found insufficient scientific evidence on which to select a cut-off point to identify those most likely to benefit.

Following the release of the FNB committee's report, the National Association of WIC Directors (NAWD) and FNS established a collaborative partnership—the Risk Identification and Selection Collaborative (RISC)—to address recommendations of the IOM report and to develop standardized and scientifically sound nutrition risk criteria. Their intent was to achieve

[1] Earlier this year a revised report, *Dietary Guidelines for Americans, 2000* (USDA/DHHS, 2000), was released (see Table 2). While structured differently, the new guidelines are similar in content to the 1995 guidelines, with the exception of an additional guideline regarding food safety.

greater consistency among state and local WIC agencies. Through multiple subcommittees, the joint NAWD/FNS Workgroup developed three lists of nutrition risk criteria: criteria that are allowed, criteria that are not allowed, and criteria that are in need of future review. RISC was created to address criteria still in need of review and to provide ongoing review. FNS released a final policy memorandum that described over 100 allowable nutrition risk criteria along with cutoffs/thresholds. These criteria were implemented as of April 1, 1999 (FNS, 1998). While state agencies are allowed to establish more restrictive cut-offs/thresholds, the final policy memorandum of allowable nutrition risk criteria provides for a reasonable degree of consistency from state to state and some flexibility to meet local priorities (FNS, 1998).

TABLE 2 Dietary Guidelines for Americans

AIM FOR FITNESS...

- Aim for a healthy weight.
- Be physically active each day.

BUILD A HEALTHY BASE...

- Let the Pyramid guide your food choices.
- Choose a variety of grains daily, especially whole grains.
- Choose a variety of fruits and vegetables daily.
- Keep foods safe to eat.

CHOOSE SENSIBLY...

- Choose a diet that is low in saturated fat and cholesterol and moderate in total fat.
- Choose beverages and foods to moderate your intake of sugars.
- Choose and prepare foods with less salt.
- If you drink alcoholic beverages, do so in moderation.

SOURCE: USDA/DHHS, 2000.

The list of official allowable nutrition risk criteria contains 18 dietary risk criteria (Table 3). Inadequate diet and inappropriate diet (failure to meet Dietary Guidelines) are included among the 18, however these are the only two criteria for which definitions, cut-off values, and priority levels have not been officially set. While priority levels for types of participants have been assigned for these two categories (see Table 4), definitions and cut-off values have not been. States are still given discretion within broad federal guidelines to define dietary risk, choose tools to assess it, and set their own cut-off points when using those tools.

CHARGE TO THE COMMITTEE

For the aforementioned reasons, FNS/USDA contracted with the FNB/IOM to appoint a committee of experts to review the scientific basis for methods currently employed in the assessment of individuals for eligibility to the WIC program based on dietary risk. The committee's task is to evaluate the use of various dietary assessment tools and to make recommendations for the assessment of inadequate or inappropriate dietary patterns. These assessments should accurately identify dietary risk of individuals and thus eligibility for

participation in WIC. More specifically, during its deliberations, the committee is charged with the following tasks:

1. Propose a framework for assessing dietary risk among WIC program applicants, focusing on "Failure to Meet Dietary Guidelines" as a risk criterion.
2. Identify and prioritize areas of greatest concern[2] when the U.S. Dietary Guidelines are incorporated into WIC programs.
3. Examine the use of food-based and behavior-based approaches in assessing "Failure to Meet Dietary Guidelines" requirements.
4. Evaluate possible approaches for use specifically in the WIC setting.
5. Provide specific cut-offs for establishing WIC eligibility using the identified approaches.
6. Identify needed research and tools necessary to implement the approaches identified as having the greatest potential for identifying those at nutrition risk.

TABLE 3 Dietary Risk Assessment Criteria Allowed for WIC Program Certification

400 Inadequate/Inappropriate Nutrient Intake
401 Failure to Meet Dietary Guidelines
402 Vegan Diets
403 Highly Restrictive Diets
410 Other Dietary Risk
411 Inappropriate Infant Feeding
412 Early Introduction of Solid Foods
413 Feeding Cow's Milk During First 12 Months
414 No Dependable Source of Iron for Full-Term Infants at 6 Months of Age or Later
415 Improper Dilution of Formula
416 Feeding Other Foods Low in Essential Nutrients
417 Lack of Sanitation in Preparation/Handling of Nursing Bottles
418 Infrequent Breastfeeding as Sole Source of Nutrients
419 Inappropriate Use of Nursing Bottles
420 Excessive Caffeine Intake (Breastfeeding Woman)
421 Pica
422 Inadequate Diet
423 Inappropriate or Excessive Intake of Dietary Supplements Including Vitamins, Minerals, and Herbal Remedies
424 Inadequate Vitamin/Mineral Supplementation
425 Inappropriate Feeding Practices for Children

Although asked to focus on "Failure to Meet Dietary Guidelines" as the type of dietary risk, the final report may consider other possible criteria where evidence substantiates an increased risk due to food choices and practices, including criteria related to food insecurity.

[2] Given that the U.S. Dietary Guidelines include a number of specific recommendations, the intent of this component of the task is to determine which of the Dietary Guidelines recommendations are most important and relevant to include in assessing dietary risk specific to the WIC population.

TABLE 4 Dietary Risk Criteria Without Standard Definitions and Cut-off Values

INADEQUATE DIET *		
Definition/cut-off value	Based on definition currently in use by State agency	
Participant	Category	Priority
Category and priority level	Pregnant Women	IV
	Breastfeeding Women	IV
	Nonbreastfeeding Women	VI
	Infants	IV
	Children	V
Justification	To be provided by State agency	
References	To be provided by State agency	
INAPPROPRIATE DIET: FAILURE TO MEET DIETARY GUIDELINES *		
Definition/cut-off value	Based on definition currently in use by State agency	
Participant	Category	Priority
Category and priority level	Pregnant Women	IV
	Lactating Women	IV
	Nonlactating Women	VI
	Children	V
Justification	To be provided by State agency	
References	To be provided by State agency	

SOURCE: FNS, 1998.

SOURCES OF INFORMATION

To assist the committee in its deliberations, a workshop on Dietary Risk Assessment in the WIC Program was held on June 1, 2000, in Washington, D.C. Eight experts on various

*While recommended for use as an allowed risk criterion for the WIC program by the IOM, this criterion is referred to the Risk Identification and Selection Collaborative (RISC) for long-term research. NAWD and FNS concur in the following recommendations: (1) to merge this criterion with 422, “Inadequate Diet”, and (2) to eliminate the use of identified specific nutrient deficiencies until a valid assessment tool for both criteria is defined. NAWD and FNS agree with IOM's recommendation for research to develop practical and valid assessment tools for identification of inadequate diets or inappropriate dietary patterns. Dietary adequacy will be considered a high priority for further research. It may take years to develop the necessary practical and valid assessment tools and related definitions/cut-off values. Therefore, unlike other criteria that are being referred to RISC, “Inadequate Diet” and “Failure to Meet Dietary Guidelines” will not be subject to the April 1, 1999 expiration date.

aspects of dietary assessment, four state WIC representatives whose states use different assessment methods and serve demographically diverse population groups, and two public policy experts gave formal presentations. Additionally, four attendees provided comments in response to an open invitation for such input to the committee. The workshop agenda and summaries of presentations can be found in Appendix A. The committee also conducted a search of the literature. A listing of references that the committee found to be of potential use can be found in Appendix B.

METHODS/TOOLS TO IDENTIFY DIETARY RISK

Dietary assessments are used not only to establish eligibility in the WIC program, but also as a basis for the individualization of nutrition education and food packages. For this reason, dietary intakes are generally assessed for most WIC applicants regardless of whether or not they have already met eligibility requirements based on nutrition risk criterion other than dietary risk. In 1998, 86 percent of state agencies had policies that required obtaining dietary intake information from all participants (USDA, 2000). The characteristics of the tools used in the assessment of dietary intake necessary for certification may differ, however, from those necessary for dietary counseling.

Currently, a few states use dietary assessment methods with a published research base. Many use methods developed or adapted by state and local WIC agencies that appear to have been less well studied. Most states define dietary risk as failure to consume a minimum number of servings from one or more food groups represented in the Food Guide Pyramid, which they interpret as indicating inadequate diet. Approximately 82 percent of states use 24-hour recalls and/or food frequency/food item checklists in their assessments of dietary intake (USDA, 2000).

The following summaries provide overviews of some of the more common methods of assessing usual dietary intake that have been used in research settings in which significant time is usually available for interviews and follow-up questioning. In some cases, these methods have been adapted for use in WIC programs, but the committee found few reported studies of their validity in this setting.

Food Frequency Questionnaires

Food frequency questionnaires (FFQs) are designed to obtain information on the frequency of consumption of selected foods over a defined period. In WIC, the period of time usually ranges from 1 week to 1 month. The number and choice of foods depends on the objective of the FFQ. For example, the FFQ might focus on important sources of only one or two nutrients, or it might be comprehensive and attempt to obtain an accurate picture of overall nutrient intake. Thus, the number of foods listed may vary greatly. Ideally, FFQs list foods individually rather than in groups because it can be very difficult for the respondent to estimate a combined frequency of intake of foods (e.g., the combined frequency of intake of apples, applesauce, and pears). The time interval over which the respondent is asked to report usual consumption can vary from “not stated” to “the last year,” “last month,” or “last week.” Each time interval has implications for accuracy of memory and for the reliability of the assessment of

usual diet. Averaging usual intake over time may be difficult for some participants (Cullen et al., 1999).

Some FFQs attempt to obtain portion size information, whereas others simply assume a specified portion size. The portion size might be a standard measurement (e.g., 1/2 cup), or it might be chosen to reflect a median portion size found in a nationwide survey. Often FFQs are designed to be self-administered. If the client can read and follow the directions, and if the results are computerized, data collection and processing can be achieved quickly and at relatively low cost. If interviewer administration is required, the process may be time consuming, but the interviewer does not have to be highly trained. FFQs lack the detail that is characteristic of diet recalls or records, and they provide no information about meal and snack patterns. However, they may provide more information about the variety of foods usually consumed (e.g., vegetables and fruits) than do 24-hour diet recalls.

The validity of FFQs is usually determined by correlating estimates of nutrient intake with nutrient-intake estimates obtained from a set of diet recalls or prospectively collected diet records. The correlation coefficients for intake of specific nutrients between FFQ and diet records or recalls (after adjustment for within-person variability) are usually 0.5 to 0.7 for FFQs used in epidemiologic studies (e.g., Block et al., 1990; Friis et al., 1997; Willett et al., 1987). Another method of assessing the performance of FFQs is to compare the FFQ's classification of nutrient intake by quintile with that obtained by a set of diet recalls or records. Typically, there is considerable disagreement in the results obtained by the two methods (e.g., Friis et al., 1997). Little evidence is available concerning the ability of FFQs to estimate intake correctly when servings of foods or food groups (rather than nutrients) are the units of comparison (Thompson, et al., 2000).

24-hour Recall

For a 24-hour recall, the client is asked to remember all food, beverages, and supplements consumed within the past 24 hours. Typically, the recall is obtained by an interviewer who is a registered dietitian or, at a minimum, a person who has been trained intensively to use this method. Often the recall is obtained face-to-face but sometimes is obtained by telephone. To improve accuracy, the interviewer probes the informant to help remember every eating occasion, including snacks and extra beverages, and to obtain descriptions of the method of food preparation and brand name of the products. For example, if an informant reports drinking a cup of coffee (decaffeinated or with caffeine), a standard probe would be made for the use of lightener (cream, nondairy creamer, milk [whole, 2 percent, 1 percent, skim]) and sweetener (sugar, honey, saccharine, aspartame). Food models, household measures (bowls, cups, teaspoons, tablespoons), fast food or other commercial containers, and two-dimensional food pictures are often used to help the informant estimate portion size. The interviewer can collect data on unusual foods and special recipes and, with few exceptions, can accommodate the diets of most informants.

A single research quality dietary recall usually requires 20 minutes for the interview (Thompson and Byers, 1994). Although time demands imposed upon the informant are relatively small, memory demands can be difficult for many, especially without probing. Because the recall is interviewer administered, literacy is not a major issue.

A major disadvantage of the single diet recall is that it does not assess *usual* intake. This is because individual diets vary by day of the week, season of the year, and from day to day. Consequently, multiple averaged 24-hour recalls are needed to estimate the usual food or nutrient intake of individuals. Moreover, detailed quality control for achieving accuracy involves a protocol for administering the recall and for the training and periodic retraining of the interviewers and data coders. Data coding, data entry, and data analysis are usually more expensive than those entailed with the food frequency method.

Estimates of nutrient intake from a single 24-hour recall are poorly correlated with nutrient intake estimates obtained from a set of diet records, from weighed intakes, or from intakes recorded by independent observers (Bingham, 1991). Small, but statistically significant, correlations (r~0.2) have been found between dietary (averaged 24-hour recalls) and circulating micronutrients (e.g., dietary folate and serum folate [Huber et al., 1988; Scholl et al, 1996]). Overweight adults and adolescents tend to have greater under-reporting than normal weight individuals (Briefel et al., 1997). Studies of adults have shown that energy intake estimated from 24-hour recalls is under-reported when compared with expenditure estimated by doubly labeled water (Johnson et al., 1998; Kroke et al., 1999; Sawaya et al., 1996; Tran et al., 2000), but this may not be true for all population groups (Harrison et al., 2000).

Diet Records

Diet records are intended to provide quantitative and descriptive information about all foods and beverages consumed over a specified time, usually several days. Good record keeping requires substantial training of the client or caregiver—a time-consuming process. Food records have many of the characteristics of diet recalls (e.g., a single day's record does not provide a sound basis for estimating usual intake, and coding of records may be time consuming, but unusual foods can be included). If recorded faithfully at the time the food is eaten, food records minimize the problem of memory, but they may change eating behavior. Invariably, the staff member needs to spend time interviewing the client to clarify entries or check on potentially missing items.

Diet History

The term *diet history* generally refers to any comprehensive measure of usual intake. It is typically composed of a detailed interview to establish usual consumption patterns. The interview usually begins with a 24-hour recall that is expanded by probing to gather information regarding day-to-day and seasonal variation. The second phase of the interview involves completion of an FFQ that includes questions on portion size. Finally, clients are asked to keep a record of everything consumed for a 72-hour period.

Diet histories allow the practitioner to gather information on a wide variety of nutrients, foods consumed over time, and eating patterns. The combined use of several methods allows the detection and clarification of discrepancies in reporting. The disadvantages of diet histories are those inherent in the separate methodologies of 24-hour recalls and food frequencies. Specifically, recall bias may result from faulty memory or poor conceptualization by the client and interviewer bias may result from inadequate or inappropriate probing. Proper training of

interviewers minimizes these effects. However, the use of multiple assessment methods is time consuming.

Behavioral Approaches in Assessing Dietary Intake

The above dietary assessment methods focus on determining *what* and/or *how much* of a food or nutrient a WIC client consumes. In comparison, a behavioral approach to diet assessment can be viewed as examining the context of eating—*where, when,* and *how*. For example, behavioral questions might determine such things as the frequency of eating at restaurants (where), eating quickly versus slowly (how), or eating between meals or skipping breakfast (when). Such questionnaires can also seek to determine the *whys* behind food consumption (e.g., eating when bored or feeding a toddler to calm fussiness).

Eating is a complex motivated behavior with multiple social, emotional, and environmental determinants. What or how much an adult or child eats (or an adult offers to a young child to eat) is the result of a complex sequence of decisions. These decisions are not usually consciously deliberated and can be affected by contextual factors, such as eating during social gatherings; the cost, convenience, or familiarity of certain foods; or cues to eating from emotional states such as loneliness. Contextual factors that motivate the what and how much aspects of diet may be easier to recall, less susceptible to various types of reporting bias, and might be the most appropriate targets for dietary counseling (Kristal et al., 1990). All of these would be practical advantages of a behavioral approach to assessing dietary risk.

There are several examples of behavioral approaches. A behavioral screening questionnaire focused on dietary fat (Kristal et al., 1990) assessed practices associated with dietary fat intake, such as “How often do you take the skin off chicken?” and “How often do you drink skim or low-fat instead of regular milk?” People who frequently ate at fast food restaurants tended to consume more dietary saturated fat (Clemens et al., 1999).

Another example relates to the feeding of preschool children. Birch and coworkers reported that when parents used food as a reward in feeding preschool children (Birch et al., 1980) or restricted access to food (Fisher and Birch, 1999a), children may have overeaten and become overweight (Birch and Fisher, 2000; Fisher and Birch, 1999a, 1999b).

FRAMEWORK FOR ASSESSING DIETARY RISK

Through deliberations, the Committee on Dietary Risk Assessment in the WIC Program developed a framework for evaluating possible methods to assess dietary risk among WIC program applicants. Building on the approach used in the 1996 WIC report, the committee set as an overall goal: an assessment tool that can identify dietary patterns for which there is (1) scientific evidence of nutrition or health risk in either the short or long-term, and (2) evidence of the ability to benefit from WIC participation for individuals with a given risk. The evaluation framework consists of characteristics that a food or behavior-based tool should have to be considered useful and effective in the WIC setting. At this point, the committee has not ruled out the possible inclusion of some type of assessment of nutrient intakes or of aspects of food security as part of this framework. The eight characteristics are as follows:

1. The tools use specific criteria that are related to health, growth, or disease.

Ideally, any risk criterion adopted for inappropriate dietary patterns should be predictive of the individual's risk of short-term or long-term health problems or growth problems, or of developing a dietary deficiency. It also should predict the likelihood that the individual would benefit from the WIC food package and/or nutrition education. For children ages 2 to 5 years and for pregnant, lactating, and nonlactating postpartum women, the 1996 IOM report suggested using the indicator "failure to meet Dietary Guidelines" (IOM, 1996). To be current, this would involve using the consensus document *Dietary Guidelines for Americans* (USDA/DHHS, 2000) as a reference.

Although the Dietary Guidelines were not developed to serve as criteria that are directly predictive of optimal health or growth, they were based on extensive review of the literature and deliberations by an expert committee—the Dietary Guidelines Advisory Committee. That committee's intent was to promote good health of Americans through use of the entire set of guidelines—priority was not given to just one or a few of them. Neither the 1996 IOM report nor the report of the Dietary Guidelines Advisory Committee makes recommendations for cut-off points for determining when the guidelines have not been met.

Useful screening tools based on Dietary Guidelines need to determine how an individual's intake compares with an appropriate cut-off point based on those guidelines. For such vulnerable populations as pregnant and lactating women and children ages 2 to 5 years, should the criterion be a dietary intake that fails to meet any one of the guidelines, or should it be more stringent? Should the criterion used differ for the three categories of women served by WIC? Should there be an emphasis on "too much" along with "not enough"?

Assessment tools need to identify shortfalls or excess intake depending on the criterion or criteria selected as most predictive of risk and benefit for the target population. The criteria (indicators and their cut-off points) need to be specified clearly for the tools, along with the rationales.

Because the criteria must be related to health, growth, or disease, they must be tailored to subgroups served by WIC. For example, an indicator to determine "failure to meet Dietary Guidelines" may not be appropriate for children younger than 2 years of age since Dietary Guidelines were developed only for people 2 years and older. Criteria to identify what constitutes an inappropriate diet for this younger age group still need to be related to risk of health, growth, or development problems.

2. The tools allow prioritization within the category of dietary risk.

Currently, funding for the food grant portion of WIC is sufficient to meet current participation levels, and all who apply and meet eligibility criteria receive the food assistance component of WIC. When resources for WIC are insufficient to serve all those eligible, a tool needs to allow the prioritization of risk within the dietary risk category. The goal should be to ensure that those at greatest dietary risk and those most likely to benefit are served first. To meet this goal, a set of criteria should be established that have different degrees of stringency reflecting different degrees of risk. Where the prioritized criteria are established, the committee will give the rationale for the prioritization developed.

3. The tools have acceptable performance characteristics.

All instruments should be held to two performance criteria: validity and reliability (Windsor et al., 1994). Validity addresses whether one is really measuring what was intended. For example, 24-hour dietary recalls are intended to measure dietary intake for the previous 24hour period, but several recent studies have revealed that as much as 30 percent of foods reported by children were not eaten the previous day (Baxter et al., 1997). Foods reported but not eaten are called intrusions or phantom foods (Domel et al., 1994). An instrument that systematically mismeasures something (e.g., overestimates consumption by including a large number of phantom foods) is biased and considered a validity issue. Reliability concerns whether applying the same instrument twice (or more times) provides the same results. Reliability thereby indicates the degree of random error in dietary assessment. Random error could be caused by the respondent or interviewer being upset at the time of assessment, excessive noise during assessment, the vagaries of memory, a person's inability to properly average intake to provide a desired response on an FFQ, etc.

One source of random error that has received substantial attention in dietary assessment is intraindividual variability—that is, variation in an individual's intake from day to day (Nelson et al., 1989). In most dietary assessment research, the investigator intends to measure a person's usual intake. However, research has demonstrated that a person's food intake varies substantially from day to day (Nelson et al., 1989). The major problems with measures that contain substantial amounts of error (low reliability) are that estimates of true values may be substantially off the mark, and correlations with other variables will be attenuated (i.e., they will be lower than correlations obtained if measures without error were available) (Traub, 1994).

One method for minimizing intraindividual variability in dietary data is to collect many days of dietary intake and average the data. The number of days needed to attain a usually desired level of reliability of 0.8 or higher varies by the nutrient or food group to be measured (IOM, 2000; Nelson et al., 1989). Although the errors of individuals in a group tend to cancel each other out and leave an unbiased estimate of the true value for the group, the error terms for any single member of that group remain if only a single day's intake has been obtained. Assessing diets with sufficient accuracy to characterize an individual's intake generally requires either multiple days of assessment (IOM, 2000) or a lengthy questionnaire. When using these dietary assessment procedures for group assessment, researchers have generally been willing to tolerate a substantial amount of error, for which they could partially compensate by increasing the number of participants in their research or using statistical correction procedures, called corrections for attenuation (Traub, 1994).

Error in the assessment of an individual for certification in the WIC program (that is, misclassification error), however, has more serious consequences: truly eligible individuals may not be classified as eligible for the services (less than perfect *sensitivity*), or individuals not truly eligible for the services may receive them (less than perfect *specificity*). Policy makers and the public must decide how much and what type of misclassification error they are willing to tolerate when certifying people to receive or not receive federally funded WIC services. The extent to which specific cut-offs recommended in the final report misclassify individuals (see Chapter 3 of the 1996 IOM report for further discussion) will be considered by the committee in its deliberations; recommendations derived will be provided in the final report along with the rationale used by the committee.

Given concerns about reliability and validity, all tools used to determine WIC dietary risk should undergo testing for these performance criteria. If a WIC agency uses several tools for the same client category, their relative ability to ascertain dietary risk accurately should also be addressed.

4. The tools are suitable for the culture and language of the population served.

The WIC program serves a multiethnic, multicultural, heterogeneous population. Forty percent of WIC participants are Caucasian, 31 percent are Latino, 24 percent are African American, 3 percent are Asian or Pacific Islander, and 2 percent are American Indian or Alaskan Native. The percentages of non-Caucasians and the diversity of cultures are expected to increase. Diversity in heritage, geography, foods consumed, and culture translates into diversity in dietary patterns and practices. To assess dietary intake and patterns effectively, dietary assessment tools need to be developed with each specific culture in mind. Thus, many WIC agencies are likely to require several or even many different dietary assessment tools to serve their population mix. Language translation alone will not provide an acceptable tool for a different culture because the types of foods consumed, the portion sizes, food combinations, and the way foods and eating are conceptualized are likely to differ. Thus, the rigorous process of development and validity and reliability testing is recommended for all dietary assessment tools designed for small target client subpopulations regardless of how small the unique target client subpopulation may be.

Effective administration and use of tools with different cultural groups is likely to require special training, but this topic is not within the charge to this committee. The committee is aware that little information exists regarding successful adaptations of dietary assessment instruments for use in different cultures whose members wish to avail themselves of WIC services. Thus, the final report will develop recommendations to assist in ascertaining dietary risk in such subgroups when the scientific basis is sparse.

5. The tools are suitable for the skill levels of the population served.

Due to time constraints of WIC staff, asking the client to fill out a questionnaire is a reasonable option. However, dietary assessment tools are complex by nature. Self-administration of the forms may not be a legitimate option for providing quality services in some WIC agencies for several reasons: the questionnaire may be too complex, the task itself is complex, and some clients have limited literacy and/or limited familiarity with completing forms (including scanable forms). It is also possible that oral administration of a questionnaire may be superior to written administration for obtaining the desired information in some settings or client groups. Thus, the method of administration is a fundamental consideration for the development and selection of appropriate dietary assessment tools for the WIC program. Pilot testing with WIC clients can help develop user-friendly tools that are appropriate for the WIC client.

6. The tools are appropriate for age and physiological condition.

Several subgroups are served in the WIC program: pregnant, breastfeeding, and nonbreastfeeding women and teenagers, along with their infants and children. When assessing dietary risk, consideration needs to be given to the different nutritional goals and appropriate feeding patterns for these groups. For example, appropriate feeding patterns change continually

throughout the first 2 years of life. In infants 0 to 6 months of age who are not exclusively breastfed, many state agencies focus on caregiver behaviors such as the proper and sanitary preparation of infant formula, and on discouraging additions, such as cereal, to the infant's bottle. Beginning at 4 to 6 months of age, issues related to the transition from breast or formula feeding to a mixed diet of appropriate texture and consistency become important. For toddlers, the appraisal may relate to the transition from pureed foods to family foods and to self-feeding. Also, questions at this stage about hand-to-mouth activity often lead to the subsequent identification of children with pica who are at risk of exposure to environmental lead from the ingestion of nonfood substances. Therefore, the need for specialized tools for each client subgroup must be considered in the development of appropriate tools for assessing dietary risk in the WIC program.

7. The tools are responsive to operational constraints.

Time constraints for both staff and participants necessitate the use of an assessment tool that can be administered, scored, and interpreted rapidly. It is imperative that the tools under consideration take into account the variety of skills and knowledge levels of the competent professional authorities (CPAs) who assess dietary intake in the WIC setting. CPAs are often paraprofessional staff who have received basic nutrition training. Whether CPAs are paraprofessional or professional, the assessment tools they use need to be linguistically and culturally appropriate for different population groups served by WIC clinics.

A tool should provide consistent results regardless of the staff member who administers it. Subjective measures in scoring should be avoided to eliminate administrator bias. Furthermore, the tool should be constructed in a manner so as not to influence the client. Features that may influence responses inappropriately include scoring mechanisms placed directly on a self-administered form and phrasing that invites desirable or favorable responses rather than accurate ones.

Additional points that need to be considered include the impact of the tool(s) on the systems used by the WIC agency, and of expected future changes to the system, such as automation or computerization.

8. The tools are standardized across states/agencies.

To some degree, tools used to determine eligibility for WIC participation based on dietary risk need to be standardized across state agencies for each of the physiological groups served by WIC. While differences in culture and language preclude the use of a single tool in all settings or even in a single setting, some form of standardization needs to occur to ensure equal access to program benefits regardless of the individual's place of residence or cultural background. Moreover, if federal funding for the program is limited, standardization needs to ensure that individuals at greatest risk and with potential to benefit are served first.

Framework Summary

The eight criteria for tools to be used to identify dietary risk have many dimensions and must take into account numerous constraints. It may be that the environment in which the WIC

program operates precludes the use of tools that have both greater predictive reliability and greater sensitivity. The final report will address methods of dietary risk assessment in the context of these constraints and of the scientific base available.

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Appendix A

Workshop Agenda and Presentations

Workshop on Dietary Risk Assessment in the WIC Program

Thursday, June 1, 2000

National Academy of Sciences

Lecture Room

2101 Constitution Avenue, N.W., Washington D.C.

8:00 a.m.	Welcome and Introduction *Virginia Stallings, Committee Chair*
8:15	Overview of WIC Operational Issues and Practices which may Impact on the Selection of Dietary Risk Assessment Methodology *Jean Anliker, University of Maryland* **A-3**
8:45	Overview of Assessing Adequacy of Intake: Reliability and Sources of Error *Valerie Tarasuk, University of Toronto* **A-5**
9:30	Development of the Dietary Guidelines and their Application to the WIC Population *Cutberto Garza, Cornell University* **A-7**
10:00	Development of the Food Guide Pyramid and its Application to the WIC Population *Kristin Marcoe, U.S. Department of Agriculture* **A-12**
10:30	Break
10:45	Assessing Individuals Total Food Intake and Cognitive Aspects of Questionnaires *Amy Subar, National Cancer Institute* **A-17**
11:30	Use of the Block Questionnaire in the WIC Program *Gladys Block, University of California, Berkeley* **A-19**
12:15 p.m.	Lunch
1:00	Use of the Harvard Food Frequency Questionnaire in the WIC Population *Graham Colditz, Harvard School of Public Health* **A-22**
1:45	Assessing Dietary Intake and Risk During Pregnancy and Special Considerations in Evaluating Intake in the Hispanic Population *Anna Maria Siega-Riz, University of North Carolina* **A-25**
2:30	Break

2:45	Practical Issues in the Use of Various Tools in WIC Settings **A-31** *Jill Leppert, North Dakota State Department of Health; Amanda Watkins, Arizona Department of Health Services; Ann Barone, Rhode Island Department of Health; Carol Rankin, Mississippi Department of Health*
3:45	The Role of WIC in Assistance to the Poor and Food Insecurity as a Predictor of Dietary Risk **A-38** *Bob Greenstein, Center on Budget and Policy Priorities; Lynn Parker, Food Research and Action Center*
4:30	Open Discussion and Comments
5:30	Adjourn

OVERVIEW OF WIC OPERATIONAL ISSUES AND PRACTICES WHICH MAY IMPACT ON THE SELECTION OF DIETARY RISK ASSESSMENT METHODOLOGY

Presented by Jean Anliker, Ph.D., R.D.

Adjunct Associate Professor

University of Maryland, Baltimore

Dietary assessment is an effective tool for identifying risk, tailoring interventions, and testing the effects of nutrition education targeted to WIC participants. The Maryland WIC 5-A-Day Promotion Program and the Maryland Food for Life Program, both funded by the National Cancer Institute, are two programs in which dietary assessment instruments were developed and utilized to evaluate program interventions. Both used trained peer educators to recruit program participants and briefly explain questionnaire instructions. However, in order to avoid any administrator bias, neither were permitted to help the participants in any capacity besides reading difficulties. While the instruments were not validated in terms of comparing survey results to actual food consumed, the experiences of both programs provide valuable insight into the feasibility and challenges of conducting detailed dietary assessment in the WIC program.

The Maryland WIC Five-A-Day promotion program was a randomized cross-over design with a 6-month intervention administered in 16 sites throughout Maryland. Eight sights were selected to be intervention sites the first year; the other eight served as control sites. Their status was reversed in the second year so that each site served as their own control. Subjects included 3,102 English-speaking women at least 18 years of age who were either pregnant, breast feeding, or were mothers of children enrolled in WIC. Sites were chosen with different demographic characteristics including rural and urban populations, as well as different racial and ethnic profiles. The program had 5 objectives: The intervention group would show significantly greater increases than the control group in (1) their knowledge about fruit and vegetable consumption; (2) their attitudes about fruits and vegetables consumption; (3) their self efficacy for fruit and vegetable consumption; (4) the stage of change for fruit and vegetable consumption; and (5) their actual fruit and vegetable consumption.

Survey development incorporated focus groups, pilot testing, and cognitive testing prior to initiation of its use in the study. The cognitive testing involved participants reading out loud and verbalizing their thought processes as they answered questions. It was helpful in ensuring that participants understood what was really being asked, and therefore, fine-tuning questions. The standard National Cancer Institute seven-item fruit and vegetable frequency consumption assessment was used along with a 35-item, 24-hour checklist for fruits and vegetables. The survey also considered psychosocial variables, including self-efficacy, perceived barriers, attitudes, social support, responsibility for food preparation and purchasing, and knowledge relating to fruits and vegetables. The final survey was self-administered and took participants 15 to 30 minutes to complete. A $10 incentive was given to participants after the post-survey (8 months later) was completed.

Results of the study showed a significant difference, with a direct linear relationship between fruit and vegetable consumption and program attendance. An increase in 0.13 servings per day among the control group and increase of 0.56 servings per day in the intervention group ($p<0.002$) were observed. Those who attended all sessions increased consumption by 1.25 servings per day. Other significant differences were seen in participant's knowledge regarding

the number of servings recommended for fruits and vegetables, attitudes about fruits and vegetables, self-efficacy for fruit and vegetable consumption, and perceived social support.

The Maryland Food for Life Program was similar in design to the Five-A-Day program, however only 10 sites were selected and the program intervention was 6 months rather than 8. While final data analysis has not yet occurred, the food assessment methodology can be described.

The food survey development for the Food for Life program included similar formative research (cognitive and pilot testing) to that of the Five-A-Day program. In addition, Gladys Block, Ph.D. served as a consultant in developing a food frequency instrument that would be culturally appropriate for the program. Objectives for this program focused on lowering the percentage of calories from fat, increasing dietary fiber, and increasing the number of servings of fruits and vegetables. Hence, the survey instrument needed to evaluate dietary patterns rather than just servings of fruits and vegetables. An 83-item food frequency instrument, capable of generating a complete nutrient profile, was developed for this program. In addition, a questionnaire was used to assess the fat levels of commonly eaten foods, stages of change for fruit and vegetable consumption, as well as fat and fiber consumption.

The 83-item food frequency questionnaire included estimations of portion size. Serving sizes were shown on the questionnaire and participants were asked to estimate their usual servings as small, medium, or large. This self-administered questionnaire utilized computer-scanned bubble sheets and took participants an average of 30 to 45 minutes to complete. A $20 incentive was given to participants after the final survey was completed.

Data generated by the food frequency assessment instrument was vast. Profiles of nutrient data included calories, protein, fat, carbohydrate, cholesterol, fiber, vitamins, and minerals. Servings of food groups from the food guide pyramid were also generated. The data generated could be used not only for evaluation, but was enormously valuable for identifying target behaviors for interventions, both at the individual and population level.

Experience with both of these programs lead to the following conclusions regarding dietary assessment in WIC programs: (1) WIC participants will complete food surveys, even surveys that take 15 to 45 minutes to complete; (2) literacy was not a common problem; 80 percent of the participants had high school education and in only a few instances were peer educators asked to help with reading; (3) food survey questions were well understood; (4) dietary data can be a useful tool in tailoring nutrition education; (5) trained peer educators can collect dietary data; and (6) self-administered forms which can be computer scanned work very well. The forms were scanned by the computer at the university, but having scanners on site in the WIC clinics would likely be feasible.

ASSESSING ADEQUACY OF INTAKE: RELIABILITY AND SOURCES OF ERROR

Presented by Valerie Tarasuk, Ph.D.

Associate Professor, Department of Nutritional Sciences

Faculty of Medicine, University of Toronto

Applying dietary assessment techniques to appraise the adequacy of an individual's intake requires: (1) an estimate of the individual's usual or habitual dietary intake over the time period of interest and (2) an estimate of the individual's dietary requirements. Neither estimate is straightforward.

The estimation of usual intake is complicated by the fact that individuals' intakes vary markedly from one day to the next. This variation is a function of environmental and biological pressures on intake and measurement errors. Further, the level of day-to-day variation differs across nutrients, depending on their concentrations in the foods that comprise the individual's diet. Classically, the highest variation is seen for vitamin A and the lowest is seen for energy.

An equation developed by Basiotis et al. (1987) can be used to determine the confidence interval around an estimate of usual intake based on the assessment of actual intake on one or more days. Using this equation, it can be demonstrated that the error term around an estimate of usual intake for an individual decreases as the number of days of intake data increases. However, the error term for estimates based on 1, 3, or even 7 days is very large, indicating that using a limited number of days to assess dietary risk for an individual is hugely problematic.

The difficulty in estimating individuals' usual intakes is compounded by the fact that the precise magnitude and nature of day-to-day variation differs substantially between people. Further, data from low-income women seeking food assistance in Toronto suggest that issues of day-to-day variation are probably even more pronounced in the target group for WIC. Intakes become even more erratic when economic constraints are added to everyday environmental and biologic influences. Because day-to-day variation comes from multiple sources that vary among individuals, it is likely impossible to strategize data collection in such a way as to eliminate this source of error in the estimation of individuals' usual intakes. Although there are statistical techniques to estimate within-person variation and adjust for its effects on intake estimates in large population studies, these methods are not appropriate for use at the level of individuals.

Other potential sources of error in the estimation of individuals' usual intakes include systematic under- or overreporting, proxy reporting, social desirability, and errors in the assumptions made regarding food composition and nutrient bioavailability. Underreporting appears to be pervasive in dietary intake surveys, affecting an estimated 10 to 45 percent of samples. It has been associated with a number of factors, but appears to be a particular problem among women with high body weight. There is also some evidence that children or young adults are less prone to underreporting, and that individuals with lower socioeconomic status, education, and literacy levels are more likely to underreport. It is unclear exactly what is being underreported although there is some data to suggest that the reporting of fat, sugar, and alcohol may be particularly problematic. In contrast to this, some studies have suggested that individuals may be likely to overreport on the consumption of foods perceived to be healthful, particularly if they had been engaged in interventions designed to improve healthful intake.

Usual intake can be estimated from the measurement of actual intake over a limited number of days (using dietary recalls or records). Alternatively, a food frequency questionnaire

can be used. However, neither method yields an estimate of usual intake without error. This is well illustrated by a study of Crawford et al. (1994) in which a small sample (n = 58) of 9-10 year-old girls had their lunch time intake observed and were asked to report their intake by one of three methods: 24-hour recall, 3-day food record, or 5-day food frequency. Median percent error between observed and reported intake by the different assessment methods (see Table 1) indicates that while the particular nature of the errors differed, all three methods measured intake with error.

TABLE 1 Median Percent Error Between Observed and Reported Intake from Lunch, by Method *

	24-hour recall (n = 19)	3-day food record (n = 20)	5-day food frequency (n = 19)
Energy	19	12	28
Protein	19	14	26
Carbohydrate	26	16	33
Fat	39	20	23

SOURCE: Crawford et al., 1994.

Lastly, the problem of measurement is compounded by the difficulty in interpreting comparisons of intake estimates with dietary standards or nutrient requirement estimates. Individuals differ from one another in their dietary requirements. Thus, if an individual's usual intake of some nutrient falls below a particular reference value, for example, it cannot be assumed that the intake is inadequate to meet her requirement for that nutrient. Nonetheless, the lower an individual's usual intake is, the greater the probability that the intake is inadequate to meet her needs. Both the between-person variation in nutritional requirements and the error inherent in our estimation of individuals' usual intakes need to be considered when applying dietary assessment methods to determine nutritional risk.

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*Percent Error = 100 × (| observed - reported |) / observed.

DEVELOPMENT OF THE DIETARY GUIDELINES FOR AMERICANS AND THEIR APPLICATION TO THE WIC POPULATION

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By law, the dietary guidelines represent the basis for federal policy and are used to guide nutrition information, education, and interventions. While the food guide pyramid is one of the major tools used for consumer education, the dietary guidelines, which incorporate the food guide pyramid, are developed to be used as a policy instrument. The guidelines are quite relevant to this committee's task, in that the guidelines form the basis of federal food and nutrition education programs.

The development of the new Dietary Guidelines for Americans was a very complex exercise which relied heavily on available consensus documents. Contributing to the complexity was incorporating all age groups from age 2 and older, all socioeconomic groups, both genders, and multiple physiological states. In addition, the information needed to be reduced in such a way as to be understandable to the average consumer, and yet be scientifically accurate.

In developing the dietary guidelines, it was necessary to come up with generic information when, in fact, the basis for it was questionable in terms of the available science. Most difficult has been the nearly complete lack of usable data on the nutrient needs of infants, children, adolescents, pregnant and lactating women—the groups that the WIC program deals with. While the DRIs are currently being revised, the information gaps in the estimation of average requirements by life stage and gender have been very difficult to come by. For this reason, it is important to understand that there is an enormous amount of scientific judgment that goes into the development of these guidelines. But yet, the best scientific information for developing the dietary guidelines was available to this last guideline committee—more so than to other committees who worked on previous versions of the guidelines.

The first “dietary goals” were issued by the McGovern report and were released in 1977. The work of the Senate select committee was very controversial. Nutrition scientists were, quite literally, almost killing each other over whether the science was adequate enough for these dietary goals to be set. History would suggest that, in fact, the Senate committee was quite wise in their recommendations on the whole. Most of them are quite relevant today and have since been borne out by the additional science.

In 1979, the American Society for Clinical Nutrition brought together a panel that was to review the relationship between dietary practices and health outcomes. Their findings were incorporated in the Surgeon General's report on health promotion and disease prevention. These were then the basis of the 1980 guidelines issued jointly by the Department of Health and Human Services (DHHS) and the United States Department of Agriculture (USDA). While it was primarily a federal effort, some external individuals were involved as well. In 1983, nongovernment scientists were selected to review and make the recommendations to USDA and DHHS about the first edition. Today, it is an external group which reviews the wide breadth of information for all ages and income groups and then advises the government. Ultimately, the guidelines are issued jointly by USDA and DHHS based on the recommendations of the external group.

The dietary guidelines are to be based on current knowledge about how dietary intake may reduce the risk of major chronic diseases and how a healthful diet may improve nutrition. The basis is not just deficiency diseases, but in fact, the emphasis is on how dietary patterns can be used to both avoid deficiency and also achieve other health outcomes that are believed to be related to diet and dietary patterns. There is now a public law that requires publication and revision of the guidelines at least every 5 years.

The guidelines serve five very broad objectives. The first is to assist consumers in making dietary choices—choices which are most likely to promote well-being and avoid or postpone the onset of diet-related chronic diseases. This presents some challenges given the paucity of data in terms of nutrient requirements of children and pregnant or lactating women. When one adds to this the relationship between diet, nutrient-specific recommendations, and chronic disease, one has to rely almost exclusively on epidemiological data. This type of data is great for hypotheses and associations, but in terms of causality, it presents some challenges.

The remaining objectives of the guidelines are: to assist federal, state, and local agencies in the development, implementation, and formulation of regulatory policies and programs; to assist health care providers in primary disease prevention efforts; and lastly, to guide other domestic and international for-profit and not-for-profit organizations in the implementation of nutrition and health goals.

In developing the new dietary guidelines, the number of guidelines increased from seven to ten and are now grouped under the categories of *Aim for Fitness, Build a Healthy Base,* and *Choose Sensibly* (see Table 1).

TABLE 1 Dietary Guidelines for Americans

AIM FOR FITNESS...
Aim for a healthy weight.
Be physically active each day.
BUILD A HEALTHY BASE...
Let the Pyramid guide your food choices.
Choose a variety of grains daily, especially whole grains.
Choose a variety of fruits and vegetables daily.
Keep foods safe to eat.
CHOOSE SENSIBLY...
Choose a diet that is low in saturated fat and cholesterol and moderate in total fat.
Choose beverages and foods to moderate your intake of sugars.
Choose and prepare foods with less salt.
If you drink alcoholic beverages, do so in moderation.

Aim for Fitness. Under this heading are the guidelines *Aim for a healthy weight* and *Be physically active each day.* These guidelines are just as relevant to pregnant or lactating women and young children over the age of 2 as they are for any other age group. While there are no specific recommendations as to what a healthy weight should be for a pregnant woman, weight is discussed for a general adult population. The advice regarding physical activity is relevant to pregnant and lactating women.

Build a Healthy Base-Let the Pyramid guide your food choices is the second group of guidelines and represents somewhat of a tautology. The pyramid is supposed to reflect the guidelines and the guidelines are saying to follow the pyramid. Under this guideline is a section of particular relevance to pregnant women—*Use of dietary supplements.* The guideline committee felt that it was very difficult for pregnant women to meet the iron requirements for pregnancy and for this reason a statement was added to this effect. The other point that this guideline makes is for folate. Women who are pregnant or who are at risk for becoming pregnant should choose foods that are fortified in folate or take a folate supplement. It was felt that, given present levels of supplementation, if women were judicious in their food choices, a supplement would not be necessary.

Choose a variety of grains daily, especially whole grains. This guideline is of relevance to the WIC population because of the concern regarding folate intake for pregnant women. When the U.S. fortification policy and consumption patterns were looked at, the guideline committee came to the conclusion that it was necessary to put the emphasis on whole grains because many grains are not fortified and without the emphasis, women could be put at risk of folate deficiency and birth defects.

Another reason whole grains were emphasized was recent epidemiological data suggesting that whole grains can be, for reasons we do not yet understand, associated with significant reductions in cardiovascular disease risk. The reason for using the word *especially* was that the grains group was the food group for which Americans have the largest gap between consumption patterns and recommendations. By using the word *especially,* the development committee hoped to emphasize grains and increase public attention to this area.

Whole grains were separated from ***Choose a variety of fruits and vegetables*** because dietary patterns based on grains, fruits, and vegetables appear to be associated with the highest reductions in disease risk. Consumers have treated these groups as interchangeable when, in fact, benefits from these nutrients are significantly distinct. By separating the groups, it was intended to point out that they are not interchangeable.

Keep foods safe to eat is the other new guideline and is the second guideline where pregnancy is specifically mentioned. The committee felt very strongly that if a recommendation is made for a healthy diet, it had to be safe as well. One could not divorce microbiological safety or other contaminants in the food supply from a healthful diet. So these were not nutrient guidelines but food-based dietary guidelines. Obviously, women may be at risk if they are not following food safety guidelines, and they may benefit from WIC, to the extent that WIC incorporates this into their educational materials. Pregnant women, along with the elderly, young children, and immune-compromised groups are at the highest risk for certain food-borne pathogens.

The third group, ***Choose Sensibly,*** is the most complicated of all the guidelines. The difficulty stems from the guideline ***Choose a diet that is low in saturated fat and cholesterol and moderate in total fat.*** Because the emphasis has been placed on low-fat diets when most of the concern was being driven by saturated fat, the message regarding dietary fats and cholesterol was not being adequately translated by either industry or consumers. This guideline is complicated because consumers are now being asked to differentiate between total fat, saturated fat, polyunsaturated fats, monounsaturated fats, and trans-fats. While there is science to back this up, trying to educate the public on these various types of fats will be an enormous challenge. However, it is one that the committee felt was significant enough because most of the risk is

related to saturated fats and trans-fats. The guideline committee 5 years ago did not have the science that is available today on the issue of trans-fatty acids.

The most controversial guideline, certainly in terms of public comment, was the guideline ***Choose beverages and foods to moderate your intake of sugars.*** There was quite a bit of debate among the development group about how the guideline should be worded. The controversy was whether the word *moderate* or *limit* should be used. In addition, dietary intake trends indicated that the highest level of increasing sugar consumption came from added sugars in beverages. There was significant concern that many consumers didn't recognize beverages as a source of sugars—they were not foods in their minds. For this reason, the committee needed to also include the word *beverages* in the guideline.

The development committee needed to be very careful whenever the term *moderation* was being used in terms of quantitating the advice. One of the major changes they tried to make with the new guidelines was to make them more actionable. For example, the word *moderate* in the total fat guideline—the wording states to aim for a total fat intake of no more than 30 percent of calories, but one does not need to go much beyond that. The committee felt that telling consumers to moderate their intake was very difficult to put into action. On the other hand, there were many others who felt that by using the term *limit,* the committee was going beyond what the science provided. The committee's rationale was that given the increasing rates of obesity in this country, it is obvious that there is an energy balance problem. If consumers are asked to eat more of certain products, they needed to be asked to eat less of other products. Consumers were asked to limit their consumption of alcohol, fat, and sugar.

The next guideline in this grouping, ***Choose and prepare foods with less salt*** has been reworded but the message is essentially the same. The only difference is that there is now a quantitative recommendation for salt intake.

The third guideline in which pregnancy is specifically mentioned is ***If you drink alcoholic beverages, do so in moderation.*** Throughout committee deliberations, it was clear that there was no way to distinguish at what level of drinking would birth defects become a problem or have other adverse effects in women. For this reason, pregnant women or those at risk of becoming pregnant were asked not to drink alcohol at all.

The other reason for the way the guideline is stated is because there are health benefits associated with alcohol. It does not matter what form the alcohol is in (wine, beer, distilled), it is the ethanol that appears to be the active agent. There is a significant reduction in risk to cardiovascular disease that appears to operate via a reduction in platelet aggregation. Because it is an acute effect, one does not obtain any benefits from a lifetime of drinking. Rather, if one is interested in drinking for health benefits, there is no reason that drinking should begin at age 21 because the benefit does not become available until one is at risk for cardiovascular disease—45 years of age for men and 55 years of age for women. It is also clear that, at least for women, more than one drink a day increases risk for breast cancer. However, women should not be asked to refrain from drinking alcohol because there are benefits as well as risks. For this reason, postponing drinking until after the age of 55 if consuming it for health reasons seems the most rational and prudent thing to do.

Overall, the major changes in the guidelines are mainly the grouping of the recommendations and the addition of guidelines on physical activity and food safety. Because pregnancy is such a teachable moment, it is hoped that WIC provides an opportunity to impress the point that physical activity is important for everyone. It is not just for women in other age groups, men, or for those who need to lose weight. There are significant health benefits that

physical activity provides. Physical activity permits individuals to increase food intake and therefore increases the likelihood of getting all the nutrients needed from food. Other changes in the 2000 guidelines include a separation of guidelines on grains from fruits and vegetables, a shift from an emphasis on total fat to the reduction of specific types of fats, a recognition of the trends in sugar intake, and greater specificity in the alcohol guidelines.

The guidelines are quite applicable to the WIC population, but only after the age of 2. The likely reason that everybody has shied away from the under 2 population is that trying to look at nutrient-specific requirements is very difficult based on the data available for the first year of life. However, focusing on women's health in the WIC setting can be very beneficial and advantage should be taken of this opportunity. In fact, it is scientifically appropriate to do so. Pregnancy represents an ideal time to get women to focus on their health and enhance their knowledge, behavior, and practices. In many households, women are the gatekeepers for health. In addition, for many women, problems with overweight and obesity appear to begin during pregnancy and the postpartum period.

While the guidelines are very applicable to the WIC population in terms of defining an inadequate diet, it is not likely possible to come up with a simple paradigm or algorithm for compliance by looking at only a few of the guidelines. The grouping of guidelines were not intended to be prioritized in any way; they all are relevant to good health. It is important to remember that the risk is to long-term outcomes. For the individual, we have gone to some lengths to ask people to look at their own family histories and their own risks. For example, if one knows that there is no hypertension in their family history and no one has ever died of stroke, then for that individual, perhaps the salt guideline under those conditions would not be as important. Perhaps in this particular family history, everyone seems to be dying at the age of 50 from atherosclerosis. For this individual, paying attention to fat and physical activity or having one drink a day once over the age of 40 may be more important to lowering this individual's risk. The guidelines could perhaps be prioritized in some way for each individual. However, from a public health perspective, it is not likely possible.

DEVELOPMENT OF THE FOOD GUIDE PYRAMID AND ITS APPLICATION TO THE WIC POPULATION

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The Food Guide Pyramid and the Food Guide Pyramid for Young Children are sciencebased food guidance. A food guide translates recommendations on nutrient intake into recommendations on food intake. The Food Guide Pyramid and, subsequently, the Food Guide Pyramid for Young Children were developed using a sound research process and were based on a set of established philosophical goals. These philosophical goals included: (1) a food guide should promote overall health; (2) it should be based on current nutrition research; (3) it should be based on the total diet instead of a core or foundation diet; (4) it should be useful to a target audience; (5) it should meet nutritional goals in a realistic manner; (6) it should allow flexibility in how consumers meet nutritional goals; (7) it should be practical, hence varying numbers of servings to meet different calorie and nutrient needs; and (8) it should be evolutionary.

Nutrition goals for the food guide were originally based on the 1980 Recommended Dietary Allowances (RDAs) for nutrients for which there are adequacy concerns such as calories, protein, vitamins, and minerals. Also considered were the 1980 Dietary Guidelines for Americans for fat and sugar—for which there are moderation concerns. Subsequent releases of the RDAs and Dietary Guidelines have been used to update the food guide.

The food groups were defined for the food guide by primarily considering the nutrient content of a food, but also the usual use of a food in meals and how a food was grouped in earlier food guides. In the most recent food guide, foods which were high in fat and added sugars and low in nutrient density were put in a separate group, the tip of the pyramid, in order to highlight the need to moderate intake of these food components. In addition, vegetables were separated from fruits, and subgroups within the vegetables were used to emphasize nutrients and specific food components.

Serving sizes for the food groups were based on typical serving sizes reported in the U.S. Department of Agriculture's (USDA) food consumption surveys. Consideration was also given to using common measures easily utilized by consumers, such as 1 cup. Nutrient content was used to establish serving sizes in the milk group and for meat alternates in the meat group. Each food in the milk group was assigned a serving size that would provide 300 mg of calcium, the amount in 1 cup of skim milk. Amounts of meat alternates would provide approximately the same amount of protein and minerals found in 1 oz of meat.

Tradition dictated that serving sizes used in previous food guides will continue to be used for some foods. For example, two slices of bread is the typical amount eaten at a single occasion, yet one slice of bread is considered a serving. There was concern that if the serving size was changed to two slices, it would reduce the minimum number of servings for grains from six to three. This would have contradicted the philosophy of the Dietary Guidelines, which encourage the consumption of more grains.

In order to determine the nutrient profiles of each food group and subgroups, composites were created using USDA food consumption survey data. Each profile represented the amounts of nutrients one would expect to obtain from eating a serving of a food group or subgroup. The

original Pyramid work used 1977–1978 Nationwide Food Consumption Survey data. The 1989– 1991 Continuing Survey of Food Intake by Individuals (CSFII) data was used to update the original data. It was based on foods reportedly consumed by 11,488 individuals, 2 years and older over 3 days. Sample weights were applied to provide estimates representative of the population. Work is currently in progress to update the composites using 2-day weighted data from the 1994–1996 CSFII and the Agriculture Research Service's Pyramid Servings Data in conjunction with consumption data from this survey.

For the initial update, composites for each food group and subgroup, such as dark-green vegetables, were developed based on reported consumption of food items (i.e., cooked broccoli) in the CSFII 1989–1991. USDA's Center for Nutrition Policy and Promotion developed a Food Guide Servings Database for the CSFII 1989–1991. This database was used to convert grams of foods consumed into numbers of food guide servings consumed. A composite of item groups was then constructed, weighted by the numbers of servings of each reported by all individuals. One food code was selected to represent each food item group in each of the composites.

Nonfortified ready-to-eat and cooked breakfast cereals were used in both the whole grain and enriched grain composites. In this way, the nutrient profiles of these composites do not overestimate the nutrients for those individuals who do not eat fortified breakfast cereals. Nutrients added at standard enrichment levels, such as in enriched bread, were used in the composites. Folate fortification was not mandated by the government at the time the 1989–1991 survey was conducted, and was therefore not reflected in the nutrient profiles for grain products. However, in the 1994–1996 work, nutrient values for folate were modified to bring them up to current levels.

Nutrient profiles for each composite were calculated using forms of food items lowest in fat and added sugars. This reflected the philosophical goals that the food guide should be realistic and allow maximum flexibility for users to select specific sources of fats and sugars within their diets.

To minimize sodium, the form of the food item with the lowest amount was used in the composite. For most of the vegetable and cooked grain item groups, food codes were used which specified “no salt added in preparation.” However, in a few cases, the salted form of the food was used for vegetables based on 1989–1991 food supply data.

Once a food code was selected to represent each of the food item groups in each of the composites, grams and corresponding nutrient values of each were calculated for its portion of the composite serving. Nutrient values were then summed across all item groups in the food group or subgroup to determine the composite's nutrient profile per serving. The nutrient values were derived from USDA's Survey Nutrient Database. Thus, each composite had a nutrient profile which represented the most frequently consumed foods in that food group.

A fat composite was developed to represent “discretionary” fat added to the diet above the fat found in lean meats and the other forms of composite foods that were lowest in fat. For example, the fat in cakes and margarine spread on bread are discretionary fats. The nutrient profile for the fat composite was updated using proportions of animal and vegetable fats in the food supply during 1989–1991.

The numbers of servings for each food group and subgroup in the food guide were based on nutrient adequacy and moderation. The numbers of servings required to meet the 1989 RDAs for protein, vitamins, and minerals were determined. Since RDAs vary based on age, sex, and pregnancy status, ranges in the numbers of servings of the food groups were set to cover the full

range of nutrient needs. The higher number of servings is for individuals with greater caloric and nutrient needs.

Sample Food Guide Pyramid diet patterns for several caloric levels, including 1,600, 2,200, and 2,800 calories, were developed to reflect the range of food group servings. For example, the minimum number of servings for each food group is based on a 1,600-calorie pattern, while the maximum number of servings reflects a 2,800-calorie pattern. The greater numbers of servings in the higher calorie diet patterns are for individuals with higher nutrient and calorie needs, such as teenage boys, active men, and very active women. The lowest number of servings is for sedentary women and older adults.

Choosing a variety of foods from within each food group is important in obtaining the expected levels of nutrients. This is particularly true for the vegetable group, where certain subgroups (i.e., dark-green and deep-yellow vegetables, legumes) have been targeted for increased consumption.

Three whole grain servings in the patterns were based on the Food Guide Pyramid recommendation to choose “several” servings a day of foods made from whole grains. There has always been an emphasis on whole grains in Pyramid materials, and this continues to be consistent with the Dietary Guidelines. For the meat alternates, the number of egg servings was based on three eggs per week. This ensured that the cholesterol value across the patterns would average 300 mg or less per day, based on the National Research Council's 1989 *Diet and Health* report.

Three servings from the milk group had been recommended in the past to meet the higher calcium needs of pregnant or lactating women, teenagers, and young adults to age 24. In light of the change in calcium requirements in the new DRIs, three servings from the milk group are now recommended for older children and teenagers (children ages 9 to 18) and adults over age 50. During pregnancy and lactation, the recommended number of milk servings is the same as for nonpregnant women. This information appears in the newly-released Dietary Guidelines 2000.

As indicated previously, sample Food Guide Pyramid diet patterns were developed and composites and their nutrient profiles used in these at three calorie levels that would meet established goals for protein, vitamins, and minerals. Ranges in numbers of servings were used to cover the varying needs of males and females 2 years of age and older. These patterns included added or discretionary fat and added sugars. Discretionary fat was added to bring the level of total fat in the three patterns to 30 percent of calories. Added sugars, represented as teaspoons of sugar, were included to bring calories to the targeted levels. It should be emphasized that the different amounts of sugar in the three patterns are not recommendations, but merely indicate the calories, in teaspoons of sugar, needed to meet the targeted calorie levels for each pattern.

Analysis of the Food Guide Pyramid diet patterns have shown that the RDAs are generally met. Nutrients that failed to meet the RDAs were iron and zinc. Iron is the main nutrient for which adequacy is a concern, but only for individuals who have both high RDAs for iron and who choose the minimum number of servings from the food groups. For example, a female whose energy requirement is 2,200 calories per day may be choosing the minimum amount of servings from each food group, and therefore, only consuming about 1,600 calories per day. At this reduced calorie level, nutrient needs, especially iron and zinc, may not be met. Therefore, these females would need to consume foods rich in iron or eat an iron-fortified breakfast cereal in order to meet their nutrient needs.

The diet patterns also meet the saturated fat goal of less than 10 percent of calories. Cholesterol values in the 1989–1991 composites, being used in the patterns, are now lower than what appear from the 1977–1978 composites. Sodium levels continue to fall below the 2,400 mg recommendation. Total dietary fiber continues to range from 17 g in the 1,600-calorie pattern to about 27 g in the 2,800-calorie pattern.

FOOD GUIDE PYRAMID FOR YOUNG CHILDREN

The Food Guide Pyramid for Young Children was developed using the same methodology as was used for the original pyramid. The quantitative and qualitative research for this project will be published in the next issue (this summer) of *Family Economics and Nutrition Review,* a peer-reviewed journal of the USDA Center for Nutrition Policy and Promotion.

In order to meet the objective of adapting the original Food Guide Pyramid to a younger audience, a literature search was first conducted to help decide on the target audience of 2–6-year-olds. The philosophical and nutritional goals, developed for the original Pyramid, were reexamined and adapted for young children. Once the goals were set, discussions were held with nutrition professionals who educate young children, parents and care-givers.

Just as composites were developed for the original Pyramid, food group and subgroup composites were developed based on reported food intakes of 1,053 children ages 2 to 6 years over 3 days in the CSFII 1989–1991.

The whole grains composite is an example of what was done for each of the food groups and subgroups. The children obtained the bulk of their whole-grain servings from cereals, both hot and ready-to-eat. Once the make-up of each of the food groups and subgroups was determined via composites, the average quantity of food a child would eat at a single occasion was calculated. The amounts reported for young children were 60 to 80 percent of those for all individuals. This suggests that it is appropriate to continue to use the serving size estimate of one-third smaller serving that was used previously in assessing nutrient levels in Food Guide Pyramid patterns for young children. Two- to 3-year-old children eat two-thirds of a serving, whereas the older or 4- to 6-year-old children have regular-sized servings.

While a 1,300-calorie pattern was developed for 2 to 3 year olds, a 1,600-calorie pattern was developed for 4 to 6 year olds. Although the REI for 4 to 6 year olds is 1,800 calories, food consumption data reported for this age group in the CSFII 1989–1991 averaged 1,533 calories.

Focus groups with parents indicated that parents were concerned that their children might not be getting adequate nutrients from the amount of food that they were eating. It was important to determine whether a diet pattern set closer to the level of calories that children reportedly eat, based on their reported food choices, could meet their nutrient requirements. The 1,300-calorie pattern represented the minimum number of servings per Food Guide Pyramid food group and was calculated by reducing the 1,600-calorie pattern by one-third for all the food groups and subgroups except milk, which remained 2 cups. This was to represent the smaller serving size estimated for 2- to 3-year-old children.

The nutrient levels in these patterns were compared to the RDA for 2 to 3 and 4 to 6 year olds, as well as to actual nutrient intakes of these children from survey data. The goal was to meet or exceed the RDA for nutrients, or to at least improve levels relative to actual consumption. The 1,600-calorie pattern met all nutrient requirements for children age 4 to 6 years, except for vitamin E. The 1,300-calorie pattern provided the RDA for most nutrients for 2 to 3 year olds. The major exceptions were iron and zinc. When breakfast cereals fortified with

iron and zinc were included in the grain composites, the patterns did provide recommended levels of these nutrients. In looking at the average actual consumption of servings in each of the food groups and subgroups, it was evident that children were not consuming the recommended numbers of servings from most food groups. Their diets could be improved by eating more dark-green and deep-yellow vegetables, legumes, whole grains, and lean meat, poultry, and fish.

Beyond the composites for children, analysis for other subpopulation groups, like Hispanics and African Americans, have not yet been done, although this is possible if the sample size is large enough in USDA's food consumption surveys.

The food guide is based on nutrient recommendations such as the DRIs and Dietary Guidelines. For this reason, as these are revised and released, the food guide recommendations will be reassessed to make sure they meet the nutritional objectives. An article entitled Reassessing the Food Guide Pyramid: Decision-Making Framework, written by Anne Shaw and others at the Center for Nutrition Policy and Promotion will appear in the March/April 2000 issue of the *Journal of Nutritional Education* and serves as a good reference of the reassessment process.

Updating the nutrient profiles of the food group composites can also be done when there are major changes in nutrient composition, like the fortification of certain grain products with folate. By using updated composites in the Food Guide Pyramid diet patterns, and comparing expected nutrient levels to nutritional objectives, it can be determined whether or not the patterns meet objectives. If not, there are several options. Guidance could be individualized for selected sex/age groups on choosing certain foods in food groups to help them meet higher nutrient standards. The numbers of servings for a food group or subgroup could be modified. Another possibility would be to create a new food group or subgroup to emphasize sources of a target nutrient or food component, such as a separate tomato group if lycopene intakes continue to generate interest, assuming serving recommendations were developed. Each proposed change would need to be evaluated in terms of its effects on calories and other nutrients in the diet patterns. In addition, consumer understanding of the Food Guide Pyramid and barriers to its use must be monitored. Such research is currently being planned and through it, the USDA will continue to have a tool that consumers can successfully use to meet their nutrient needs.

ASSESSING INDIVIDUALS TOTAL FOOD INTAKE AND COGNITIVE ASPECTS OF QUESTIONNAIRES

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National Cancer Institute

From a cognitive point of view, food frequency questionnaires (FFQs) can be difficult for respondents to understand and complete. They require complex knowledge, skills, and attentiveness with respect to food intake. Cognitive techniques can be used on all types of instruments, whether they are self- or interviewer-administered, and would be useful in the WIC population or any specific population.

This research describes the methods and results of three rounds of cognitive interviewing, the purpose of which was to improve self-administered FFQs. Cognitive aspects having to do with the wording, ordering, or anything that would ease the task and help respondents better understand the questions were evaluated. The cognitive research was conducted with the help of two cognitive psychologists, Jared Jobe and Albert Frederick Smith. The goal was to learn about the cognitive strategies individuals use in responding to FFQs, identify the problems, modify and test new questions, and design a cognitively improved questionnaire. The instrument that was developed based on this cognitive testing was then to be evaluated with respect to response rates, validation, calibration, and measurement error.

Using a Block questionnaire as the baseline instrument, 24 respondents in each of three phases were enlisted. While an effort was made to recruit a diverse group of respondents in terms of socioeconomic level and ethnic diversity, individuals with major literacy issues were not included. The respondents were asked to think aloud as they completed the instrument. In this way, the researcher could hear what the respondents were thinking as they formulated their answers to each question. Mistakes and misunderstandings could be heard as the instrument was completed. Doing pilot testing in this way versus discussing questions, thoughts, or problems after completion of the instrument has advantages in that interviewers hear and see problems with question, wording, layout, and understanding for each individual question as it is answered. In some cases, such problems might not be remembered at the end of a long task. Each interview took, on average, 2 hours per respondent.

Following the interviewing, the researchers pooled findings and discussed common problem areas. The interviewing uncovered a series of both subtle and generic issues in responding to FFQs having to do with wording, layout, design, and order. Specific examples of problem areas had to do with respondents having difficulty with not having a response category of “never” separated from “a few times per year,” responding to portion size questions referred to as “small,” “medium,” and “large,” responding to frequency of intake for seasonal foods, and responding to line items which included one or more foods not typically eaten as substitutes for one another (for example, tomatoes and tomato juice). Although averaging intake over 1 year is not particularly easy, it does provide the best picture of usual intake. Asking about shorter time frames such as the past month or week may be easier but may not best represent long-term usual intakes. Many of the stumbling blocks for respondents are simple things that can be easily changed helping respondents to easily get through the process of completing the instrument. Although most of the innovations incorporated into the new instrument based on the cognitive testing would likely make completing the questionnaires easier for respondents, the next

important area of research was whether or not such innovations would lead to better food group and nutrient intake estimates.

Findings from the cognitive testing led to the development of a new FFQ at the National Cancer Institute, the Diet History Questionnaire (DHQ), which was validated using a checklist approach, to assess frequency of intake in the past month. Three studies were conducted or are in the process of being conducted to validate it to see if, in fact, the cognitive improvements would prove to be valuable in validation studies. Findings from the Checklist Validation Study show that most, but not all of what were considered cognitive improvements incorporated in the DHQ were superior. Many of the changes made to the instrument based on the cognitive testing showed significant improvements over the Block instrument as compared to reference data from the past month. In a few areas, the data showed that the changes were not improvements. In some cases, even if accuracy was no different, the cognitively improved questions were retained if the investigators felt strongly that they were easiest for the respondents to answer. Based on the findings of the Checklist Validation Study, the DHQ was further modified.

Further piloting compared response rates and data completeness between the DHQ and a standard FFQ in a sample of participants from a clinical screening trial. Response rates were identical for both FFQs. A significantly lower proportion of respondents skipped or missed portion size and supplement questions on the DHQ versus the standard FFQ. These findings suggest that intensive cognitive interviewing is beneficial in the development of dietary assessment instruments and would be beneficial in developing a dietary assessment tool to be used in the WIC setting.

USE OF THE BLOCK QUESTIONNAIRE IN THE WIC PROGRAM

Presented by Gladys Block, Ph.D.

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This study was designed as a validation study for the Block Food Frequency Questionnaire (Block FFQ) and the Harvard Food Frequency Questionnaire (Harvard FFQ). The questionnaires were self-administered and had both geographic and ethnic variation. Full length questionnaires with manual scoring systems were tested. Subjects consisted of WIC participants of African American, Caucasian, and Hispanic origin. Seven hundred fifty-seven pregnant, lactating, and nonpregnant women, and children ages 1 to 4 completed the study. There was equal distribution across the three ethnic groups and throughout WIC clinics of California, Ohio, Texas, and New York. Intake was examined for protein, iron, calcium, vitamins A and C, and energy.

Participants in WIC clinics were randomized to receive either the Harvard or Block FFQ (see Table 1). The questionnaires, which were self administered at baseline, were offered in English or Spanish. Then, over the next month, three telephone interviews took place using the Minnesota NDS system. At the conclusion of the 1-month time period, a self-administered questionnaire was repeated at the WIC clinic.

Results among the women indicated identical caloric intake and no significant differences in the mean nutrient intakes between the Harvard and Block FFQ. Among the children, there were significant differences in the mean nutrient intakes by recall data in protein (47.5 g [Harvard] vs. 52.0 g [Block]; $p = 0.04$) and calcium (876 mg [Harvard] vs. 893 mg [Block]; $p = 0.06$). Data were recorded for the length of time for completion of the FFQ, the amount of assistance required, and the time for the WIC staff member to perform manual scoring.

While these tools were originally developed for epidemiological study, in this study they were used to determine eligibility for the WIC program. Both are long instruments designed to calculate an extensive list of nutrients. For this reason, the time for completion and evaluation is overestimated since the instruments are more extensive than what would be needed in a WIC clinic.

TABLE 1 Usability in WIC Settings

Criterion	Ethnic Group	Harvard		Block	
Time for respondent to complete FFQ (median in minutes)	White	6.0		8.0	
	African American	8.0		9.0	
	Hispanic	10.5		13.5	
Amount of assistance required (1=none, 2=little, 3=some, 4=much) (mean)	White	1.5		1.6	
	African American	2.0		2.1	
	Hispanic	1.9		2.0	
		Median	Mean	Median	Mean
Time for aide to perform manual scoring (minutes)	FFQ-1 (baseline)	3.0	3.9	3.0	3.8
	FFQ-2 (endpoint)	3.0	3.2	3.0	3.4

Nutrient intake recalls were examined and compared to both the Harvard and Block FFQs. Both the Harvard and Block FFQ were found to significantly overestimate intakes of protein, calcium, vitamin A, and vitamin C. The Harvard FFQ also overestimated energy intake and the Block FFQ overestimated iron intake. While both instruments were found to overestimate various nutrient intakes, the Block FFQ tended to overestimate less often than the Harvard FFQ.

Pearson correlations were performed on the Harvard and Block FFQ between the FFQ and three 24-hour recalls (see Table 2). Correlations below 0.40 were considered inconclusive. The Block FFQ tended to have a higher correlations for African American and Caucasian WIC participants. Both instruments had low correlations with three 24-hour recalls in children and Hispanic women, and therefore seemed to be no more reliable than chance.

TABLE 2 Validity Coefficients of the Harvard and Block Food Frequency Questionnaires

Mean Nutrient Intake by Recall Data	Harvard	Block
Hispanic Women		
Energy (kcal)	0.19	0.14
Protein (g)	0.13	0.09
Vitamin A (RE)	0.4	0.15
Vitamin C (mg)	0.28	0.17
Iron(mg)	0.28	-0.01
Calcium (mg)	0.18	0.15
Black Women		
Energy (kcal)	0.18	0.53
Protein (g)	0.22	0.46
Vitamin A (RE)	0.00	0.28
Vitamin C (mg)	-0.36	0.32
Iron (mg)	0.02	0.40
Calcium (mg)	0.27	0.46
White Women		
Energy (kcal)	0.27	0.44
Protein (g)	0.33	0.53
Vitamin A (RE)	0.28	0.62
Vitamin C (mg)	0.33	0.20
Iron (mg)	0.27	0.47
Calcium (mg)	0.40	0.56
Children		
Energy (kcal)	0.13	0.14
Protein (g)	0.19	0.15
Vitamin A (RE)	0.28	0.03
Vitamin C (mg)	0.10	0.19
Iron(mg)	0.01	0.15

One possible explanation for the poor outcomes seen in the Hispanic population could be attributed to the level of education. While all of the African American respondents had greater than a ninth grade education, 35 percent of the Hispanic respondents and 1.4 percent of Caucasian respondents had less education than the ninth grade. In addition, the FFQs were designed for African American and White women's cognitive capabilities, not Hispanics. This is an important area to pursue, given that various cultures answer questions in different ways.

Cross-classification is a better measure than correlation because correlations are influenced by a number of factors, including the range of distribution. The questionnaires and the diet recall were divided into quartiles by 3-day averages, then cross-tabulated. For the African American and Caucasian participants, the agreement was 28 percent. The cross-tabulation approach worked better for the Block FFQ and did not work at all for the Hispanic participants

Manual scores were examined for the Block FFQ to determine if this method was able to identify a group with low intake (or high intake). Based on the average of three 24-hour recalls, low true intake levels were observed in the low quartile of the manual score method in the WIC nutrients. With the manual scoring system it is possible to move the cut point. For example, if individuals who are getting less protein than the recommended level need to be identified, the cut point could be moved down. Another example would be to move the calcium cut-off point in order to identify individuals with intake under 800 mg, or less than the RDA. To accomplish this, the cut point could be moved. Unfortunately, this approach would not be valid for the Hispanic WIC population or in children.

Use of a FFQ is difficult in WIC children. Women who had 24-hour responsibility for the nutrition of their children were asked to report the food intake for their children. No significant correlations in FFQ and diet recall were found. Using short simple screening questions may be a more effective method for evaluating dietary risk in children. For example, questions such as “Did you give your child any fruit last week?” or “How many days a week did you give your child any fruit?” There will be problems in justifying the scientific validity, but in terms of common sense, one could say if it is less than seven for any of these, then there should be a concern for that child.

In terms of Hispanic participants, similar problems exist. Correlations were found to be poor for both instruments. Since the Block FFQ was not designed to contain Hispanic food choices, it is not currently a good choice for this population. The instrument would need to be modified for a Hispanic population. Because of problems with education level, interviewing respondents rather than providing participants with questionnaires that need to be self administered may help. Overall, the Block questionnaire appears to be an instrument that works in the African American and Caucasian population when using the manual score methodology.

USE OF THE HARVARD FOOD FREQUENCY QUESTIONNAIRE IN THE WIC PROGRAM

Presented by Graham Colditz, M.D., Dr.P.H.

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The Harvard Food Frequency Questionnaire (HFFQ) is a self-administered tool in which a client makes reference to a 4-week time period in contrast to a 1-year reference period that many other FFQs use. It was originally developed as a 60 item questionnaire for nurses in response to a request from the National Cancer Institute. It has since been expanded to include approximately 120 items. In the mid-1980s, the questionnaire was modified and implemented for use in pregnant and lactating women. Later, it was also modified for use in children 1 to 5 years of age. Most of the development for use in children included input from local WIC participants in Boston.

The HFFQ is currently available in both English and Spanish and can be administered in a paper format as well as a computerized direct entry format. It is comparable to other FFQs, except for the length of the reference period. It is simple and tends to have less items than other FFQs. Responses can be manually entered by either the participant or staff in a WIC setting and can provide instant computer-generated printouts. Computerized scoring systems are optimal to manual scoring methods because they can provide tailored feedback.

The development of the list of foods and portion sizes for the HFFQ is based on data from the Continuing Survey of Food Intake by Individuals. It has been designed with substantial input from clinics in Massachusetts as well as U.S. Department of Agriculture (USDA)-funded focus groups and clinics in North Dakota. The Harvard nutrient database is used. Although this database is primarily based on USDA data, it is additionally supplemented for some nutrients. While it contains data on more than 80 nutrients, the WIC Clinic computerized version focuses on nutrients specifically focused on in the WIC program. The database is continually updated. For example, when the food supply was fortified with folate, the values for folate were updated for all foods in the HFFQ. One limitation of the instrument is the focus on nutrients rather than whole foods and food patterns. This is an area that is currently being reexamined.

The computerized direct entry version was developed and pilot tested in Massachusetts with feedback from WIC providers and clients. The instrument is in a menu-driven format with on-screen directions. This set-up allows for branching. For example, if a client fills in that she does not drink milk, she does not have to get the next set of questions regarding milk consumption. This makes the overall process more efficient. Another advantage of direct entry is that there is not the opportunity for clients to skip lines. In contrast, in the old grid system, one could go across the rows when marking answers and put two marks on the same line. Another advantage is a significantly lower error rate on the computerized entry version compared to the pencil and paper version. Hence, there is less likely to be gross overestimation. It is also efficient in terms of the provider's time. The participant can complete the HFFQ prior to meeting with the WIC counselor and the allotted time can be used for nutrition counseling, rather than completing the assessment. The disadvantages to this process include the equipment cost and space requirements in addition to a paper copy needed for backup in the client record.

Several validation studies using the HFFQ have been performed in pregnant women and children. In 1999, Blum and colleagues conducted a validation study using the HFFQ in White and Native American children. Suitor and colleagues (1989) conducted a validation study on Caucasian, African American, and Hispanic women. The analysis consisted of WIC nutrients only. In 1999, Wei and colleagues used the same data, expanded the range of nutrients in the analysis, and used an alternative approach to error correction for intra-individual variation in day-to-day diet, based on three 24-hour recalls. A summary of the correlation coefficients found in these studies can be found in Table 1.

TABLE 1 Summary of Validation Studies Performed on the Harvard Food Frequency Questionnaire

Tools and References	Sample		Number of Nutrients for which Average Correlation was Derived	Average Pearson Correlation Coefficient
	Children	Pregnant Women		
Children's HFFQ				
Blum et al., 1999	X		19	0.55[a]
	1–2 years			0.57
	3–5 years			0.55
	Native American			0.56
	Caucasian			0.52
Women's HFFQ				
Suitor et al., 1989		X	8	0.5[a, b]
Wei et al., 1999		X	26	0.47[b]

Recent data indicate that the HFFQ can be used for determination of WIC eligibility based on dietary risk. In a completed, but not yet published, study by Rodan and colleagues, an 80-item version of the HFFQ is compared to a 31-item version of a Massachusetts FFQ. The HFFQ uses a reference period of 4 weeks and the Massachusetts questionnaire a time period of 1 week. Ninety-six percent of women found the HFFQ easy to use and can complete it independently within 9–12 minutes. The HFFQ identified 95 percent of these women as being at nutritional risk compared to 85 percent based on the Massachusetts questionnaire. Only 6 percent, however, were found to be eligible for WIC based solely on dietary risk. In children, the HFFQ identified 98 percent to be at nutrition risk compared to 94 percent based on the Massachusetts questionnaire; 49 percent were eligible for WIC based solely on diet.

In summary, WIC programs in several states have implemented the HFFQ and there is growing evidence from validation studies that indicate its performance in WIC settings is comparable to that of a research tool. It is conceptually superior to a 24-hour recall because WIC's focus is to measure long-term intake. The ease of use has also been documented by studies in Massachusetts. While measurement of biochemical markers would be the best validation of the HFFQ, unfortunately this has not been done and is not practical at this time. The printout that the client receives from the HFFQ includes both nutrients and food groups and this

[a] Adjusted for within person variation.
[b] Adjusted for energy intake and within person variation.

output can easily be used for nutrition counseling. In addition, if the HFFQ is administered repeatedly, research has indicated that it could be used to evaluate change in diet over time. In the future, there is also the potential to use the data for surveillance and program planning.

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ASSESSING DIETARY INTAKE IN THE HISPANIC POPULATION

Presented by Anna Maria Siega-Riz, Ph.D.

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Over the last 10 years, the Hispanic population has increased more than 50 percent. The majority of the increase has occurred in individuals of a Mexican, Central South, and South American origin. Hispanic children are the second largest group of children in the country. The Mexican-American subgroup is the largest (60 percent) of the Hispanic population; however, the second largest Hispanic subpopulation (23 percent) cannot be classified as Mexican, Puerto-Rican, or Cuban. This reinforces the concept that one dietary assessment tool cannot serve everyone within a state or across a nation. There are four main considerations when examining a dietary assessment tool. These are language, educational level, cultural practices, and dietary culture.

It is usually not appropriate to use a translator as an interpreter in the public health setting. It is more useful to utilize a person who is linguistically and culturally competent in the area of Hispanic attitudes and practices when administering a dietary assessment and providing other WIC services. Although there are no studies available that validate the accuracy of the information reported by an interpreter at a WIC clinic, it would not be uncommon that the viewpoint of the interpreter may be expressed or the participant's responses may be filtered. This is an especially important consideration when translating participants' views of food voodoos or taboos or breast feeding attitudes and practices, which are very much an everyday occurrence in the WIC program.

Based on national data, Hispanics have the lowest rates of high school degrees. The majority of native-born Hispanics have less than 8 years of formal education. Many of the available food frequency questionnaires (FFQs) require thinking on an abstract level. It is difficult for individuals with minimal education to understand an FFQ, especially when asked about the frequency of consumption of a particular food when it is not in the context of a meal. This is not only true for Hispanics, but for anyone with a low level of education.

When providing health services to the Hispanic population, there are many cultural issues that present challenges. Often, a Latina woman has strong viewpoints that have been passed down from generation to generation, such as “the family is always first.” The woman may provide her family with the advice and services provided to her by WIC, while neglecting herself. Another strong cultural issue is conflict with authority figures and social desirability. For example, a Hispanic woman may not disclose in-depth answers to an interviewer for fear that the interviewer would think less of her because of her inability to provide for her family.

Different subgroups of Hispanics have different food consumption patterns. One dietary assessment tool can not adequately assess all Hispanics living in America today. None of the existing dietary assessment tools have been designed to capture the dietary habits of different subgroups of Hispanics. In an ethnically diverse population, the 24-hour recall or a food diary would be the preferred methods of assessing dietary intake because they are open ended and allow the individual to report the foods they are consuming as opposed to selecting from a restricted food list. These methods may be limiting as the database of foods in computerized programs may not contain the ethnic foods consumed or the WIC provider may not be

knowledgeable with regard to the ethnic foods and their composition.

Among some Hispanic populations, particularly migrant workers, environmental factors such as nonexistent or inadequate housing can cause high intra-individual variability of dietary intake. Limited income also has the potential to decrease the variety of the foods. Income is variable from month to month and can affect dietary intake. In summary, in order to conduct dietary assessments in the Hispanic population, it is recommended that the WIC program promote and support the attitudes, behaviors, knowledge, and skills necessary for staff to work respectfully and effectively with clients.

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DIFFERENCES BY SOCIODEMOGRAPHIC CHARACTERISTICS IN DIET QUALITY AMONG PREGNANT WOMEN

Presented by Anna Maria Siega-Riz, Ph.D.

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A Diet Quality Index for Pregnancy (DQI-P) was developed using data from the Pregnancy, Infection, and Nutrition (PIN) cohort (n > 3000) in central North Carolina. The goal was to develop a composite that reflected current nutritional recommendations for pregnancy as well as the Food Guide Pyramid (Shaw et al., 1999). Dietary intake was assessed during the second trimester using a Food Frequency Questionnaire. The DQI-P includes eight components: percent of recommended servings of grains, vegetables, and fruits based on the Food Guide Pyramid, percent of dietary reference intakes (DRI) for folate, calcium, and iron (NRC, 1989; Yates et al., 1998), percent of energy from fat based on the Dietary Guidelines, and dietary variety score based on the Food Guide Pyramid (Shaw et al., 1999; USDA/DHHS, 2000). Scores range from 0 to 80 with each component contributing 10 points.

The DQI-P differentiates diets both quantitatively and qualitatively. The mean score for the population was 51. Higher amounts of grains, vegetables, and fruits and other DQI-P components were associated with an increasing DQI-P score. High intakes of nutrients not measured on the DQI-P, such as vitamin A and vitamin C, were also associated with high DQI-P scores. One drawback of the study was that the food frequency questionnaire underestimated intake of grains.

Sociodemographic characteristics of the women were also examined. There was no difference in mean score based on ethnicity, however several significant differences were found based on sociodemographic factors. Women who were nulliparous, over 20 years of age, over 350 percent of the poverty level, and had at least a high school education had significantly higher overall scores. Non-Hispanic black women consumed more grains compared to non-Hispanic white women. Vegetables consumption was higher among non-Hispanic blacks, women over 20 years of age, over 350 percent poverty, and women with some college education. Fruit consumption was higher in nulliparous and non-Hispanic black women. Women who had incomes less than 185 percent of the poverty level, were nulliparous, younger than 30 years of age, non-Hispanic black, and had less than a college education had greater intakes of iron. These results may reflect nutrition counseling that these women received. Non-Hispanic white women who had higher incomes, were greater than 30 years of age, and were better educated tended to consume diets lower in fat. Compared to their counterparts, non-Hispanic black and nulliparous women had higher dietary variety scores. There were no differences found in sociodemographic characteristics for calcium, folate, or diet variety.

Establishing textiles as cut points for the DQI-P may be useful. Women who were in the lowest tertile had a mean diet quality score of 37. This equated to meeting 60.2 percent of the Recommended Dietary Allowance (RDA) for folate, 40.7 percent the RDA for iron, consuming 36.5 percent of energy from fat, as well as not meeting the recommended intakes for fruits, vegetables, and grains. Another approach to the DQI-P would be to examine women who do not achieve two-thirds of the recommendations on any six of the components. This would be

equivalent to a mean diet quality score of 35.

In the population of pregnant women examined, the DQI-P was qualitatively and quantitatively differentiated. It has also been reproduced in later research. An advantage of using the DQI-P is that it assesses overall variation in diet as opposed to assessing one nutrient. It also can be used in a computerized assessment. The DQI-P may be a useful public health tool for evaluating the overall diet quality of pregnant women.

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THE FREQUENCY OF EATING DURING PREGNANCY AND ITS EFFECT ON PRETERM DELIVERY

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The 1990 Institute of Medicine report, *Nutrition During Pregnancy,* recommended that pregnant women eat nutritious snacks and small to moderate-sized meals at regular intervals in order to meet the increased nutritional needs during pregnancy (IOM, 1992). This has been translated into a recommendation of three meals and at least two snacks per day. Several studies have examined eating frequency and results indicate that eating three to six meals per day improves glucose tolerance and lipid and lipoproteins profiles in pregnant women.

In order to identify meal patterns of pregnant women and investigate the relationship between these meal patterns and preterm delivery, an analysis was performed using data from pregnant women (n = 2,065) in the Pregnancy, Infection, and Nutrition Study (Siega-Riz et al., in press). Meal patterns were created from the reported number of meals (breakfast, lunch, and dinner) and snacks consumed per day during the second trimester, as well as having the women characterize the times of meals and snacks on a 24-hour time clock. In accordance with the IOM's recommendations, an optimal meal pattern was defined as three meals and two or more snacks.

Seventy-two percent of women were found to meet this recommendation. These women had the lowest rates of preterm births. The highest rates of preterm birth were associated with women who had erratic eating patterns. Women who did not meet the IOM recommendation had a 30 percent higher risk of preterm delivery (adjusted odds ratio [AOR]=1.30, 95 percent confidence interval [CI]=0.96, 1.76). Women who consumed meals/ snacks less frequently than recommended were found to be slightly heavier prior to conception, were older, and had a lower total energy intake. While there was no difference in risk found to be associated with gestational age, women delivering after premature rupture of the membranes (AOR=1.87, 95 percent CI=1.02, 3.43) had a higher risk than those who delivered following preterm labor (AOR=1.11, 95 percent CI=0.65, 1.89).

The above mentioned study supports previous animal model work, which has shown an association between frequency of eating and preterm delivery (Binienda et al., 1989; Fowden et al., 1994). Experimentally induced fasts during late gestation have been found to stimulate intrauterine prostaglandin production, uterine contractions, and preterm delivery. In one study, pregnant sheep who were fasted for 12 to 48 hours in the last half of pregnancy were found to experience hypoglycemia and an increase in prostaglandins leading to uterine contractions and subsequent preterm delivery. In another study, effects of a 16-hour extended overnight fast in pregnant women and nonpregnant women found that only the pregnant women experienced hypoglycemia, hypoinsulinemia, and ketonemia (Metzger et al., 1982).

Given the results of these studies, the eating frequency of pregnant women (n=1,494) in the Pregnancy, Infection, and Nutrition Study using reported meal and snack times was evaluated (Herrmann et al., in press a). The usual time period without food (including an overnight fast) was found to range from 2 to 24 hours. Thirteen percent of the women fasted 3 to 8 hours per day, 58 percent fasted 9 to 12 hours per day, and 29 percent fasted 13 to 24 hours per day. While controlling for age, income, race, pregravid body mass index, and caloric intake, multivariate

logistic regression analysis indicated that the risk for preterm birth was highest among women who fasted 13 hours per day compared to women who fasted 8 hours per day (AOR = 3.2, 95 percent CI = 1.1–9.7). These results suggest an association between fasting during the second trimester of pregnancy and preterm delivery.

In order to better understand the relationship between fasting and preterm labor, levels of corticotropin-releasing hormone (CRH), which can serve as an indicator of stress during pregnancy and have been associated with preterm delivery were studied (Herrmann et al., in press b). To investigate the relationship between fasting, CRH and gestational age in pregnant women, 24-hour food recalls and CRH were measured in 688 pregnant women at 18 to 20, 28 to 30, and 35 to 36 weeks. Women who fasted for more than 13 hours the day prior to plasma CRH analysis were found to have an elevated level of CRH as compared to women who did not fast. Lastly, women who skipped meals and snacks were found to be at a higher risk for preterm birth even after total caloric intake and other factors were considered. Measuring meal and snack intake, as well as the timing of meals and snacks, may be a very simple public health tool that can be used to evaluate the prenatal diet and could easily be incorporated into assessments of dietary risk for WIC eligibility.

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PRACTICAL ISSUES IN THE USE OF VARIOUS TOOLS IN WIC SETTINGS

Presented by Jill Leppert

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North Dakota Department of Health

The state of North Dakota has used the Harvard Food Frequency tool since 1993 to assess dietary risk in all participants. It is used for certification and recertification of women and children. Prior to the adoption of this tool, the state used both the 24-hour diet recall and a food frequency method. Concerns over time constraints, repetition, and lack of consistent results prompted a search for a better tool. The goal was to streamline the process, have a better tool that was easy for paraprofessionals to use, and could be used in a variety of settings. In addition, the tool needed to provide enough information to be used to assess both eligibility and serve as a basis for nutrition education.

The Harvard tool provided all of the information needed. The printout provides the number of servings eaten each day in all food groups, the number of servings of vitamin A foods, vitamin C foods, simple sugar foods, and fats. In addition, it provides the percent Recommended Dietary Allowance, calories, and a breakdown of the percentage of fat, carbohydrate, and protein. The information was all computerized. Given that the staff was comfortable with computers and they were available in all the agencies, it was a good match.

The tool was piloted in three sites. After 3 months, results were very positive. The tool takes the client approximately 5–7 minutes to complete and it takes staff approximately 2–3 minutes to enter the data in the computer. This then provides an immediate 3-page printout with the information mentioned above. Paraprofessionals were easy to train in terms of administering the tool and interpreting the results. Clients liked the new tool and found it easy to fill out. Approximately 90 percent of clients do a very good job in completing the form. Approximately 3 percent of clients were not able to fill out the previous food frequency tool and this same group has similar limitations with this tool. The other 7 percent do not take the time to fill out the questionnaire because they are either rushed or uninterested. However, this would be the case with any tool that was used.

With the time saved in using the Harvard tool, more time was available for nutrition education. Clients liked the printouts they received and seemed to be more engaged in the nutrition education. They felt confident in the results received because they had been computer generated. Using the client education page has worked out well. Clients find the food groups to be helpful and appreciate receiving the information. They seem to like computer-generated information about themselves. North Dakota is currently in the process of updating its computer system and the new technology will work well. In a new program, nutrition risk codes could be recognized by the computer and automatically identify individuals at risk, which will further decrease errors.

In North Dakota, the average WIC family has 3.9 people. Sixty-seven percent of families have both the mother and father present. Sixty-nine percent have either one or both parents employed full-time. Sixty-six percent of the participants are Caucasian, 15 percent Native American, 5 percent Hispanic, 3 percent black, and less than 1 percent Asian. Fifty-seven percent of the families have incomes below 100 percent, 20 percent have incomes between 100 and 133, and 23 percent have incomes between 133 and 135. Forty-seven percent of WIC mothers have a

high school education. Twenty-four percent have less than a high school education, and 29 percent have more than a high school education.

It is difficult to estimate the number of WIC participants who are at dietary risk for a number of reasons. Primarily, it is an issue of coding and priority. Only the five highest priority codes are listed in the computer. Since dietary risk codes are not high priority (level 4, 5, or 6) they often do not make it into the computer. Eighty-three percent of pregnant women are priority level one. Typical priority one clients would be those who are underweight, overweight, anemic, or had a previous poor pregnancy outcome. Only 17 percent are priority four; however not all priority four clients are eligible based on dietary risk. Priority four also includes conditions such as migrancy, homelessness, transfer of certification, and inadequate vitamin intake. For children, approximately 36 percent are coded as priority three (overweight, underweight, anemic, or other specific health problem). Dietary risk is priority five. While 64 percent of children are coded as priority five, this includes other conditions such as inappropriate use of bottle or other inappropriate feeding practice.

Overall, there is an exceedingly small number of income eligible individuals who are not certified for the program because they lack nutrition eligibility—perhaps 1 percent. While Congress did not set up the WIC program this way, it would best if the risk assessment were divorced from the eligibility criteria. While assessment is important for nutrition education, it would be best if eligibility were based on income alone. Lastly, when it does come to selecting and approving a tool for dietary assessment, it would be best if two or three different tools were approved that the states could choose between.

PRACTICAL ISSUES IN THE USE OF VARIOUS TOOLS IN WIC SETTINGS

Presented by Amanda Watkins, M.S., R.D.

Nutritionist, Arizona WIC Program

Arizona Department of Health Services

To date, Arizona has used a food frequency questionnaire for dietary assessment. The state is currently in the process of automating the WIC program and in an effort to incorporate diet assessment into the automation process, Arizona reviewed numerous tools and decided to have a new food frequency questionnaire created. The Arizona Department of Health Services has contracted with Dr. Douglas Terrin of the University of Arizona to create a short food frequency tool that could be validated. This tool unfortunately did not prove to be valid and it was recommended that it not be used for certification purposes. For this reason, the state of Arizona is back at square one.

After reviewing many options, the current tool decided on is a 24-hour recall, adapted from a tool used by a local agency. It is a paper tool that utilizes the food guide pyramid. All age groups and types of clients can be assessed using one form. The community nutrition worker (CNW) shades in each serving of a food group eaten. Thus, the tool may be used for nutrition education as well. While the tool can be self administered (the participant fills out what they eat on top and the CNW does the evaluation on the bottom), the most common method in Arizona is for the tool to be completed through an interview process, as there is a high percentage of Hispanics and literacy does tend to be a problem.

Dietary assessment is not mandatory in Arizona. If another risk is determined which qualifies an individual for the program, a dietary assessment does not need to be performed. Only when the certifier is unable to find a valid risk do they proceed with dietary assessment. Thus, Arizona has a low rate of certification for dietary risk. The decision for not making dietary assessments mandatory is not completely clear; it may be because of the controversy over which tools are truly valid and it is very seldom that an individual qualifies on dietary risk alone. Generally, if an individual is not eating properly, chances are that they will qualify for another reason such as anemia, underweight, overweight, or other risks. The feeling among many clinics is that given the validity of the assessments, do not go there unless necessary.

Sixty-two percent of Arizona's WIC population is Hispanic. Approximately 30 percent are non-Hispanic whites, 5 percent are African American, 2 percent are Native American, and 1 percent are Asian. The Native American population appears low because there are actually three separate programs in Arizona: Arizona WIC program, the Navajo Nation WIC program, and the Intertribal Council of Arizona WIC program. The Navajo Nation program and the Intertribal Council of Arizona WIC programs are the two programs that certify and service the majority of the Native American WIC population.

To address the needs of the Hispanic population, the dietary assessment tool is in English on one side and in Spanish on the other. In addition, the combination foods list contains popular Mexican fare. The most important way that the Arizona program meets the needs of the Hispanic population however is that the majority of the staff are not only bilingual, they themselves are Mexican-American, live in the same community, and many of them have been WIC participants themselves. The CNWs are truly their peers. They not only perform the certifications, they also perform the dietary assessments, and in most cases also provide the nutrition education. The

CNWs are required to have a GED or high school diploma. The majority have had no other nutrition education other than what they have received through WIC training. For this reason, the staff drives the requirements we have for a dietary assessment tool.

Based on different focus and working groups of state and local WIC agency staff, several things need to be considered in designing a dietary assessment tool. In order to be useful to the state of Arizona, it needs to be fast and easy to administer—3 minutes would be ideal. A new enrollment appointment is allotted approximately 20 minutes. In this time period quite a bit needs to get done (blood work, income documentation, height, weight, health history questions, etc.). In addition, the clinic flow needs to be kept in mind. Diet assessments are only performed if no other risks are found. Results of the assessment must be able to be converted into portion sizes according to the U.S. Department of Agriculture Food Guide Pyramid, be used for dietary counseling, measure changes in dietary patterns, be easily incorporated into Arizona's automated system and, preferably, be a food frequency questionnaire. Ideally, the tool would be one which would be interviewer administered and information obtained would be input into the computer by the CNW. The ideal tool has yet to be created.

PRACTICAL ISSUES IN THE USE OF VARIOUS TOOLS IN WIC SETTINGS

Presented by Ann Barone, LDN

Nutritionist, Rhode Island WIC Program

Rhode Island Department of Health

In the state of Rhode Island, the dietary risk assessment process has been in a state of revision. While a 24-hour recall and food frequency tool continue to be used, the food frequency tool is now based on the food guide pyramid rather than being nutrient based. In addition, some of the required servings have been adjusted (e.g., calcium serving size and protein requirements for children). Other changes were made in terms of combining groups such as inadequate intake of fruits and vegetables.

In determining the tool to be used for Rhode Island, assessment tools were collected and examined from many states. A committee of WIC agency nutritionists from around the state examined the tools and determined what was needed for the Rhode Island population. The food guide pyramid is the base of the tool. An assessment tool was modified for each group (e.g., pregnant, breastfeeding, and children), including 1–2 year olds.

In Rhode Island, every person who applies for WIC has a dietary assessment performed. An average WIC appointment takes approximately 30 minutes per participant. The tools are administered by a nutritionist, who has a minimum of a bachelor's degree. Completing both a 24-hour recall and a food frequency does not leave much time for education. Together, the assessment and evaluation take approximately 15 minutes. It is the same individual who performs the assessment that does the education.

Approximately 20 to 30 percent of the population in Rhode Island is Hispanic and less than 5 percent is African American. There is a fairly large Portuguese population in one part of the state. Thirty-seven percent of participants qualify for WIC based on dietary risk alone. Only a very small percentage of individuals who apply for the WIC program are not deemed eligible. Staff will generally find some reason why an individual qualifies. In terms of dietary risk, if an individual is short a serving or over by a serving, they are eligible based on dietary risk.

PRACTICAL ISSUES IN THE USE OF VARIOUS TOOLS IN WIC SETTINGS

Presented by Carol Rankin, M.S., R.D., L.D.

Nutritionist, Mississippi WIC Program

Mississippi State Department of Health

In Mississippi, the tools used to assess dietary risk are basic, but provide the information needed to determine whether an applicant is at nutritional risk. Three separate forms are used for dietary assessment of women, infants, and children. A food frequency tool is on all forms and a 24-hour recall is on all except for the form for the infant. There is a section for inappropriate feeding practices as well, which are used as talking points for the counselor and can be checked off to indicate risk. The dietary assessment is used for both determination of eligibility and nutrition education.

For infants, food frequencies are checked against the recommendations. If any group is missing or there are two inappropriate food groups, then the infant is certified based on inappropriate diet. Inappropriate feeding practices are broken down for the different ages: 0 to 3 months, 4 to 5 months, 6 to 9 months, and lastly, 10 to 12 months. The dietary assessment forms for women and children include both the food frequency and the 24-hour diet recall. Children are divided into age groups of 1 to 3 years of age and 3 to 5 years of age.

The tools used for nutrition assessment were chosen in order to fulfill U.S. Department of Agriculture (USDA) and Mississippi WIC requirements for the specific populations served. Accepted dietary guidelines, food guide pyramid recommendations, and other established feeding practices such as American Academy of Pediatrics recommendations were considered. In addition, two other factors contributed to the selection of the nutrition assessment tools: ease of obtaining usable information in a format for busy clinics and ease of use by nonnutrition professionals.

Additional nutrition assessments are used for pregnant women and infants who are enrolled in the perinatal high-risk and infant services program. This is a program where a team of health professionals case manage high-risk, Medicaid-eligible patients. The team consists of a nutritionist, nurse, and social worker. The pregnant woman is followed through 60 days postpartum and the infant until 1 year of age. All of these patients also qualify for the WIC program. The nutrition assessment for these special populations is more in-depth, requiring additional calculations of calorie levels, growth parameters, and questions about food security and preparation. The WIC nutrition staff use the information in determining WIC eligibility and in order to provide nutrition education targeted to the needs of the patient.

The forms may appear complicated, but once training is received the forms are simple to use. They are used by paraprofessionals, nurses, and lactation specialists. It takes about 10 minutes to complete one of the dietary assessment forms. There is then an additional 5 to 10 minutes for nutrition education. Mississippi WIC sites do not currently have computers but are expected to within the next 1 to 2 years.

High risk applicants and those who are certified based on inappropriate dietary intake receive a diet history during every clinic visit. All other clients should get a nutrition assessment at least once per year. If an individual is certified based on another type of risk, they may not receive a dietary assessment. However, if an individual meets no other risk and does have a

dietary assessment, it is rare that they would not be certified. According to USDA figures, 22 percent of WIC clients in Mississippi qualify for the program based on dietary risk.

THE ROLE OF WIC IN THE FRAMEWORK OF OVERALL ASSISTANCE TO THE POOR

Presented by Robert Greenstein

Executive Director, Center on Budget and Policy Priorities

Washington D.C.

It has been suggested by many over the years that additional nutrition criteria on which eligibility is based be done away with. However, for several reasons, the WIC program has continued to operate, thrive, and produce significant positive health outcomes with program eligibility based on both income and nutrition criteria.

Overall, research on the impact of the WIC program on diet and health over the last quarter century has shown striking results in terms of its impact on birth outcomes and lowering the incidence of low birth weight. In 1992, the General Accounting Office (GAO) did an evaluation synthesis in which it concluded that the WIC program reduced the incidence of low birth weight by 25 percent and very low birth weight by 44 percent (USGAO, 1992). While these figures are not precise due to questions on selection bias and other matters, when looking at the body of research as a whole, it is pretty clear that the findings are robust and the that the direction is strong in terms of the significance of effects on reducing the incidence of low birth weight. Overall, the research has led to findings that low-income women who receive WIC during pregnancy have better birth outcomes than low-income women who do not.

The WIC program also appears to reduce the incidence of anemia in children. Researchers at the Centers for Disease Control (CDC) compared the anemia levels of infants and children at the time of initial enrollment in WIC to their anemia level at the time of WIC follow-up visits. Significant reductions in anemia rates were found for most age groups of infants and young children in most years for which data were examined. Researchers reported that the prevalence of anemia was consistently higher for children seen at initial visits than for those seen at WIC follow-up visits (Yip et al., 1987). Barbara Devaney and others who have looked at the data from CDC have concluded that the evidence is pretty strong in terms of the WIC program's anemia-reducing effects (Devaney, 1998).

An area that until recently was the most controversial was whether or not WIC improved the diets of children. Findings from the national WIC evaluation of the mid-1980s found very strong effects in reducing the frequency of low intakes of certain nutrients among infants and children (Rush et al., 1988). While no one was quite sure what to make of the findings because the study had been marred by significant selection bias problems, Devaney and others noted that the selection bias problems were more likely to understate, rather than overstate, WIC's effects because the control group was better off than the treatment group (Devaney, 1998). Nevertheless, the problems were significant enough to cast doubt on the findings that WIC improved the diets of children. In the last 3 years, however, this has changed in part because of a better controlled study by Rose, Habicht, and Devaney (Rose et al., 1998). These researchers found that WIC had significant effects in increasing preschoolers intakes of ten nutrients, including iron, zinc, and vitamin E. These three nutrients are among the four most frequently deficient in the diets of low-income preschoolers. The increases in WIC participants in iron and zinc were particularly large.

Within the past month, a new study was released by Oliveira and Gunderson of the Economic Research Service (Oliveira and Gunderson, 2000). This study, which uses data from the 1994 to 1996 Continuing Survey of Food Intake by Individuals (CSFII), found that

participation in WIC significantly increases children's intake of iron, folate and vitamin B_6. With the addition of this study, there is now a body of evidence that, when looked at together, suggests that WIC both reduces anemia and improves diets among children. In particular, WIC apparently reduces the incidence of low intakes of particularly important nutrients such as iron among low income children. In addition, a review of the literature conducted and published by Leighton Ku of the Urban Institute, prior to the study by Oliveira and Gunderson, found similar results (Ku, 1999). While noting that there are holes in the research, Ku concluded that taken as a whole, it is hard to think of any public program with so consistent a body of positive research findings.

At the Center for Budget and Policy Research, the gamut is covered when it comes to means tested benefit programs at both federal and local levels (e.g., health, income, supports, housing programs). Research is constantly being reviewed and evaluated. Some programs are found to be less effective, others are found to be more effective, and some are found to need various changes. However, there is not another means-tested program for which the literature of efficacy approaches that of the WIC program. WIC is an important remedial and preventive program.

Inadequate dietary pattern as a nutrition risk criteria to determine eligibility for WIC has been described as being applied in an imprecise and sometimes loose manner. However, to some degree, policy makers have known that inadequate dietary pattern was imprecise and loosely applied and, to some degree, that is the kind of criteria they have wanted. At two points, in the late 1970s and again in the mid-1980s, policy makers gave serious consideration to eliminating nutrition risk as an eligibility criterion for pregnant women or for pregnant women and infants. Ultimately, this was not done for a few reasons, which could largely be put under the heading of *optics.* There was very much a sense on the part of both policy makers and state WIC directors that if income was the only eligibility criterion, it would lead to the perception of WIC as merely another *welfare* program as opposed to a *health* program. It was felt that this would be damaging to WIC's political viability, its image in the community, its effectiveness in reaching working families who do not want to be on welfare, and lastly, that it might result in some agencies paying less attention to providing the dietary, nutrition, and other health information and counseling needed.

The decision not to drop the nutrition risk criteria was aided by the fact that in exploring the elimination of the nutrition risk criteria, policy makers found that hardly any pregnant women who met the income criteria and applied for the program were turned away because of not meeting the nutritional risk criteria. This is what many policy makers wanted. A nutrition assessment could be performed and the image of a health program rather than a welfare program would be maintained, and yet low income individuals for whom there would be a preventive value would not be denied entry into the program. This raises an important question for this committee: How can the necessary information be collected in an effective manner while avoiding a significant narrowing of the criteria that could possibly make a few million individuals who are currently eligible for WIC, ineligible?

Shrinking the eligible pool of individuals for WIC by narrowing the eligibility criteria would seem reasonable if this meant opening slots for needier individuals. However, while this may have been the case some years ago, it is not the case now. WIC actually has as much money right now as it needs to serve virtually everybody who walks in the door and applies. The program has substantial amounts of carry-over funding. It has been funded for the last 3 or 4 years by the Congress to serve between 7.4 and 7.5 million women, infants, and children and each year it has served 7.3 million individuals. Last year, there was close to $200 million of

available WIC funds that were unspent and carried forward to the following year. While there sometimes are occasional problems of a few months when there is too much money in a given state and not enough money in another, it can not be said that substantial numbers of people are trying to get into WIC and are turned away.

Another argument for narrowing the eligibility criteria would be if one thought that the eligibility criteria was too loose and that money could be better spent on other important functions. There are a few problems with this argument. The first is that narrowing the eligibility criteria could weaken WIC's effectiveness as a preventive program. People who meet the income test but do not immediately meet one of the more rigorous nutritional risk screens could be denied WIC, only to meet the nutritional screen subsequently if their nutritional status deteriorates. In addition, the current budgetary situation is not one of deficits that threaten the economy. Rather, the picture is one of growing surpluses. In the next 4 weeks, both OMB and the Congressional Budget Office (CBO) will release new budget forecasts that place the new surplus estimate, outside Social Security, at more than $1.5 trillion over the next 10 years. In other words, OMB and CBO are about to double the size of the surpluses they projected only 4 months ago. Congress already is preparing to start expending more money on both the tax and the spending side. A plethora of tax bills that cost significant sums is starting to move through the House and Senate, the latest of which would ultimately reduce revenue $50 billion a year by eliminating the estate tax, even though that tax applies to the estates only of the wealthiest 2 percent of people who die in the United States. The point is that if one were to narrow significantly the eligibility criteria for WIC, the result would simply be fewer people served and a reduction in WIC funding levels. Where would the money saved go? These days, a bigger tax cut would be the likely outcome.

The idea of WIC becoming an entitlement program is politically a nonstarter. As previously mentioned, there are currently WIC funds available that are not being spent, and participation in the program has dropped by 3 percent since its peak in 1996. In 1996–1997, WIC participation reached its peak of approximately 7.4 million participants. Now participation is 7.2 million. (In comparison, food stamp participation has dropped 40 percent since 1994.) The drop in WIC participation is likely due primarily to the economy; there are fewer numbers of low-income individuals now. In addition, in all assistance programs, the working poor have a lower participation rate than the welfare poor.

Making WIC an entitlement was considered by policy makers in the late 1970s and mid-1980s. It was not something that proved to be a viable option politically then. It is even less likely to be considered a viable option now, given the more conservative Congress today. The chance that it would be seriously considered is near zero.

It is important to look at what improvements can made in the nutritional risk criteria, particularly if such improvements can improve information for WIC clinics and provide participants with more effective counseling and other services. However, one would hope that the Committee on Dietary Risk Assessment in the WIC Program keeps the Hippocratic oath in mind if it considers options that could significantly narrow the pool of low-income women, infants, and children who are eligible for WIC. The principal effect of such an approach would be fewer low-income individuals being provided with WIC benefits and services and more money made available for tax cuts likely to accrue primarily to relatively high-income individuals.

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FOOD INSECURITY AS A PREDICTOR OF DIETARY RISK

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In considering how food insecurity applies to WIC, it is important to understand the history of where this concept came from. The idea of measuring food insecurity started in the United States in the 1980s during the period of recession when there were major cut backs in federal nutrition programs. Many more people were coming in for emergency food assistance and service providers began to document enormous jumps in need. Concerns, however, were discounted by policy makers and there was a strong desire around the country to convince them that a hunger problem not only existed, but was increasing, and had negative consequences for the country.

The Food Research and Action Center, working in partnership with the Connecticut Association for Human Services, developed a systematic approach to studying the problem of hunger among families with children, which was called the Community Childhood Hunger Identification Project (CCHIP). It was the first time a group attempted to develop an objective measurement of hunger that could be used in a national survey (Wehler et al., 1995). Hunger was defined as food insufficiency due to constrained resources, not voluntary hunger, but involuntary hunger because of not enough money to buy food. A survey was developed for families with children under the age of 12. It consisted of a series of eight questions and based on the results, families were categorized as *hungry, not hungry,* or *at risk of hunger.* This type of survey was needed as it would not have been feasible to measure blood levels of nutrients or to administer 24-hour recalls. These measures would have been incredibly time consuming, extremely expensive, and would have required a level of training on the part of interviewers that would not have been feasible with the type of community groups involved.

Results from the surveys showed that a highly significant number of children were hungry and that families were food insecure. In addition, a relationship was found between hunger and reported infections, fatigue, irritability, headaches, and ear infections and colds among kids. We also found that parents are the first to be hungry and children are the last. This has come through again and again in national surveys. When children are found to be food insecure, it is a very severe problem in the family.

We also learned that who the interviewer is and who the respondent is can affect the response. There appeared to be a difference in response because our interviewers were paraprofessionals who were trained to carry out the survey. Parents may not be as truthful if they are afraid their child will be taken away if they admit to a government interviewer that they cannot feed them. In addition, individuals living in rural areas were less likely to admit that they were hungry than those who lived in urban areas.

At the same time that the CCHIP survey was being used, work was also being done by researchers at Cornell University, and the Life Sciences Research Office (LSRO) came out with definitions on how to define hunger, food security, and food insecurity (see Box 1). Also during this time, the Nutrition Monitoring Act was signed into law. The Act had a provision in it that required the federal government to develop some kind of measure of food insufficiency. In 1994,

the Department of Health and Human Services, United States Department of Agriculture, and the Census Bureau got together and developed what is now the food security module, which is an annual part of the Current Population Survey. The population survey is given out to approximately 58,000 households monthly (Hamilton et al., 1997). The food security module has been included in the population survey for one month of the year, every year since 1995. (In 1998, results showed that 19 million adults and 12 million children were in households classified as food insecure.) There are several categories of food insecurity based on severity. Even individuals who are classified as "food secure" may still have indicated on the survey that they worry about food running out or that the food they bought did not last. The questions on the survey are listed in the typical order in which they may be answered affirmatively (Table 1). The conservative nature of this measure is evident here.

BOX 1 LSRO DEFINITIONS ON HOW TO DEFINE HUNGER, FOOD SECURITY AND FOOD INSECURITY

Food security—Access by all people at all times to enough food for an active, healthy life. Food security includes at a minimum: (1) the ready availability of nutritionally adequate and safe foods, and (2) an assured ability to acquire acceptable foods in socially acceptable ways (e.g., without resorting to emergency food supplies, scavenging, stealing, or other coping strategies.)

Food insecurity—Limited or uncertain availability of nutritionally adequate and safe foods or limited or uncertain ability to acquire acceptable foods in socially acceptable ways.

Hunger—The uneasy or painful sensation caused by a lack of food. The recurrent and involuntary lack of access to food. Hunger may produce malnutrition over time. Hunger, as the recurrent and involuntary lack of access to food which may produce malnutrition over time, is discussed as food insecurity in this report.

Hunger, in its meaning of the uneasy or painful sensation caused by lack of food, is in this definition a potential, although not necessary, consequence of food insecurity. Malnutrition is also a potential, although not necessary, consequence of food insecurity (Wehler et al., 1995).

Results indicated that approximately 10 percent of the households surveyed were considered food insecure —two-thirds of them without hunger and one-third with hunger. Households that were more likely to be found food insecure were those with children, households headed by single females, and black or Hispanic households. Inner city and rural families were also more likely to be food insecure than suburban households and food insecurity ran higher in the southern and western parts of the United States than it was in any other regions of the country.

Questions from the food insecurity module or various combinations of them are now being included or are in the process of being included in several national surveys such as the National Health and Nutrition Examination Survey, the Continuing Survey of Food Intake by Individuals (CSFII), and the National Behavior and Knowledge Survey. Shortly, there will likely be good research data to answer questions regarding food insecurity and how it relates to dietary behavior and nutritional status.

In 1996, the report from the IOM Committee on the Scientific Evaluation of WIC Nutrition Risk Criteria found limited evidence to evaluate the causal links between food insecurity and nutrition and health risk. They also found insufficient scientific evidence to select a cut-off point for WIC eligibility based on food insecurity. However, they did recommend use of the food insecurity measure at some point.

TABLE 1 Response Profile By Category (Percentage of Households in Each Food Security Category Answering Each Question Affirmatively)

		Food Security Status			
Questions (in order of increasing severity)		Food Secure[a]	Food Insecure, without Hunger[b]	Food Insecure, with Moderate Hunger[c]	Food Insecure, with Severe Hunger[d]
Q53	Worried food will run out	5.0	89.5	97.2	99.1
Q54	Food bought didn't last	2.3	80.9	98.1	99.4
Q55	Adult not eat balanced meals	1.9	75.4	94.9	98.5
Q58	Child fed few low-cost foods	2.3	63.4	91.0	100.0
Q24	Adult cut size or skipped meals	0.4	36.8	93.1	99.1
Q56	Couldn't feed child balanced meals	0.3	41.2	77.4	95.5
Q32	Adult eat less than felt they should	0.3	34.4	90.3	98.8
Q25	Adult cut size or skipped meals, 3+ months	0.1	20.0	77.2	94.6
Q57	Child not eating enough	0.1	15.5	53.5	96.2
Q35	Adult hungry but didn't eat	0.1	8.3	57.5	94.3
Q38	Adult lost weight	0.0	2.8	30.5	71.7
Q40	Cut size of child's meals	0.0	2.1	24.2	70.7
Q28	Adult not eat whole day	0.0	2.4	20.7	87.6
Q47	Child hungry	0.0	1.7	20.0	72.9
Q29	Adult not eat whole day, 3+ months	0.0	0.8	11.6	80.6
Q43	Child skipped meal	0.0	0.6	8.1	56.4
Q44	Child skipped meal, 3+ months	0.0	0.2	4.7	43.6
Q50	Child not eat for whole day	0.0	0.1	1.4	18.1
Number of households in sample (unweighted)[e]		39,736	3,254	1,326	331

There have been a number of studies showing an association between food insecurity and dietary risk in terms of nutritional inadequacy in a number of nutrients. Recent research by Dixon et al. (in press) showed low fasting levels of vitamin E and C in relationship to food insecurity. This was the first time a biochemical measure has been related to food insecurity. It has also been interesting to note that the research has shown a deeper and broader impact of food insecurity on nutrient levels in women than was originally thought. Cristofar and Basiotis (1992) looked at data from the CSFII for women aged 19 to 50 and children 1 to 5. They were able to demonstrate a relationship between food security status and nutrient intakes for women. While they did not see a strong relationship with children, it was not surprising given the demonstrated protective factor placed on children (i.e., adults apprear to sacrifice eating first before allowing their children to eat less or go hungry.) Kendall, Olson, and Frongillo (1996) used the RadimerCornell Hunger and Food Insecurity measure and found a relationship between food insecurity and a lower consumption of fruits and vegetables and lower levels of vitamin C, potassium, and fiber in the diet. They also saw much more disordered eating patterns in food insecure households. Rose and Olivera (1997) also demonstrated that in all nutrients looked at, adult women who were food insufficient did worse in terms of nutritional adequacy. Tarasuk and Beaton (1999) have also shown similar results using a slightly altered survey in Canada.

Dr. Christine Olson (2000) recently reported on a relationship between food insecurity and body mass index (BMI). She found that women who were food secure and women who were food insecure with hunger had, on average, very similar BMIs that were not indicative of obesity. The women who were food insecure without hunger were much more likely to be obese. She theorizes that food deprivation may lead to over-eating at times when food insecure people do have enough food or have enough money to buy food. If an individual is very poor, chronically food-deprived, and lacking the opportunity to overeat, the individual will have a lower BMI. However, if the individual is going through the constant ups and downs of having enough and not having enough to eat, it may lead them to adopt unhealthy eating habits that can lead to obesity. Dr. Olson's conclusion was that ending health disparities related to chronic disease will require ending food insecurity.

There have also been a number of studies looking at the impact of food insecurity on psychosocial indicators in school-aged children. Associations have been found with increased depression, anxiety, and inattentiveness in class. There is also research showing an impact on children's ability to learn, explore, and interact with their environment.

Overall, the research is important to consider in terms of the WIC program. WIC has been very successful at being a preventive program. Many of the people who come to the WIC clinic may be food insecure one day and not the next. They tend to go in and out of poverty. It may be as little as one child needing a new coat that could lead the family to go for a few weeks with less food than needed. It is important to remember what food insecurity looks like in these families. There has been work done on adapting the food insecurity survey to make it shorter. It may be possible to build only one or two questions into the dietary assessments in WIC settings. A few food insecurity questions would be helpful. Just as dietary assessment questions help to guide nutrition counseling, food insecurity questions could lead a nutritionist to recognize when a family may need other assistance programs such as food stamps, Temporary Assistance to Needy Families, Medicaid, or emergency food. Using these questions, the nutritionist could assist in increasing the food security in a family as well as helping them improve their diet.

[a] No or minimal indicators of food insecurity evident.

[b] Multiple indicators of food insecurity, but no or minimal indicators of resource-constrained hunger evident for household members.

[c] Multiple indicators of resource-constrained hunger evident for adult household members.

[d] Multiple indicators of resource-constrained hunger evident for children in household and/or indicators of severe adult hunger.

[e] For questions applicable only to households with children, the unweighted sample in the four groups is: 14,192, 1,934, 655, and 133.

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Appendix B

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