

Methods of Surveying Diet and Physical Activity

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Background

The problem of overweight and obesity results from a long-term imbalance between energy consumed and energy expended. To understand the risks of obesity, we need to understand what people eat and how much energy they expend through physical activity. Forshee reviewed the primary methods for assessing diet and physical activity and discussed their limitations.

Methods and Findings

The 24-hour dietary recall (24HR) is one of the most common methods used by surveys to assess diet. It is considered a reliable estimate of a respondent's diet for the period covered, although underreporting is a common problem. The 24HR uses an interviewer to probe a respondent's diet during the previous 24 hours. The current version used in the Continuing Survey of Food Intakes by Individuals (CSFII) and National Health and Examination Survey (NHANES) is a computer-aided, multipass method that prompts respondents to report commonly forgotten foods such as snacks and between-meal beverages. The new method includes two 24-hour recalls on nonconsecutive days for each respondent, and future NHANES surveys will integrate the CSFII methodology. However, the 24HR captures only a snapshot of the respondent's recent diet, not his/her long-term or usual diet. A major weakness of the 24HR is the reliance on self-reports of dietary intake. These may be affected by memory and intentional misreporting, for instance, overreporting of "good" foods like fruits and vegetables and underreporting of "bad" high-fat snacks. Self-reports of height and weight used in the calculation of Body Mass Index (BMI) also introduce measurement error. For height and weight, statistical corrections are possible using surveys that contain both measured and self-reported height and weight. For 24HR, a method for calculating "usual" intakes from multiple days of 24HR has been developed by Iowa State University.

The Food Frequency Questionnaire (FFQ) attempts to record usual intake, which is food consumption over an extended period. The FFQ method is based on the detailed dietary history interview developed by Burke in 1947. The respondents are given a list of commonly eaten foods and asked to report how often they have eaten each item over the past week, month, or 12 months. The FFQ is intended to provide a more long-term measure of an individual's diet and is generally less expensive and burdensome for respondents than the 24HR. However, it is limited to the foods on the questionnaire, demands more of the respondent's memory than the computer-assisted 24HR, and does not account for food portion sizes. Recent studies have questioned the reliability and accuracy of the FFQ for quantitative dietary assessment.

The constraints of the FFQ and 24HR have motivated efforts to improve methods of assessing long-term diet quality. One approach uses a “food propensity” questionnaire as a supplement to the 24HR. The propensity method assumes that usual intake is a function of the propensity to consume (the probability that a person will eat a specific food or beverage on a given day over a designated time period) and the average amount consumed on a day when the food is actually eaten. Initial validation studies have shown that the FFQ accurately measures propensity as defined for this method and that combining the 24HR and FFQ is a more efficient way to estimate commonly eaten foods in the U.S. diet. However, this approach is still subject to error associated with self-reporting of intake. The Food Propensity Questionnaire (FPQ) will be incorporated into future NHANES, and information will be combined with the 24HR data.

USDA’s Economic Research Service (ERS) annually tracks several hundred agricultural commodities in order to estimate the amount of food available for human consumption. Food disappearance data—also called the food supply and use data—measure the flow of raw and semiprocessed food commodities through the U.S. marketing system. The disappearance data measures food supply, not food intake. These data should be treated as food available for consumption. ERS currently uses conversion factors meant to account for waste, spoilage, and shrinkage in the distribution system for most commodities so as to minimize overestimation of food consumption. The long-term nature of these data makes them a unique source for assessing consumption trends.

Large, nationally representative surveys have no accurate methods for estimating physical activity. The CSFII measures of physical activity are extremely limited, but NHANES III has more detailed measures. For adults, NHANES asks how often each respondent engages in a list of about 16 common physical activities and allows for respondents to add other types of physical activities. Each activity is also given an intensity rating to indicate how strenuous it is. For adolescents, the NHANES III asks respondents about participation in team sports and exercise programs and how often they exercise hard enough to break a sweat. CSFII and NHANES measure sedentary behavior by asking about the number of hours spent watching television. As with dietary intake reports, respondents often misreport on physical activity questionnaires, and researchers have questioned the validity of the questionnaire approach, especially among children and adolescents. Moreover, these surveys do not account for individual differences in basal metabolic rate (BMR). The Food and Agriculture Organization and various other agencies have adopted the principle of relying on estimates of energy expenditure, rather than energy intake from dietary surveys, to estimate the energy requirements of adults. Physical Activity Level (PAL), expressed as a multiple of the BMR, provides a convenient way of controlling for age, gender, weight, and body composition. Data on occupational physical activity are available and have been used in some research studies, and they could conceivably be merged with NHANES data. Other studies have measures of physical education and recess opportunities for children in school.

Discussion

All the above survey methods of assessing consumption represent short-term measures of diet, while the phenomenon of overweight and obesity is the result of a long-term imbalance between energy intake and expenditure. The long-term health effects of overweight and obesity require longitudinal data about diet quality and physical activity for better understanding of the links between overweight and obesity and chronic disease risks.

The instruments available in surveys are not strong and reliable measures of a respondent's long-term diet and physical activity. Furthermore, existing surveys tend to focus on either diet or physical activity and have no standardized approaches to collecting and analyzing these data. Standardized approaches, comprehensive surveys, and more research into reporting accuracy are critical to improving diet quality and physical activity. Researchers also need to understand the limitations of the measures in order to use and interpret them properly.

Future Research

Clearly, more data are needed for the economic analysis of obesity. Additional sources include Consumer Expenditure Surveys (CES), scanner data on food spending, food use data (Food Stamp Cashout Studies, National Food Stamp Program Survey), and price data (Bureau of Labor Statistics, scanner data). Currently, few data exist on expenditures in food/nutritional choice surveys and on food choice in expenditure surveys.

There are also methodological issues. Is the statement above, that “standardized approaches, comprehensive surveys, and more research into reporting accuracy are critical,” true, or is sufficient precision unattainable? Regardless of the answer, the importance of longitudinal data structure is not diminished. Some structure for studying economic choices about nutrients is needed. The questions in this context are: What nutrition outcomes (e.g., regulation of weight, caloric intake, and essential nutrients) are the objects of choice? What are their prices, and how can the prices be captured in economic models?