

aids and pictorial instruction on describing and measuring foods and activities. When the girls entered middle or junior high school (at age 13–14 y), video instructions were implemented. A culture-specific instructional videotape was designed to appeal to adolescent girls and reduce the time required for instruction. The videotape included rap music, short sound bites, age-appropriate language, and failure scenes. Input from study participants, as well as staff members experienced in instructing girls with low literacy levels, was used to make the videotape culturally and cognitively appropriate. The following benefits of using the instruction videotape were observed. It was easier to maintain the girls' attention, less time was required to train instructors, fewer instructors were needed, fewer sessions were required because larger groups could be taught at one time, and monitoring for standardization was no longer necessary. In addition, a cost comparison between classroom or small-group instruction and videotape development and instruction showed considerable savings for the study. A videotape-instruction approach may be useful in epidemiologic studies in which dietary or physical-activity measurements are repeated.

KEY WORDS Growth and Health Study, children, adolescents, risk factor, obesity, videotape

Validity of vitamin A assessment in semiquantitative food-frequency questionnaires

FR Darden and L Kohlmeier, Departments of Nutrition and Epidemiology, University of North Carolina at Chapel Hill

Dietary antioxidants have recently received attention in both the scientific community and the news media because of their possible association with chronic diseases. In light of the current interest in vitamin A and the growing use of semiquantitative food-frequency questionnaires (SFFQs) as dietary assessment tools, we assessed the validity for total vitamin A of an SFFQ by comparing it with a 7-d food record. The study population was a group of 31 nutrition graduate students aged 22–43 y. Each person completed a 7-d food record and a 64-item SFFQ. One subject reported intakes exceeding 100 000 retinol equivalents (RE) on 2 d. These were investigated and verified. Inclusion of this information in the validation trial greatly influenced the findings of the study with respect to both average intakes and intraindividual variation. The correlation coefficient between the vitamin A intake on the food record and that on the SFFQ was -0.01 (for both unadjusted and energy-adjusted values), without inclusion of the extreme values. Mean intake of vitamin A was 1569 RE according to the 7-d food records and 3492 according to the SFFQ. These data indicate the importance of validating dietary assessment instruments in each study population for the specific nutrients of interest and illustrate the effect of individuals with unusual intake levels on population estimates.

KEY WORDS Antioxidants, vitamin A, semiquantitative food-frequency questionnaire, 7-d food record

Dietary fat and cholesterol questionnaire for use with young children

BA Dennison, PL Jenkins, and H Rockwell, Mary Imogene Bassett Research Institute, Cooperstown, NY

Dietary assessment in young children is difficult and time consuming. Brief dietary assessment instruments are needed

for both clinical and research purposes. We modified a questionnaire developed by AR Kristal et al for use with young children, producing a 31-item dietary behavior questionnaire with a five-point Likert scale. Children aged 2–5 y scheduled for well-child visits and their parents were recruited from a general pediatric practice. Fourteen days of dietary data (seven 24-h dietary recalls and 7-d written dietary records) were analyzed for 162 children with use of the Minnesota NUTRITION DATA SYSTEM. The 91 2-y-old and 71 5-y-old children consumed, on average, 1248 and 1634 kcal/d, respectively, with 105 mg/1000 kcal dietary cholesterol and 14%, 13%, and 32% of energy from protein, saturated fat, and total fat, respectively. Spearman correlation analysis and logistic regression analysis were used to select the questions that best predicted intake of dietary fat, saturated fat, and cholesterol. A 14-item questionnaire was developed: 10 questions correlated with the percentage of energy from total fat ($r = 0.67$; $P < 0.0001$); 9 with the percentage of energy from saturated fat ($r = 0.70$; $P < 0.0001$), and 4 with dietary cholesterol intake ($r = 0.58$; $P < 0.0001$). This brief 14-item questionnaire must be evaluated in other populations of young children, but it could possibly be used to screen and identify young children with high or low dietary intakes of total fat, saturated fat, or dietary cholesterol.

KEY WORDS Children, questionnaire, 24-h recall, 7-d written record, fat intake, saturated fat intake, cholesterol intake

Evaluation of underreporting through use of 3-d records in nonobese adults

JHM de Vries and MB Katan, Department of Human Nutrition, Wageningen Agricultural University, Wageningen, Netherlands

The goal of this study was to distinguish subjects who provide valid food records from those who produce biased records. We compared self-reported energy intake calculated from 3-d food records with actual intakes needed to maintain body weight during controlled trials lasting 6–9 wk (de Vries et al, *Am J Clin Nutr* 1994;60:855–60). In 269 free-living healthy men ($n = 119$) and women ($n = 150$) with mean body weights close to ideal values [body mass index (BMI, in kg/m^2 ; $\bar{x} \pm \text{SD}$): 22.1 ± 2.4], reported intake was 10.4% lower than actual energy requirements during the experiments. We defined a subject as a valid reporter if the self-reported energy intake was $\geq 1.55 \times$ basal metabolic rate (BMR) [Schofield et al, *Hum Nutr Clin Nutr* 1985;39C(suppl1):1–96], which reflects the habitual expenditure associated with a sedentary lifestyle (Black et al, *Eur J Clin Nutr* 1991;45:583–99). Forty-eight percent of the subjects reported an energy intake below the cutoff limit; their mean reported ratio of intake to BMR was 1.28. In the other group, this ratio was 1.82. We classified 70% of the men and 39% of the women as valid reporters. The subjects providing valid records underestimated their energy intake by 4%, whereas the underreporters had an underestimation of 17%. Energy intake was 13.1 MJ in the valid reporters and 10.2 MJ in the underreporters. The BMI of the subjects who provided biased records was significantly higher and their height and actual energy intake were significantly lower than those of the other subjects. The men who produced biased food records had a significantly higher BMI and body weight and a

significantly lower height than the other men. Our results showed substantial differences in some selected physiologic characteristics between valid reporters and underreporters and confirm the value of the $1.55 \times \text{BMR}$ limit. It seems unlikely that the outcomes of this study can be fully explained by a lower level of energy expenditure relative to the BMR in the underreporters.

KEY WORDS Underreporting, 3-d food record, basal metabolic rate, valid reporter

Dietary intake screening by means of a food-frequency questionnaire

PA Dyson, RJ Morris, and RR Holman, for the Fasting Hyperglycaemia Study Group, Diabetes Research Laboratories, University of Oxford, United Kingdom

Two hundred sixteen (95%) of 227 subjects (41% male; $\bar{x} \pm \text{SD}$ age: 50 ± 9 y) recruited into the Fasting Hyperglycaemia Study successfully completed both a food-frequency questionnaire and a 3-d food diary. Computerized analyses of the diary and questionnaire scores showed significant correlations for carbohydrate intake ($r_s = 0.43$, $P < 0.001$), fat intake ($r_s = 0.42$, $P < 0.001$), and fiber intake ($r_s = 0.46$, $P < 0.001$). Questionnaire scores and dietary analyses of daily intakes of carbohydrate and fiber were categorized into adequate or poor dietary compliance when compared with BDA nutritional standards. Fifty percent of subjects were given the same classification by the diary and questionnaire for carbohydrate intake ($P < 0.05$); 67% for dietary fiber ($P < 0.001$). A simple, self-administered food-frequency questionnaire can be a useful tool for identifying individuals who may require specialist dietary advice.

KEY WORDS Fasting Hyperglycaemia Study, food-frequency questionnaire, 3-d food diary, dietary advice

Validity of a semiquantitative food-frequency questionnaire in men and postmenopausal women with high concentrations of low-density lipoprotein and low concentrations of high-density lipoprotein cholesterol

NM Ellsworth, SF Mackey, DE Jatulis, and ML Stefanick, Stanford Center for Research in Disease Prevention, Stanford University, Stanford, CA

To validate the self-administered, scannable version of the Block-National Cancer Institute food-frequency questionnaire (FFQ) in postmenopausal women ($n = 94$) and men ($n = 124$) with moderately elevated low-density lipoprotein and low concentrations of high-density lipoprotein, nutrient intakes were compared with the average intake from five nonconsecutive, unscheduled 24-h dietary recalls collected by telephone with use of the University of Minnesota NUTRITION DATA SYSTEM. Mean crude Spearman correlations were 0.44 for women and 0.39 for men for energy, protein, fat, saturated fat, carbohydrate, calcium, vitamin C, cholesterol, dietary fiber, and iron. Correction for the attenuation caused by day-to-day variability in the recalls increased mean correlations to 0.59 for women and 0.46 for men and mean correlations for percentage of energy from fat, protein, carbohydrate, and saturated fat improved from a mean of 0.44 to 0.53 for women and from 0.52 to 0.61 for men. The FFQ significantly underestimated energy intake compared with the recalls. The means and SDs for energy intake from the FFQ were 1360 ± 429 for women and $1706 \pm$

609 for men compared with 1857 ± 522 for women and 2403 ± 589 for men calculated from the recalls. Although these correlations are similar to those in other studies comparing FFQs with food records or multiple recalls, care must be taken in interpreting quantitative nutrient levels generated by this FFQ.

KEY WORDS Semiquantitative food-frequency questionnaire, low-density lipoprotein, high-density lipoprotein, telephone recall, 24-h dietary recall

Reliability and validity for nutrients, foods, and food groups of an expanded Willett food-frequency questionnaire for cancer-prevention studies

PJ Elmer, L Fosdick, SA Smith, and TM Tharp, Division of Epidemiology, School of Public Health, University of Minnesota, Minneapolis

The reliability and validity of a 1-mo modified Willett food-frequency questionnaire (FFQ) were assessed in a group of 30-74-y-old men and women at increased risk for colon cancer who were participating in a randomized, controlled intervention trial of increased fruit and vegetable intake. Reliability and validity assessments were conducted in the control group, whose members maintained their usual diet throughout the study. Macronutrients, micronutrients, individual foods, and food groups were examined. The 153-item FFQ included expanded fruit, vegetable, and supplement sections and more low-fat foods. Participants completed the self-administered FFQ and food records at baseline and at 3-, 6-, and 9-mo follow-up visits. Data from food records were entered into the Minnesota NUTRITION DATA SYSTEM. Reliability correlation coefficients were calculated for the baseline and 3-mo FFQ ($n = 95$). In preliminary findings, the average correlation coefficient for the macronutrients was 0.74, with correlations ranging from 0.57 for percentage of energy from protein to 0.93 for percentage of energy from alcohol. Correlations for the micronutrients were somewhat lower, with a mean correlation of 0.70. Correlations of 0.80, 0.71, 0.77, and 0.48 were obtained for the fruit, vegetable, high-fat meat, and low-fat meat groups, respectively. Correlations for individual foods varied from 0.13 for other grains to 0.94 for decaffeinated coffee. Validity was assessed by comparing the 3-d food record with the FFQ ($n = 91$). The correlation coefficients were deattenuated to account for variability in daily intake. Correlations for the macronutrients at the 3-mo follow-up ranged from 0.33 for percentage of energy from polyunsaturated fatty acids to 0.76 for percentage of energy from carbohydrates; the mean correlation for the macronutrients was 0.54. Similar results were obtained for total micronutrient intake from foods and supplements (average correlation, 0.55). The correlation coefficient for the total fruit and vegetable group was 0.41; however, correlations for fruit and vegetable subgroups ranged from 0.36 for the vegetable group to 0.82 for the juice group. Additional time-point comparisons were done. The data indicate that the modified FFQ is highly reproducible for macronutrients, micronutrients, and some food groups and has moderate validity for macronutrients and micronutrients compared with food records.

KEY WORDS Food-frequency questionnaire, colon cancer, fruit and vegetable intake, food record, correlation coefficients