4. PRESCHOOL AGE CHILDREN

4.1 The Preschool Years (Ages 2 to 4 Years)

The preschool years are characterized as a time of increasing autonomy, expanding language skills, increasing ability to control behavior, and broadening social circumstances, such as attending preschool or staying with friends or relatives (100). Preschool children continue to expand their gross and fine motor capabilities and by age 4 years, a child can hop, jump on one foot, ride a tricycle or bicycle with training wheels, and throw a ball overhand. Most children consume the foods eaten by the rest of the family by age 2 to 3 years. Feeding is not as messy because the child can use a fork, spoon, and cup well, although the ability to use a knife to cut or spread foods is not fully developed. The overall rate of growth continues to be relatively slow, with periods of growth "spurts." Consequently, the preschool child has a relatively small appetite with periods of increasing food intake in advance of a growth spurt. Although the preschool child's intake may fluctuate widely from meal to meal and day to day, over a week's time the intake remains relatively stable because preschool children have the ability to self-regulate food intake and to adjust their caloric intake to meet caloric needs (133). The child's increasing autonomy and expression of food preferences, combined with a variable appetite, cause many parents to describe their child as a "picky eater" (100).

Many factors make assessing intake in this age group difficult: preschool children eat small amounts of food at frequent intervals; they are not able to complete questionnaires on their own and have a limited cognitive ability to recall, estimate, and otherwise cooperate; they often spend time under the care of several individuals; and their food habits and nutrient intakes may change rapidly (134-136).

4.2 Validation of Dietary Assessment Methods in Preschool Populations

Twenty-three validation studies in preschool populations are included in Table 4.1. Studies with children older than 5 years were included if they had a substantial number of preschool children. A recent review includes a few additional studies through 2000 from Senegal, Malawi, and Ghana as well as reproducibility measurements (137).

Food Records (FRs). Two studies (129, 92) found close agreement between food records and the reference method. Davies (129) found close agreement (3%) at a group level between energy intake from 4-day weighed FRs and DLW total energy expenditure measurements in a group of 81 preschool children recruited from towns around Cambridge. In this study, mothers weighed all food consumed at home, but used a notebook to record details of food consumed away from home. The results lead to the recommendation to use the 4-day weighed FRs in the

U.K. National Diet and Nutrition Surveys program, which investigates the diets and nutritional status of representative samples of British children age 1.5 to 4.5 years.

In a U.K. study of a preschool population of recent Indo-Asian immigrants, close agreement (7%) was found between energy intake estimates from a 5-day weighed FR and a diet history conducted in the homes (92). However, in this low-literacy population, the use of the Portable Electronic Tape Recording Automated (PETRA) scale by caregivers was problematic, requiring intensive instruction and monitoring by investigators and frequent repair.

Diet History (DH). Livingston and colleagues (138) validated a 1- to 2-hour DH interview with the DLW method in a small group of children in the U.K who were age 3 to 5 years. The DH overestimated total energy expenditure measurements by 9%.

24-Hour Recall (24HR). Two studies validating a 3-pass 24HR interview with the DLW method were found. In 2001, a representative sample of 41 preschoolers (age 3 to 4 years) from Glasgow, Scotland, completed a DLW measurement and three telephone-administered 24HR in 7 days with a parent. Mean 24HR energy intakes overestimated DLW energy expenditure measurements by about 11 percent, with no evidence that the bias was related to diet composition or weight status. In an older sample of 24 children (age 4 to 7 years), Johnson found closer agreement (3% underestimation) between energy intakes reported in three 24HR interviews and DLW energy expenditure estimates at the group level. The limits of agreement were wide in both studies, indicating no agreement between methods at an individual level.

Three studies comparing intake reported in a 24HR interview with direct observation of intake at one or more meals found agreement between reported and observed energy intake within 10 percent (139-141). In a study of a diverse group of 56 preschoolers, teams of observers shadowed children for 12 hours recording food intake (139). A 24HR interview with the child's mother the following day underestimated observed energy intake by 7% and found only 65% agreement in food items. Although socioeconomic status was not consistently related to reporting errors, racial/ethnic differences were observed (white and Hispanic mothers tented to underreport and blacks tended to overreport). In addition, mothers who were not at home with children were less able to report on their child's diet for a large part of the day. In a similar study in older Hispanic children (age 4 to 7 years), a 24HR on the day following direct observation of the evening meal in the child's home overestimated energy intake by 9% (140). A third study observing children eating with their parents in a cafeteria found mothers and fathers interviewed separately on the following day were equally able to recall the child's intake of energy and nine other nutrients (141).

Two small studies found no significant differences between energy and nutrient intakes estimated by 24HR interviews and 1- to 3-day weighed FRs in children age 2 to 4 years (142;143). A third study in older children (age 4 to 8 years) found close agreement (2%) for energy intake between a 24HR and 7-day estimated FR, but less agreement for the nine nutrients examined (128;143). In two of these studies, child care workers participated in food recording or measurement (128;142;143). One study included the child care provider in the recall interview (142).

As summarized in a recent similar review (137), agreement between the food recalls in these validation studies and the reference measurement varied by food group. Intake of main meal items was more likely to be reported than intake of desserts and snack food (141) and it was more common to omit than add food items (139;140;143). Portion size estimation was inconsistent with both over- and underestimation of various foods. Four studies reported correlation coefficients for energy and macronutrients $\geq$0.45 (140-143). Investigators included very little examination of effect of sex, ethnicity, or weight status on recall validity; no effect of gender on validity was found in the two DLW method studies (144;145) but some reporting differences were found by gender in one direct observation study (139).

Food Frequency Questionnaires (FFQs). Although the eight FFQ validation studies examined differed in the actual FFQ instrument and reference method, all found the FFQ overestimated energy and other nutrients (Table 4.1). The only validation study using the DLW method as the reference measurement found the HFFQ overestimated energy intake by 59% (146). No differences were found in reporting by gender, ethnicity, or the body composition of the child, but the paternal percent body fat was significantly correlated with misreporting of energy intake. It is speculated that the use of adult portion sizes on the FFQ may have contributed to the sizeable overestimation (137).

The three studies comparing various FFQs with multiple (2 to 4) 24HR recalls spaced at varying intervals, found the FFQ overestimated intake by 42% (147) 66% to 73% (136), and 70% (102). These three studies varied greatly by how information was obtained on the child's intake while with a child care provider or preschool. One study contacted alternative care givers for information (102), another excluded times when food was consumed outside of the parent's supervision from the recall data (136), and another included only children whose intake was directly observed by the 24HR respondent (147).

Two studies examined the validity of the HFFQ in a WIC population with widely varying results. In one study, the HFFQ (modified for a 1-month time period) agreed closely with results from three 24HR interviews (administered 10 days apart). The FFQ overestimated energy intake slightly (0.2% overestimation) and was within 10% of 24HR intakes for 20 nutrients (103). However, the other validation study compared the HFFQ or the NCI HHHQ with three 24HR interviews and found low correlations for energy (HFFQ = 0.13/HHHQ = 0.14) and also for five nutrients with each FFQ (25).

Other reference methods for validating the FFQ have found varying results. Energy-adjusted correlations between a HFFQ modified for the previous 7 days and a 3-day weighed FR were significant, but the HFFQ was administered immediately after the weighed FR when parental awareness of food intake would be expected to be high (142). In a urban Hispanic community, the reported percentage of calories from fat did not differ between the bi-annual administration of the HFFQ and quarterly 24HRs (148). Although the HFFQ overestimated intake of total fat, saturated fat, and cholesterol, significant associations were found between total serum cholesterol and LDL cholesterol and classification of children into tertiles of total fat, saturated fat, calorie adjusted fat, and total fat intake.

Other Questionnaires. FFQ instruments targeting specific foods or nutrients show promise. A beverage FFQ showed high correlations (>.5) with intake of milk and four other beverages reported on a 3-day estimated FR (98). Estimates of total fat, saturated fat, and dietary cholesterol correlated well between a 17-item fat FFQ and a 24HR and 3-day estimated FR in a rural Head Start population (149). A calcium FFQ overestimated calcium intake by 18% but correlated well with a 4-day estimated FR, and also classified 84% of the children correctly into calcium intake quartiles (150).

4.3 Studies in Preschool Populations

Table 4.2 includes summary data on 12 surveys and studies on preschool populations. Table 4.3 at the end of the chapter contains more detail on each study. In the 1999-2000 NHANES and the 1994-96 CSFII, 24HR interviews were conducted with the preschool age child's parent or a designated proxy using the same portion size estimating aides used in interviews with adults. Parents were asked to estimate serving size based on the adult aides. If intake of a food occurred when the respondent was not present, data retrieval was conducted with the caretaker, day care center, or preschool. Table 2.4 in chapter 2 presents the diet-related question in each of these surveys as well as in the integrated What We Eat in America-NHANES survey currently in the field. The rationale for the instrument selection was recently reviewed (64). In the integrated What We Eat in America-NHANES, preschool age children's intake is assessed through two 24HR interviews (one in-person and one by telephone), and a 100-item propensity questionnaire. Supplement use questions are included in another questionnaire (Table 2.4).

Two national surveys in Europe (108;151) also used 24HR interviews with preschool parents. Spain supplemented the 24HR information with a FFQ (151).

Table 4.2. Summary Table: Surveys of preschool age populations

						Assessment Method							
	Preschoolers (n)	**Age (years)**	**Ethnically Diverse**	**Longitudinal Study**	**Cross sectional Study**	**Weighed Food Record (no. days)**	**Estimated Food Record (no. days)**	**24-Hour Recall (n)**	**FFQ Type**	**Other Questionnaire**	**Nutrient Biomarkers**	**Supplement Intake Assessment Method**	**Outcomes**
National Surveys													
US National Health and Nutrition Examination Survey (NHANES) 1999-2000 (41)	486	3-5	✓		✓			1; 2 in 10%			✓	Quest.& 24HR	Food, nutrient, physical activity, and chemical exposures
Continuing Survey of Food Intake of Individuals (CSFII) 1994-96 (42)	4,574	3-5	✓		✓			2			✓	24HR	Food and nutrient exposures, diet and health knowledge
enKid Study, 2001 (Spain) (151;151;152;152)	385	2-5	✓		✓			1; 2 in 30%	164 item			FFQ	Food group intake, activity patterns
Russian Longitudinal Survey, 1992-4 (108)	746	0-6	✓		✓			1				NS*	Total iron, heme and bioavailable iron in diet
Population Surveys of Food and Nutrient Exposures													
Avon Longitudinal Study of Pregnancy and Childhood (ALSPAC) Avon, UK (112;153)	863	3.3	NS	✓			3d				✓	NS	Energy and 17 nutrients, blood lipids, iron status
Iowa Fluoride Study, 2003 (114)	400	3-5	NS	✓			3d		Bev.			Quest.	Energy and 21 nutrients, beverage intake, fluoride supplement use, dental caries

*NS = Not Specified

Table 4.2. Summary Table: Surveys of preschool age populations, continued

	Preschoolers (n)	Years (n)	Ethnically Diverse	Longitudinal Study	Cross sectional Study	Assessment Method: Weighed Food Record (no. days)	Estimated Food Record (no. days)	24-Hour Recall (n)	FFQ Type	Other Method	Nutrient Biomarkers	Supplement Intake Assessment Method	Outcomes
Population Surveys of Food and Nutrient Exposures, continued													
DONALD Study (Germany) (154;155)	787	2-14		✓		3d					✓	NS	Energy and nutrient intake (total vs. fortified foods), growth.
Adelaide Nutrition Cohort Study, 1981 (South Australia) (117)	155	4		✓		3d						NS	Food, nutrient, energy intake and somatic growth
Framingham Children's Study (156)	77	3-4		✓			3d					NS	Energy, protein, CHO, fat, SF, MUFA, PUFA, cholesterol, calcium, potassium, and sodium
Columbia University Study of Childhood Activity and Nutrition (70;135;136)	181	3-4	✓					7	HFFQ		✓	NS	Energy, fat, SF, PUFA, cholesterol, protein, CHO, sodium, potassium and calcium
Skinner Tennessee Longitudinal Study (157)	72	3-5					2d	1				24H R	Energy and nutrient intake
Bogalusa Heart Study, 1987 (118)	106 2219	3 4	✓	✓				1			✓	Suppl. given	Energy and nutrients, serum lipids, growth

*NS = Not Specified

Three-day weighed FRs were used in both the German DONALD longitudinal survey (154) and the Adelaide Nutrition Cohort in South Australia (117). The DONALD survey applied the Goldberg ratio (EI:BMR) of less than 1.06 to identify implausible intakes. Protein intakes were validated with nitrogen excretion from a 24-hour urine collection (154).

The UK ALSPAC study (112), the Framingham Nutrition Study (156), and the Iowa Fluoride Study (98;114) each employed a 3-day estimated FR in this age group. A longitudinal survey of infants and preschoolers in upper-income Tennessee households used both an annual 24HR interview and a 2-day estimated FR in 3 to 5 year olds (157). In the Bogalusa Heart Study, 24HR interviews were conducted annually in a subset of cohort members aged 3 to 4 years (118). Investigators studying a cohort of Hispanic preschoolers in New York City used multiple 24HR interviews and the Harvard FFQ paired with serum lipid levels in a series of validation studies and surveys (70;135;136).

As apparent from Tables 4.2 and 4.3, a standardized approach to collecting supplement information was not found. Often, studies did not report whether and how supplement information was collected. Reported approaches included collecting information in the diet assessment instrument or using a separate questionnaire.

4.3 Research Needs

Drawing conclusions from the validation studies on preschool populations discussed in this chapter is difficult because of the varied study designs, the relatively small study populations, and limited number of studies on each dietary assessment method. Even among studies using the same dietary assessment method, the protocol for the method differed. For example, the 24HR studies differed in the number of recall passes, the portion size estimating aides, and the number of recall interviews. As in the infant and toddler age group, validation studies in preschool children using larger and more representative populations, similar methodologies, and examining the impact of gender, ethnicity, or infant age on the validity are needed. A comprehensive study evaluating multiple measures of child intake simultaneously would be helpful. In a longitudinal study, the timing and frequency of dietary assessment in preschoolers should be examined.

Research is needed on portion size estimating aides for this age group (126); most of the studies reviewed used adult portion-size estimating aides. Existing validation research has mainly compared estimates of nutrients consumed rather than reported foods. Several investigators have recommended more research on the assessment of the accuracy of reported foods in 24HR interviews (135;136;139;145). There is a lack of research supporting the best method for collecting information on the preschool child’s intake when not with the parent or primary caregiver.

The impact of social desirability on reporting bias has not been examined in preschool populations. Parents may feel reporting their child's intake of foods of questionable nutritional value will reflect negatively on perceived parenting skills. Larger studies examining the effect of gender, BMI of the parent and child, and ethnicity on errors in reporting are needed. Validation studies in low-literacy populations are needed. The methods research priority recommendations from the "Future Directions for the Integrated CSFII-NHANES" 2002 workshop (9;64), discussed in Chapter 2, can also be applied to preschool populations. Validation of automated or web-based dietary assessment methods is an additional research need.

Table 4.1. Validation of dietary assessment methods in preschool children (2-5 years)

Reference	Study Population	Test Method (TM)	Reference Measurement (RM)	Design Features	Correlation Between TM and RM	Mean Intake Difference Between TM and RM
FOOD RECORDS (FR) or DIET HISTORY (DH)						
Davies et al., 1994 (129) National Diet and Nutrition Survey	1.5-4.5 yrs. = 81 52%M; 29% 1.5-2.49 yrs.; 38% 2.5-3.49 yrs.; 27% 3.5-4.49 yrs. UK	4d Weighed FR	DLW method to estimated TEE	In fall of 1989, DLW dose followed by 10 daily spot urine collections. During 10d period, mothers kept 4d Weighed FR including 1 weekend day. 64% response rate for all parts of study. Child Care Input: Mothers recorded food consumed away from home in notebook. Supplement Intake: Not specified	**4d Weighed FR EI vs. DLW TEE** 0.41 kJ/d $p < 0.01$ 0.36 kJ/kg $p < 0.01$	**4d weighed FR vs. DLW** 3% underestimation energy 1141 vs. 1178 kcal/d Mean energy difference was greatest for ages 1.5-2.5 yrs. (6% underestimation), and smallest for ages 3.5-4.5 yrs. (1% overestimation)
Harbottle et al., 1993 and 1994 (91;92)	4-40 mo = 117 Indo-Asian children from low literacy HHs. Sheffield, UK.	4d Weighed FR (infants) or 5d weighed FR (children) with a Portable Electronic Tape Recording Automated (PETRA) scale	Diet History (DH) and collection of food samples	The Weighed FR completed by mother in home or by older female sibling or other relative. Field worker provided participant training in home and did monitoring visit after first 24h of weighed FR. DH collected in home to validate FR. Child Care Input: Not specified Supplement Intake: Not specified	Not specified	**Weighed FR vs. DH** 7% underestimation energy 778 vs.838 kcal Weighed FR lower than DH for mean intakes as follows: 9% protein, 3%, fat; 9% iron and 6% vitamin C. Analyzed by age group, differences were significant for energy at 12 to < 18mo.; for iron at 6 to < 12mo and 12 to < 18mo.; and for vitamin C at < 6mo.
Livingston et al., 1992 (138)	3-5 yrs. = 20 3 yrs. = 8 5 yrs. = 12 Belfast, Northern Ireland	Diet History (DH) 1-2 hour in home interview	DLW method to estimated TEE	Energy intake from diet histories was compared with concurrent TEE by the DLW method. Child Care Input: Not specified Supplement Intake: Not specified	Not specified	**DH vs. DLW** 9% overestimation 6.29 $\pm$ 0.71 MJ/d vs. 5.76 $\pm$ 1.12 MJ/d 3 yrs. = 12% overestimation 5 yrs. = 8% overestimation

Table 4.1. Validation of dietary assessment methods in preschool children (2-5 years), continued

Reference	Study Population	Test Method (TM)	Reference Measurement (RM)	Design Features	Correlation Between TM and RM	Mean Intake Difference Between TM and RM
24-HOUR RECALL (24HR)						
Reilly et al., 2001 (145)	3-4 yrs. = 41 56% M; representative sample Glasgow, Scotland	24HR 3x in 7d Telephone administered; 3 pass method; photographs of food portion sizes.	TEE by DLW method	Representative sample of population of Glasgow, Scotland recruited from nurseries. Multiple pass (quick list, detailed description, and review) 24HR conducted by telephone with primary care giver. Post DLW dose spot urine collected on d1 and d7. Child Care Input: Not specified Supplement Intake: Not specified	Mean difference (bias) and limits of agreement tended to increase with increasing EI but did not reach significance (r = 0.26, p>.05)	**24HR vs. DLW** 11% overestimation (p<.0.01) 6.5 + 1.1 MJ/d vs. 5.8 + 1.2 MJ/d (p<.0.01) No significant differences between results of boys vs. girls.
Johnson et al., 1996 (144)	4-7 yrs. = 24 50% M; mean age 5.5 for M and 6.4 for F; mean BMI slightly higher than norm for age group; recruited from newspaper ad Vermont	24HR 3x in 14d 2 in person and 1 by telephone USDA 3-pass method	DLW method	First in-person 24HR conducted at research center before DLW dosing; 2nd by telephone during 14d dosing period; and 3rd in-person at research center at 14d visit. Interviews conducted with mother with child present. 8 DLW spot urines collected: after dosing (4), morning after dosing (2) and on day 14 (2). Child Care Input: Only mother and child interviewed. Supplement Intake: Not specified	Pearson Correlation Unadjusted 24HR vs. TEE kcal = 0.24, p=.24 (For individuals, poor prediction of intake from TEE)	**24HR vs. DLW** 3% underestimation 1,553 vs. 1,607 kcal, not significant The limits of agreement ranged from –1,102 to 897 kcal/day, indicating poor agreement on an individual basis. No differences in misreporting by BMI/obesity status of child or parent; no significant difference between boys and girls in misreporting.

Table 4.1. Validation of dietary assessment methods in preschool children (2-5 years), continued

Reference	Study Population	Test Method (TM)	Reference Measurement (RM)	Design Features	Correlation Between TM and RM	Mean Intake Difference Between TM and RM
24-HOUR RECALL (24HR), CONTINUED						
Iannotti et al., 1994 (142)	2-4 yrs = 17 53% M; 50% in daycare Washington, DC	24HR HFFQ for previous 7d	3d Weighed FR	24HR of parents/caregiver. All food and beverages weighed or measured for 3d. HFFQ given at the end of the 3rd day for intake in previous 7d. Examined energy, sodium, cholesterol, PFAT and PSAT Child Care Input: Child care providers measured intake during day care and participated in recall of day care intake. Supplement Intake: Not specified	Pearson Correlation Unadjusted 3d weighed FR vs. 24HR kcal = 0.45 3d FR vs. HFFQ kcal = 0.37 Adjusted (kcal/kg) 3d weighed FR vs. 24HR kcal = 0.61 (p<.01) 3d FR vs HFFQ kcal = 0.0.49 (p<.05)	**24HR vs. 3d Weighed FR** No significant mean differences for 5 of 5 nutrients and energy.
Baranowski et al., 1991 (139) Texas SCAN (Studies of Child Activities and Nutrition)	3-5 yrs = 56 52% M 48% white 41% black 11% Hispanic 10 mothers <HS 14 mothers HS 32 mothers >HS Texas	24HR NCC protocol	12h direct observation (DO)	Observations of food intake conducted by following each child wherever he or she went (home, school, day care). Observation teams of two alternated every 2 hrs to increase personal safety, permit inter observer reliability checks, and reduce fatigue and error. 24HR conducted by nutritionist using NCC protocol (Nutrition Coding Center, University of Minnesota.) Child Care Input: Mother's recall Supplement Intake: Not reported	Not specified **Other results:** SES status was not consistently related to reporting errors. Caucasian and Hispanic mothers tended to underreport and blacks tended to overreport. Mothers not-at-home were less likely to be able to report on their child's diet for a notable part of the day or for the full day.	**24HR vs. DO** 7% kcal underestimation (1,053 vs. 1,138 kcal/d) 24HR underestimated CHO and calcium and overestimated 9 nutrients. For food items: 65% mean agreement; 18% underreport by 24HR; 10% overreport by 24HR; 7% partial agreement

Table 4.1. Validation of dietary assessment methods in preschool children (2-5 years), continued

Reference	Study Population	Test Method (TM)	Reference Measurement (RM)	Design Features	Correlation Between TM and RM	Mean Intake Difference Between TM and RM
24-HOUR RECALL (24HR), CONTINUED						
Basch et al., 1990 (140)	4 to 7 yrs = 46 61% M, 1st generation Latino from Dominican Republic; low income; healthy New York, NY	24HR 3-dimensional food models; protocol for recall not specified	Direct observation of evening meal	Bilingual observers visited home from 4 to 8 pm to observe and record food intake of child. Parents believed observation of child activity was the purpose of home visit. The day following observation a different investigator administered 24HR to parents. Child Care Input: Not applicable Supplement Intake: Not specified	Pearson Correlation Energy-Adjusted: Kcal = 0.71 Protein = 0.50 Fat = 0.52 14 other nutrients = (-1.0 to 0.72)	**24HR vs. DO** 9% overestimation 507 vs. 465 kcal for evening meal Other results: 51% of reported portion sized equaled observed portion sizes, 15% smaller and 33.5% larger. For 9 out of 10 most frequently eaten food groups, observed and recalled frequencies were identical. Mothers tended to omit food more often than add them.
Eck et al., 1989 (141)	4-9.5 yrs = 34 47% M, mean age 5.8 yrs; Caucasian; 71% middle to upper income HH Memphis, TN	Recall of lunch meal Bogalusa 24HR protocol	Direct observation and weighing of plate waste at lunch meal.	Unobtrusive observation made of child eating with family in cafeteria. Plate waste measured after family left cafeteria. On following day, recall of lunch meal next day in home by interviewer who did not observe intake. Mother and father interviewed separately and then consensus interview with mother, father, and child. Child Care Input: Not applicable Supplement Intake: Not specified	Pearson Correlation Unadjusted Fathers: Kcal = 0.83 Protein 0.79 Fat = 0.72 Other nutrients: 0.61-0.88 Mothers: Kcal = 0.64 Protein 0.56 Fat = 0.65 Other nut: 0.57-0.74 Consensus: Kcal = 0.87 Protein 0.91 Fat = 0.7285 Other nut: 0.75-0.90	**Lunch Recall vs. DO** No significant differences between mean kcal and 9 other nutrients between DO and recall my father, mother, and consensus. Group accuracy in correctly reporting different types of foods varied from the fathers' underreporting of breads (-27%) and overreporting of fruit intake (+50%). The largest percentages of over- and underreporting were in fruits and condiments.

Table 4.1. Validation of dietary assessment methods in preschool children (2-5 years), continued

Reference	Study Population	Test Method (TM)	Reference Measurement (RM)	Design Features	Correlation Between TM and RM	Mean Intake Difference Between TM and RM
24-HOUR RECALL (24HR), CONTINUED						
Klesges et al., 1987(143)	2-4 yrs = 30 57% M; white; middle SES; 63% mothers full time homemakers	24HR Modified Bogalusa 24HR protocol	1d Weighed FR by research staff	Researcher in home observed and weighed all food intake for 24h. 1st 24HR recalled food intake day prior to observation. 2nd 24HR day in evening after weighed FR. Child Care Input: Not applicable Supplement Intake: Not specified	Pearson Correlation Unadjusted same day 24HR vs. 24h Weighed FR Kcal = 0.48 Protein = 0.63 7 nutrients = 0.48-0.75	**24HR vs. 24h Weighed FR** No significant differences for 7 of 7 nutrients. 4% underreporting (not identifying foods eaten)
Persson and Calgren, 1984 (128)	4-8 yrs = 46 Age and sex breakdown not specified Sweden	24HR	7d Estimated FR	7d estimated FR in household measures and recorded on form. Children age 8 yr told parents what they ate at school. Time and method of 24HR not specified. Child Care Input: For 4 yr old children in day care centers, day care staff recorded food intake. Supplement Intake: Not specified	Not specified	**24HR vs. 7d FR** 2% underestimation 1784 $\pm$ 384 vs. 1780 $\pm$ 568 kcal Other results: 24HR overestimated 1 and underestimated 2 of 8 nutrients. 24HR did not successfully classify the individual to the same category as RM.

Table 4.1. Validation of dietary assessment methods in preschool children (2-5 years), continued

Reference	Study Population	Test Method (TM)	Reference Measurement (RM)	Design Features	Correlation Between TM and RM	Mean Intake Difference Between TM and RM
FOOD FREQUENCY QUESTIONNAIRE (FFQ)						
Parrish et al., 2003 (102) Diabetes Autoimmunity Study in the Young (DAISY)	1-3 yrs = 68 49%M; 79% white; 57% of mothers with 4 yrs. college; 79% HH income > $30,000 Colorado	Harvard 111-item FFQ	24HR 4x, 3 mo apart NCC protocol Blood sample on random sub sample of 38 for plasma lipids, alpha tocopherol, and ascorbic acid	In 1997-98, primary caregiver of participants completed 24HR interview quarterly. At end of year, primary caregiver completed self-administered HFFQ. Child Care Input. Alternative care givers (child care, fathers non living in home, grandparents, etc.) contacted for 24HR information. Responses of parent and alternative caregiver combined into one 24HR. If data not available from alternative care givers or parent recall excluded from analysis. Supplement Intake. Not specified	Pearson Correlation HFFQ vs. 24HR 0.08 for kcal (-0.16 to 0.31) Energy-adjusted nutrient correlations ranged from 0.33 for protein to 0.41 for CHO. HFFQ and plasma correlations: vitamin C (0.51); alpha tocopherol (0.48), beta crptoxanthin (0.41) and alpha carotene (0.39)	**HFFQ vs. 24HR** 70% kcal overestimation 2070 ± 709 kcal vs. 1220 ± 347 kcal
Blum et al., 1999 (103)	1-5 yrs = 233 M and F; 56% Native American; 55% 1-2 yrs 45% 3-4 yrs. 44% white; WIC Program participants North Dakota, US	Modified 84-item HFFQ 2x with 1 mo interval Modified for 1 mo period; self-administered	24HR 3x in 1mo (@ 10d intervals) NDS computer assisted	1st HFFQ administered at routine WIC visit. 3 24HRs administered by telephone or in-person 10d apart. HFFQ administered again after final 24HR. Mean of 3 24HR and 2 HFFQs compared. Child Care Input. Not specified Supplement Intake. Not specified	Pearson Correlation Protein = 0.43 CHO = 0.52 Fat = 0.59 14 other nutrients ranged from 0.26 – 0.63 Correlations not different for younger vs. older children or for Native Americans vs. Caucasians.	**HFFQ vs. 24HR** 0.2% kcal overestimation 1688 ± 482 kcal vs 1684 ± 467 kcal HHHQ overestimated 10 of 20 nutrients; HFFQ intakes for each nutrient within 10% of 24HR.

Table 4.1. Validation of dietary assessment methods in preschool children (2-5 years), continued

Reference	Study Population	Test Method (TM)	Reference Measurement (RM)	Design Features	Correlation Between TM and RM	Mean Intake Difference Between TM and RM
FOOD FREQUENCY QUESTIONNAIRE (FFQ), CONTINUED						
FNS, USDA, 1994 (25)	1-4 yrs = 150 WIC participants distributed evenly between black, white, and Hispanic	HFFQ NCI-Block HHHQ	24HR 3x by telephone 2-dimensional food models	Data collection from July 1993 through January 1994. In each category, half the sample received WFFQ followed by 3 non-consecutive phone 24HRs and a second administration of the WFFQ. The other half of the sample received the HHHQ followed by 3 non-consecutive 24HR and a second administration of the HHHQ.	**FFQ vs. 24HR** HFFQ/HHHQ Kcal 0.13/0.14 Pro. 0.19/0.15 Vit. A 0.28/0.03 Vit. C 0.10/0.19 Iron 0.01/0.15 Calcium 0.27/0.04	Not specified
Iannotti et al., 1994 (142)	2-4 yrs = 17 53% M; 50% in daycare Washington, DC	HFFQ for previous 7d 24HR (see 24HR section of table)	3d Weighed FR	All food and beverages weighed or measured for 3d. 24HR of parents/caregiver. HFFQ given at the end of the 3rd day for intake in previous 7d. Examined energy, sodium, cholesterol, PFAT and PSAT Child Care Input: Child care providers measured intake during day care and participated in recall of day care intake. Supplement Intake: Not specified	Pearson Correlation Unadjusted HFFQ vs. 3d FR = 0.37 Adjusted (kcal/kg) HFFQ vs. 3d FR kcal = 0.49 ($p<.05$)	Not specified
Kaskoun MC et al., 1994(146)	4.2-6.9 yrs. = 45 49% M; 80% Caucasian; 20 % Mohawk Native Americans Vermont, US	Harvard FFQ	DLW method to measure TEE	Volunteer parent-child pairs recruited by newspaper ads. DLW dosing on d1, 2 spot urines on morning of d2, 2 spot urines on d14. Child's mother completed FFQ and returned on d2 or d14, reflecting intake for past year. Body composition and anthropometrics on child and parents.	Paternal % body fat was significantly correlated with misreporting of energy intake ($r = 0.32$, $p = .03$). Body composition measurements of children not correlated with misreporting of energy intake.	**HFFQ vs. DLW** 59% overestimation 9.12 $\pm$ 2.28 vs. 5.74 $\pm$ 1.13 MJ/d (+808 kcal) No significant difference between total energy intake and TEE by sex, ethnicity, sex by ethnicity so data pooled for further analysis.

Table 4.1. Validation of dietary assessment methods in preschool children (2-5 years), continued

Reference	Study Population	Test Method (TM)	Reference Measurement (RM)	Design Features	Correlation Between TM and RM	Mean Intake Difference Between TM and RM
FOOD FREQUENCY QUESTIONNAIRE (FFQ), CONTINUED						
Stein et al., 1992 (136) Columbia Study of Childhood Activity and Nutrition	3.6-5 yrs = 224 60% M; 91% Hispanic; 8% black; 1% white New York, NY	Modified HFFQ Interviewer-administered 3x @ 6 mo intervals Modified for 6 mo period; portion sizes changed for 24 foods; 10 common Hispanic foods added	24HR 4x in 1 yr., 3 mo apart 3-dimensional food models, containers, plates, cups, spoons, and other utensils for portion size estimation.	In 1986-87, 24HRs and FFQs administered in the same 1 yr period by trained bilingual interviewers. First FFQ eliminated from analysis as obtained on same day as 1st 24HR. Memory probes tied to child activities and checklist of key foods included in interview. <u>Child Care Input</u>: Times when food was consumed outside of parent's supervision were excluded from recall data. <u>Supplement Intake</u>: Not specified	Pearson correlation <u>Energy and within person adjusted</u> Boys--0.34 kcal; 0.29 protein; 0.28 fat; range of nutrients 0.05 PUFA to 0.71 potassium Girls--0.59 kcal; 0.59 protein; 0.39 fat; range of nutrients 0.14 sodium to 0.78 potassium	**HFFQ vs. 24HR** <u>Boys</u>: 66% overestimation (1063 kcal) 2667.3 $\pm$ 637.9 vs. 1604.3 $\pm$ 388.2 kcal <u>Girls</u>: 73% overestimation (1093 kcal $p < 0.01$) 2586.1 $\pm$ 745.2 vs. 1492.3 $\pm$ 330.3 kcal <u>Other results</u>: FFQ significantly overestimated 10 of 10 nutrients both sexes. FFQ overestimated frequency of consumption of dairy products, meat, and FV.
Shea et al., 1991 (148) Columbia Study of Childhood Activity and Nutrition	4-5 yrs = 108 53% M; Hispanic; low income; good health New York, NY	Modified HFFQ Interviewer-administered 3x @ 6 mo intervals Modified for 6 mo period; portion sizes changed for 24 foods; 10 common Hispanic foods added	Serum lipid concentrations 24HR 4x in 1 yr, 3 mo apart 3-dimensional food models, containers, plates, cups, spoons, and other utensils for portion size estimation.	In 1986-87, 24HRs and FFQs administered in the same 1 yr. period by trained bilingual interviewers. First FFQ eliminated from analysis as obtained on same day as 1st 24HR. Memory probes tied to child activities and checklist of key foods included in interview. Fasting venous blood sample collected and height and weight measured to determine BMI. <u>Child Care Input</u>: Times when food was consumed outside of parent's supervision were excluded from recall data. <u>Supplement Intake</u>: Not specified	Not specified	**HFFQ vs. 24HR** 33.2 % vs. 33.0% kcal from fat 165.6 vs. 165.6 mg chol/1,000kcal 137.7 vs. 79.3 g/d total fat for children in highest tertiles. FFQ overestimated intake of total fat, saturated fat, and cholesterol. Total serum cholesterol and LDL cholesterol increased significantly across tertiles of total fat, saturated fat, calorie-adjusted saturated fat intake and calorie-adjusted total fat (LDL cholesterol only); after adjusting for age, sex, and BMI, associations remained significant.

Table 4.1. Validation of dietary assessment methods in preschool children (2-5 years), continued

Reference	Study Population	Test Method (TM)	Reference Measurement (RM)	Design Features	Correlation Between TM and RM	Mean Intake Difference Between TM and RM
FOOD FREQUENCY QUESTIONNAIRE (FFQ), CONTINUED						
Treiber et al., 1990 (147) Studies of Children's Activities and Nutrition (SCAN)	3-5 yrs = 33 to 51 Mixed gender; 83% middle SES; 2-parent HH; mean parental education = 14 yrs Georgia	Modified HFFQ 2x 1 wk apart (51 children) Interviewer-administered using food models Modified for a 3 mo period	24HRs 2x 1 wk apart (33 children) Bogalusa method	Interviewer visited home to administer the 24HR (25 min) followed by the FFQ (50 min) two times 1 wk apart. Child Care Input: Recall administered only to parents who directly observed intake. Supplement Intake: Standard questions on HFFQ	Pearson correlation Unadjusted mean of 24HRs 1 and 2 and FFQ 2 Protein = .41 Calcium= 0.50 Potassium = 0.40 Cholesterol = 0.62	**FFQ 1 vs. 24HR1** Unadjusted 42% kcal overestimation 2350 ± 749 vs. 1660 ± 447 kcal/d Kcal/kg 40% overestimation 126.7 ± 47.5 vs. 90.7 ± 26.9
OTHER QUESTIONNAIRES						
Marshall, et al 2003 (98) Iowa Fluoride Study (IFS)	6 wks = 240 followed longitudinally through 5 yrs 50% M; from well educated, economically secure HHs in longitudinal Iowa Fluoride Study (IFS) USA	Beverage FFQ	3d Estimated FR (2 weekdays and 1 weekend)	From 1992-2000, instruments mailed to parents when children were 6wks, 3, 6, 9, and 12 mo and every 4 mo through 3 yrs of age and then every 6 mo until 5yrs. Parents completed FFQ for the week preceding the 3d FR and returned by mail. Analysis reported at 6 and 12 mo and 3 and 5yrs. Child Care Input: Parent obtained information from childcare provider or provider completed FR. Supplement Intake: Questionnaire	Spearman correlations 3 yr. milk = 0.76 juice/drinks = 0.64 water = 0.70 soft drinks = 0.59-0.74 (liquid or powdered) 5 yr cow's milk = 0.63 juice/drinks = 0.54 water = 0.70 soft drinks = 0.56-0.63 (liquid or powdered)	**Beverage FFQ vs. FR:** 3 yr FFQ milk estimate 1.3oz./d lower than FR 5 yr FFQ milk estimate = 0.2oz./d lower than FR

Table 4.1. Validation of dietary assessment methods in preschool children (2-5 years), continued

Reference	Study Population	Test Method (TM)	Reference Measurement (RM)	Design Features	Correlation Between TM and RM	Mean Intake Difference Between TM and RM
OTHER QUESTIONNAIRES, CONTINUED						
Dennison et al., 2000 (149)	2-5 yrs = 91 46% M; rural; Head Start population Upstate NY	17-item Child Dietary Fat Questionnaire (CDFQ)	24HR 3d Estimated FR Kids Food Portion Booklet and measuring cups and spoons	24HR administered in the home followed by parent/caretaker completing 3d Estimated FR. CDFQ administered twice separated by 2 wks.	Pearson Correlation CDFQ vs 24HR + 3d FR Total fat = 0.54 ($p<0.0001$) SFA = 0.36 ($p<0.01$) Dietary cholesterol = 0.55 ($p<0.001$)	Not specified
Taylor et al., 1998 (150)	3-6 yrs = 63 65%M New Zealand	35-item calcium intake FFQ	4d Estimated FR	Participants recruited by advertisement and completed FFQ and 4d estimated FR. FFQ queries frequency of intake of 35 food and beverage items for past year.	0.52 (type of correlation not specified)	**Calcium FFQ vs. 4d FR** 942 $\pm$ 419mg vs. 798 $\pm$ 271 mg
Frank et al., 1991 (158)	4 yrs = 341 42% M; 58% Mexican-American; low to middle income San Diego, CA	7-point fat avoidance scale	1d Estimated FR	24-hour food intake record compiled from direct observation by parents at evening meal and recordings by day-care center staff of breakfast and noon meal.	Fat Scale vs. FR Total fat: -0.22 ($p=.006$) 86% agreement for milk type and 78% agreement for cooking fat	Not specified

Table 4.3. Nutrient and/or food intake studies in preschool age populations

Reference/ Study Name	Study Population	Diet Assessment Method	Objective and Design Overview	Nutrients and Outcomes Assessed
FOOD RECORDS (FR)				
Marshall et al., 2003 (114) Iowa Fluoride Study (IFS)	642 infants followed longitudinally through age 5 3 yrs = 441 4 yrs = 410 5 yrs = 396 49% M; 81% HHs with HS education; 13% income <$19,000. Iowa	3d Estimated FRs 1 weekend and 2 week days Iowa Fluoride Study (IFS) Questionnaire (includes beverage FFQ) with each Food Record	<u>Objective:</u> Longitudinal investigation of the relationship of dietary and non-dietary fluoride exposures and the relationship between fluoride exposures and dental fluorosis and caries. <u>Design:</u> Starting in 1992, parents mailed IFS questionnaire and 3d FR at 6 wks, 3, 6, 9, and 12 mo every 4 mo until 3 yrs. and then every 6 mo through 5 yrs. IFS questionnaire collected information on child's beverage intake, general health, and oral health behaviors. Dental examinations at 4 and 7 yrs. <u>Supplement Intake</u>: Questions on IFS questionnaire. <u>Child Care Input</u>: Not specified <u>Instrument Selection Rational</u>: Not specified	Energy intake and intake of 21 nutrients, dairy products, sugared beverages, and sugar-free beverages. Dental caries at 1, 2, 3, 4, 5 years.
Rogers et al., 2002; Emmet et al., 2002; Northsone et al., 2002 (109;111;112) Avon Longitudinal Study of Pregnancy and Childhood (ALSPAC) Children in Focus (CIF) substudy	18 mo = 1,026 (77% response rate) 43 mo = 863 (69.1% response rate) UK	3d Estimated FR 1 weekend and 2 weekdays not necessarily consecutive	<u>Objectives:</u> To investigate food and nutrient intake in toddlers and preschoolers and to investigate the relationship between fat intake as a percentage of energy, and nutrient adequacy, growth, blood lipids, and iron status in 18- and 43-month-old children. <u>Design:</u> Parents sent FR one week before clinic visit. Mothers recorded all drinks consumed in a 3d FR and containers for drinks. Data analyzed for 1st 24h period. A capillary blood sample was taken at 18 mo for measurement of hemoglobin and ferritin levels. Non-fasting venous blood samples were taken at 31 and 43 mo and analyzed for total and high-density lipoprotein cholesterol. <u>Supplement Intake</u>: Not specified <u>BM Intake</u>: Record breastfeeding; 2.4% at least one BF at 18 mo <u>Child Care Input</u>: Not specified <u>Instrument Selection Rational</u>: Not specified	KCAL, CHO, starch, sugar, non-milk energy sugar, protein PUFA, MUFA, P:S ratio, cholesterol, 15 vitamins and minerals

Table 4.3. Nutrient and/or food intake studies in preschool age populations, continued

Reference/ Study Name	Study Population	Diet Assessment Method	Objective and Design Overview	Nutrients and Outcomes Assessed
FOOD RECORDS (FR), CONTINUED				
Sichert-Hellert et al., 2001 and 1998 (154;155) DONALD Study (Dortmunc Nutritional and Anthropometric Longitudinally Designed Study)	2-14 yrs = 787 49% M; 45% of parents have grammar school education and 39% hold university degrees. Germany	3d Weighed FR annually 24H urine collection on third day of recording	<u>Objective:</u> The DONALD Study is a cohort collecting detailed data on diet, metabolism, growth and development from healthy subjects between infancy and adulthood (once a year for subjects older than 2 yrs). (http://www.fke-do.de/donald.html) <u>Design:</u> Parents of children or older children kept 3d FR of all food and fluids consumed as well as leftovers using electronic scale. Product wrappers were kept. Dietary records evaluated with dietitian. In 75% of completed records more than 90% of food weighed. For external validation investigators calculate a ratio **(EI/BMR)** of the reported energy intake (EI) and estimated basal metabolic rate (BMR) on the basis of individual measured body weight and height. FRs with a Goldberg ratio of less than 1.06 excluded for implausibly low intakes. Dietary information of underreporters analyzed separately. For the direct validation of reported intakes by biomarkers: a) The **protein intakes** of the 3d Weighed dietary records were validated against total **nitrogen excretion** measured in the collected 24hr urine samples. b) Anthropometry-based creatinine excretion in valid 24hr urine samples should exceed 0.1 mmol per kg body weight per day <u>Supplement Intake</u>: Not specified <u>Child Care Input</u>: Not specified <u>Instrument Selection Rational</u>: Not specified	Energy and nutrient intakes (total vs. fortified), growth

Table 4.3. Nutrient and/or food intake studies in preschool age populations, continued

Reference/ Study Name	**Study Population**	**Diet Assessment Method**	**Objective and Design Overview**	**Nutrients and Outcomes Assessed**
FOOD RECORDS (FR), CONTINUED				
Skinner et al., 1999 (157)	2-5 yrs = 72 Followed longitudinally from birth until 60 mo Recruited with mothers; healthy, full-term white infants; 52%M; mothers >18yrs; 50% college degrees; middle or upper SES families. Tennessee, US	2d Estimated FR and 24HR interviews in home at 24, 28, 32, 36, 42, 48, 54, and 60 mo	Objective: To determine the nutrient and food intakes of healthy, white preschoolers from middle and upper SES families and to compare intakes to current recommendations. Design: In 1994-97, using incomplete random block design, mother-child pairs were interviewed longitudinally in mother's home, collecting 24HR, and food likes and dislikes. Mothers kept 2d FR. Supplement Intake: 24HR Child Care Input: Not specified. Instrument Selection Rationale: This combination of 24HR and 2 days of food records has been used in national studies such as CSFII.	Intakes of energy, carbohydrate, protein, fat, calcium, iron, magnesium, phosphorus, potassium, sodium, zinc, Vitamins A, D, E, K, C, B6, B12, thiamin, riboflavin, niacin, folate, and pantothenic acid. Introduction of complementary foods. Weight, length, and head circumference.
Boulton et al., 1995 (117) Adelaide Nutrition Study Cohort	4 yrs = 155 South Australia	3d Weighed FR	Objective: This study re-examined data collected in the 1980s on food energy and nutrient intake and somatic growth measured at intervals throughout infancy to 8 yrs. Design: Children randomly selected by birth order and followed longitudinally from birth to mid-teenage. At 4 yrs of age parents kept a 3d Weighed FR before annual visit. Supplement Intake: Not specified Child Care Input: Not specified Instrument Selection Rational: Not specified	Food energy, nutrient intake, and somatic growth.

Table 4.3. Nutrient and/or food intake studies in preschool age populations, continued

Reference/ Study Name	Study Population	Diet Assessment Method	Objective and Design Overview	Nutrients and Outcomes Assessed
FOOD RECORDS (FR), CONTINUED				
Singer et al., 1995 (156) Framingham Children's Study	3-4 yrs = 77 5-6 yrs = 86 7-8 yrs = 91 61% M; white; middle SES; 50% of mothers employed outside of home Framingham, MA.	3d Estimated FR Collected longitudinally for 6 yrs Y1 = every 3 mo Y2, 3, & 5 = every 6 mo Y4 & Y6 = every 12 mo	Objective: To compare the nutrient intake of children at 3-4 yrs of age with that in ages 5-6 and 7-8 yrs to determine whether nutrient intake tracked over time. Design: Intakes of 10 nutrients were estimated by means of multiple days of food diaries collected over a span of up to 6 yrs of follow-up for children in the Framingham Children's Study. All diaries collected during each of three age periods (age 3 through 4 yrs, age 5 through 6 yrs, and age 7 through 8 yrs) were averaged. Nutrient density intakes at each age period were compared. Supplement Intake: Not specified Child Care Input: Supplementary food intake information collected from other care givers Instrument Selection Rational: Not specified	Energy, protein, CHO, fat, SF, MUFA, PUFA, cholesterol, calcium, potassium, and sodium
24-HOUR RECALL (24HR)				
Aranceta et al., 2003; Aranceta et al., 2001 (151;152) enKid Study	2-5 yrs = 385 50% M; cross-section of population; total of 3534 children 2-24 yrs Spain	24HR and 164-item FFQ Repeat 24HR in 25-30% subsample	Objective: To analyze prevailing food patterns among Spanish children and young people and their relationship to sociodemographic and lifestyle factors. Design: Cross-sectional population survey. Supplement Intake: FFQ contained questions on supplement intake Child Care Input: Not specified Instrument Selection Rational: Not specified	Food groups, activity patterns

Table 4.3. Nutrient and/or food intake studies in preschool age populations, continued

Reference/ Study Name	Study Population	Diet Assessment Method	Objective and Design Overview	Nutrients and Outcomes Assessed
24-HOUR RECALL (24HR), CONTINUED				
Kohlmeier et al., 1998 (108) Russian Longitudinal Monitoring Survey	0-6 yrs = 746 48% M; recruited from a probability sample of 7,200 HHs Russia	24HR	Objective: Russian Longitudinal Monitoring Survey is designed to monitor social, economic, and health conditions in Russia using interview administered questionnaires, 24HR, and anthropometric measurements. This study evaluated iron sufficiency in the Russian diet. Design: In 1992 through 1994, four rounds of interviewer-administered 24HR of a nationally representative longitudinal survey of 10,548 women and children. Supplement Intake: Not specified BM Intake: Not specified Child Care Input: Not specified Instrument Selection Rational: Not specified	Total iron, heme, and bioavailable iron in diet.
Stein et al., 1991 (135) Columbia University Study of Childhood Activity and Nutrition	3-4 yrs = 181 47% M; 93 % Hispanic; 7% black New York, NY	7 24HRs Y1 = 4x Y2 = 3x	Objective: To examine intra-individual day-to-day variation in nutrient intakes and tracking nutrient intakes over time. Design: 24HRs administered to mother with 3-dimensional food models and measuring cups and spoons 7 times over 19 mo period. Supplement Intake: Not specified Child Care Input: Not specified Instrument Selection Rationale: 24HR has been validated in adult populations, but utility and limitations in preschool populations not well studied.	Tracking of nutrient intakes of participants over a 19 mo period. Energy, fat, SF, PUFA, cholesterol, protein, CHO, sodium, potassium, calcium.

Table 4.3. Nutrient and/or food intake studies in preschool age populations, continued

Reference/ Study Name	Study Population	Diet Assessment Method	Objective and Design Overview	Nutrients and Outcomes Assessed
24-HOUR RECALL (24HR), CONTINUED				
Webber et al., 1987 (118) The Bogalusa Heart Study	440 infants born 1/1/1974 through 6/30/1975 Followed longitudinally from birth through 7 yrs 48% M; 50% Black Bogalusa, LA	24HR on subsample @ 3 yrs (n=106) and 4 yrs (n=219).	Objective: To describe distributions, interrelationships, and trends over time for selected anthropometric measurements, BP levels, serum lipid and lipoprotein concentrations, and dietary intake patterns in longitudinal cohort from birth through 7 yrs of age. Design: Infants recruited at birth in 1974 and 1975. When children were 1, 2, 3, 4, and 6 mo of age, Infant Feeding Practices questionnaires mailed to parents. When the children were 6 mo and 1, 2, 3, and 4 yrs of age, replicate cardiovascular disease examinations were performed and 24HR on subsample. Supplement Intake: Multivitamin (Vi-Daylin F) provided as incentive. Child Care Input: Not specified. Instrument Selection Rationale: Not specified	Birthweight, any complications, Apgar scores, morbidity, serum lipid levels, length, weight, blood pressure, energy, and 11 nutrients.
FOOD FREQUENCY QUESTIONNAIRE (FFQ)				
Basch et al., 1994 (70)	3.6-5 yrs = 160 Hispanic; low-income New York, NY	Modified HFFQ 3x over a 1 yr period Interviewer-administered 3x @ 6 mo intervals Modified for 6 mo period; portion sizes changed for 24 foods; 10 common Hispanic foods added	FFQ administered to mothers three times for their own intakes and three times for their child's intake over 1 yr Child Care Input: Not specified Supplement Intake: Not specified	Mother's intake vs. child's intake for 10 nutrients and reproducibility for 3 mo vs. 1 yr.