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B770: Nutritional Assessment of Elementary School Children

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INTRODUCTION

One goal of health education is to diminish problems through prevention of disease rather than through intervention or treatment. Physicians and health scientists have identified such nutrition-related diseases as obesity, atherosclerosis, dental disease, osteoporosis, diabetes, and cancer as conditions that may be affected by lifelong dietary habits. Burgess and Dean (1) have emphasized that food habits learned early in life are difficult to change. This recognition of the importance of introducing and expanding nutrition education in the elementary curriculum has caused a proliferation of programs. Long-range educational planners are asking for recommended methods of evaluation of the effectiveness of nutrition education (2, 3).

For many subject matter areas, solutions for evaluation are in the cognitive domain. But the proof of nutrition education lies in the affective domain and can be measured as a change of a learned behavior — eating. Since knowledge tests seldom relate directly to behavior or attitude changes, other methods are being sought. Results of nutrition instruction should be reflected in the nutritional status of the child. Nutrition educators need more inexpensive methods of assessing the status of large numbers of school children for program evaluation than those associated with individual interviews. In the protocol described by Frank et al. (4), it was demonstrated that special training of interviewers and detailed probing were required to obtain reproducible data from individual interviews of children.

The Glenburn study was designed to provide nutrition education for children in grades K–8 and to comply with demands for program assessment in an era of diminished funding. Glenburn is a typical rural Maine community, with children representing a variety of socioeconomic, educational, and ethnic backgrounds. The program was introduced to the teachers and school board members by the principal and the researcher as an educational component of the total school program. As such, there was no opportunity to obtain socioeconomic nor educational information about the parents. Instruction and evaluation as a cooperative effort of

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the Glenburn principal, teachers, and School Nutrition Programs' (SNP) personnel with the University of Maine nutrition education staff member and students occurred at two-year intervals, beginning in January 1975.

The program was divided into the two components of instruction and nutritional status assessment. It was hypothesized that if the instruction were effective, the nutritional status of the children would change in a positive direction. For measurement of the change, it was necessary to 1) standardize procedures for collecting anthropometric and dietary data for assessment of nutritional status, and 2) develop a computer program for comparison of anthropometric and dietary measurements with standards or norms from the National Center for Health Statistics (NCHS) (5) and with the National Research Council's Recommended Dietary Allowances (RDA)(6).

The purpose of this bulletin is to describe procedures for assessing nutritional status of school children utilizing anthropometric measurements and dietary intake records and to report the findings.

The objectives of the study utilized for establishing the procedures were 1) to compare the nutritive value of dietary intakes recorded by school children with the Recommended Dietary Allowances, 2) to classify school children according to anthropometric measurements, 3) to compare the measurements made in 1975 with those made in 1977, and 4) to make recommendations for future work.

METHODS

Dietary Records

All data were collected in the winter months and the dietary records were recorded during school days. The first step in each phase of the study was the collection of 134 two-day dietary records in 1975 and 160 three-day records in 1977. In an effort to obtain accurate intake records from the children, a protocol for instructions was developed (Appendix A). Consistency in presentation of recording instructions to the children and in answering questions was stressed in the training sessions of the interviewers, who were the investigator and two food and nutrition senior assistants.

The group interviews were held as early in the school day as possible in classrooms for grades four through eight. The investigator and one assistant began each initial interview by explaining the procedure to the children. The introduction to the recording task included a display of food models for assisting the visualization of amounts eaten. To increase the accuracy, such tools as standard glass measuring cups, fractional cups and spoons, and labeled milk cartons were made available to the children. A comparison of sizes of small, medium, and large glasses used for juice

and milk was made, stressing the use of metric volume measurements. The same comparison was made for cereal bowls commonly used. Wrappers for candy, peanuts, and crackers were displayed to emphasize the necessity of label reading and recording.

Following the discussion of rules for recording food intakes, the children recalled and recorded the breakfast they had eaten 2-3 hours earlier. Questions about brand names, types of milk, and sizes of containers were answered individually. Snack items were examined by the researchers to assist children in identifying correct weights. The children were encouraged to discuss amounts in the presence of the researchers in preparation for careful observations of lunch and dinner intakes. A time period of thirty to forty-five minutes was allowed for the first session.

The investigators ate lunch with some of the children in graded classrooms, which allowed close observation of amounts served and food acceptance. The SNP personnel were helpful in providing information about ingredients and portion sizes. Classrooms in which no project personnel were present during lunch were visited by investigators afterwards for supervision of recording of food intake. The children were reminded of the importance of accurately recording snacks and dinner. On the second and third days, the children required less instruction, but it was necessary to check their intakes, to ask questions about obvious omissions, and to assist some individuals with recording.

In 1975 the teachers of the young children in kindergarten and second grade assisted in scheduling parent interviews, and the parents assumed the responsibility for recording two-day intake records. In 1977 intake records were not collected for the kindergarten and second grade children because it was impossible to arrange for parent interviews for obtaining dietary information.

The second step of the study was the computerized determination of the nutritive value of individual intakes. Each food item was coded from Agriculture Handbooks No. 8 (7) and No. 456 (8) and the amount recorded in grams. To provide consistency, the same nutrition assistant coded all records collected in one year. Foods not listed in USDA handbooks were treated in one of several ways. Alternate items or a combination of items in the handbook that appeared most appropriate were coded and recorded for later decisions in the study. The nutritive value of 30 food items was calculated and added to the Vermont computer data bank. Commonly chosen snack food items not listed in the handbooks were purchased at the neighborhood store to provide information on ingredients and amounts.

The energy and nutritive content analysis was performed utilizing a computer program obtained from the University of Vermont (9), and run on an IBM model 360 computer. Data banks of nutritive values contained

in programs from the University of Minnesota (10) and the University of Rhode Island (11) were also utilized. Average individual intakes of energy, protein, calcium, iron, vitamin A, thiamin, riboflavin, niacin, and vitamin C were transferred to IBM computer cards in a prescribed format that included subject number, age, sex, and anthropometric measurements (Appendix B, Table 1). The population was coded according to age and sex into eight groups (Appendix B, Table 2). The percentage contribution of between-meal snacks to the total daily intake and to the RDA was determined.

In order to compare the energy and nutrient intake levels to the 1974 RDA for the appropriate age and sex, a program was written that included 327 If-statements to divide the subjects into those that were equal to or greater than 100% RDA, 67-99%, 34-66%, 0-33% and greater than 133% RDA. With subjects categorized into appropriate age and sex groups, a subprogram breakdown of the Statistical Package of the Social Sciences (SPSS)(12) was utilized to produce tables giving mean intake of each nutrient and energy with the standard deviations and the number of subjects in each of the 5 nutrient intake groups. Frequency tables were generated to show the percent of subjects in each age group falling in each of the 5 nutrient intake groups. The mean intakes in 1975 were compared to those of the subjects in 1977 utilizing student's *t*-test.

Anthropometric Measurements

The second measure of nutritional status of the Glenburn children was anthropometric including height, weight, arm circumference, and triceps skinfold. The children in grades K, 2, and 4-8 were measured in 1975 and those in grades 4-8 in 1977. Measurements were made at the same time that dietary records were kept. Weight was measured on a Detecto-medic physician's balance. Subjects removed sweaters, jackets, heavy belts and other excess clothing. Height was measured in stockings with feet together, back and heels in contact with the upright bar of a calibrated steel rod with a horizontal crossbar attached to the scale balance used for weighing subjects. The subjects were instructed to look directly forward with head held straight (Frankfort plane). The measurer instructed the subject to stand to maximum height but not to stretch nor to raise the chin. The tragion and the nose were aligned.

The thickness of the skin plus subcutaneous tissue was measured at the triceps with a landmark placed with a wax pencil on the posterior aspect of the upper arm midway between the olecranon of the ulna and the acromial process of the scapula. Using a Lange skinfold caliper, three measurements were made on the left side of each subject, recorded to the nearest half millimeter, and averaged. When necessary, discrepancies were resolved by a fourth measure. To insure consistency the same individual

took all triceps measurements. Midarm circumference was measured at the landmark with a plastic tape calibrated to a Lufkin steel tape.

At the initiation of this study, the indecision in the literature about the best standard for screening children for nutritional status (13, 14) caused the workers to consider two methods for presenting body measurements. They were those stated by Jelliffe (15) and the NCHS standards (5).

Based on standards from Jelliffe, categorization within a group was made when weight for age and height plus one other measurement, either arm circumference or triceps skinfold, indicated underweight, overweight, or obesity. An individual who was 90 percent or less of the standard was classified underweight; one who was 91-109 percent of the standard was normal; if 110 or 119 percent of the standard he was classified overweight and one who was 120 percent or more of the standard was classified obese.

The more widely used method of screening children for nutritional status is to compare the body measurements to reference data compiled by a task force of the National Center for Health Statistics. Such data include the sex- and age-specific tables resulting from the cycles II and III of the Health and Nutrition Examination Survey which contain eight percentile groups (i.e., less than 5th, 5th, 10th, 25th, 50th, 75th, 90th, and 95th percentiles) (5).

For a countinuing method of assessing rate of growth of Glenburn children, a computer program was developed with *If Statements* classifying the subjects into the eight percentile groups according to height, weight, or triceps skinfold measurement. Code numbers for each percentile group were assigned as shown in Appendix Table 3. It can be seen that number 1 designated those individuals who were less than the 5th percentile. All individuals within the percentile points of 5.0 to 9.9 were defined as being in the 5th percentile. Other bands were similarly defined.

Statements of the range in height were made for each age and sex, which allowed the computer to classify the subjects into percentiles for evaluation of growth. A code number of one to twenty was assigned for the height of individuals of each sex for the 6 to 15 year old individuals.[1] Code numbers 21-40 were designated for statements of ranges in weight from NCHS standards.[2] For the 40 variables established there were 391 *If Statements.*

To classify the subjects according to triceps skinfold measurement, NCHS statements[3] of the range in millimeters based on age, sex, and

[1]DHEW Pub. No. (HSM) 73-1605. Series 11 No. 123, Table 1
DHEW Pub. No. (HSM) 73-1606. Series 11 No. 124, Table 3
[2]DHEW Pub. No. (HSM) 73-1605. Series 11 No. 123, Table 2
[3]DHEW Pub. No. (HSM) 73-1602. Series 11 No. 120, Tables 11-22

weight for children 6-11 years were coded with the prefix TSF and the numerals 21-32. The youths from 12-15 years were coded TSF I-8 based on NCHS data,[4] giving age and sex. The total number of variables established was 20, with 567 *If statements.*

In using SPSS on these data, it is necessary to have 164,000 bytes of transpace. It may require one or more than one job, depending on the capacity and time of accessibility of the computer. The procedure for analyzing the 1975 and 1977 data was to record the variables and raw data on tape. Request cards were then submitted to transfer the variables and *If statements* to alternating tapes.

The job control cards for utilization of the SPSS program to provide breakdown tables of frequencies, means, and standard deviations of classification categories were listed and were stored for use in future surveillance of Maine individuals.

RESULTS AND DISCUSSION

The methods for assessing nutritional status of elementary school children included the evaluation of the adequacy of the food intake based on 2- or 3-day dietary records and the classification of individuals into percentiles according to anthropometric measurements. The procedures were revised and refined to assure standardization for longitudinal growth studies or surveillance of children in the school system. The procedure included 1) development of instruments for data collection, 2) refinement of techniques for classroom interviews to obtain accurate dietary records, 3) design of computer programs combining dietary data analyses and comparison with RDA for age and sex, 4) standardization of methods of making anthropometric measurements in the school setting, and 5) description of a system for comparing anthropometric measurements with reference data for longitudinal growth studies and for screening for prediction of such common disorders as obesity.

Instruments for Data Collection and Analysis

The form that appeared to provide the space and headings most likely to encourage accurate recording of all food eaten by children in grades 4-8 is shown in Appendix C. The coding of food items for nutritive analysis may be on any 80-column sheet for guidance in transfer to IBM computer cards or terminals. The *If-statements* for definition of variables for comparison of energy and nutrient levels to the RDA are on computer cards[5] and on a tape[6] at the University of Maine.

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[4]DHEW Pub. No. (HRA) 74-1614. Series 11 No. 132, Table 1

[5]School of Human Development — Food and Nutrition

[6]Computing Center

The individual subject anthropometric form for longitudinal recording of weight, height, arm circumference (AC), and triceps skinfold measurements (TSF) is shown in Appendix D. Since student time away from the classroom must be minimized to meet the strenuous scheduling demands of the teacher, it is essential that the measurements be made in the least possible time. It was found that efficiency was increased by recording on separate sheets alphabetical student lists for each classroom, with columns for height, weight, AC, and TSF. Individual records were compiled as needed.

The coding of the anthropometric measurements may be on any 80-column sheet for transfer to IBM computer cards or terminals. The *If-statements* for definition of variables classifying the subjects into percentile groups, according to the reference population described in the Health and Nutrition Examination Survey by the National Center for Health Statistics, are on computer cards[7] and on a tape[8] at the University of Maine and may be applied to any population where data are coded as shown in Appendix B. The job control cards may be written according to information presented in the SPSS manual (12).

Dietary Data

Procedures for group interviewing of 9-15 year old students that more nearly met the schedule demands and cost constraints of a public school system than did individual interviews, were developed and the protocol is shown in Appendix A. To increase accuracy in food calculations, an alphabetical list of food items not found in the USDA handbooks (7, 8) was developed to provide guidance for coding items containing optional ingredients, for interpretation of amounts, for aid in distinguishing brands most commonly used, and for standardization of procedures.

The mean nutrient intake and the percent of intake compared with the Recommended Dietary Allowances for all persons in different age and sex groups for 1975 and 1977 are presented in Tables 1 and 2. In Table 1, it can be seen in the 7-10 year old group and with the 11-14 year old males, the mean intake of all nutrients, except vitamins A and C, increased from 1975 to 1977. The same pattern was true for 11-14 year old females with the exception of vitamin A, where the large standard deviations diminish the importance of the difference. The number of subjects in the 15 year old groups was insufficient to justify comparisons. A comparison of the mean intakes of boys versus girls shows that the intakes of all nutrients except vitamin A in 1977, thiamin in 1975 and vitamin C both years, were higher for the males than for the females. Brown, et al. (16) found that

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[8]Computing Center

among junior high students, the intakes of all nutrients, except vitamin A and ascorbic acid, were significantly higher for the males than for the females.

In comparing mean intakes of groups with the RDA, it can be seen in Table 2 that the intake of protein, vitamin C, and riboflavin was well above 100 percent of the 1974 Recommended Dietary Allowances in all age groups in both time periods. The amount of vitamin C ingested is sufficient to assure compliance with the higher amounts recommended in the 1980 RDA (17). Since the Recommended Dietary Allowances are guidelines only for groups and are limited because of individual variability, diets are considered low in a nutrient when they contain less than 67% of the RDA for that nutrient. The only nutrient that showed a mean value less than two-thirds of the RDA was iron in the 11-14 year old males and females in 1975 (58 and 43 percent) and the 15 year old females (38 percent). This is in agreement with the findings of Brown, et al. (16). The mean intake of iron and calcium increased from 1975 to 1977, as did that of niacin and riboflavin. The increase in iron was 26% for males and 24% for females, and the increase in calcium was 11%. The mean energy intakes of all age groups were less than 100 percent, but there were increases in all categories except among the 15 year old males between 1975 and 1977.

A comparison of the mean energy and nutrient intakes of the two groups may be seen in Table 3. The 1977 subjects reported significantly greater intakes of kilocalories, protein, fiber, iron, niacin ($p < 0.001$) and greater intake of calcium ($p < 0.01$). The mean intake of thiamin and riboflavin appeared to increase although the change was not statistically significant. The amount of vitamin A and vitamin C consumed decreased over the two year period but the large standard deviations for these nutrients demonstrate the high degree of variability in intakes.

Although mean intakes of the groups appeared to meet the RDA, it can be seen in Table 4 that the percent of 11-14 year old females consuming less than two-thirds of the allowance for iron was 92% in 1975 and 55% in 1977. The change in iron intake for the 11-14 year old males was a decrease from 76% in 1975 to 25% in 1977. In the younger group of 7-10 year old subjects, the percent changed from 39% in 1975 to 3% in 1977. The percent of 11-14 year old females consuming less than two-thirds of the allowance for calcium changed from 54% in 1975 to 50% in 1977. The percent of 11-14 year old males in the low calcium intake group decreased from 24% in 1975 to 10% in 1977. There was a similar change for the younger children.

A decrease in the percent of individuals who consumed less than two-thirds of the allowance for the B-vitamins and vitamin C can be seen from 1975 to 1977; but for vitamin A the trend was reversed for 11-14 year old

males and the females showed no change. Koh & Caples (18) found in a group of 102 subjects, (11-18 years old) that 59% consumed less than two-thirds of RDA for vitamin A. They found also that mean intake of vitamin A of males was lower than levels found in females.

Snacks

Much concern has been voiced in recent years over the frequent practice among students of eating between meals. Since 89% in 1975 and 100% in 1977 of the Glenburn population recorded between meal eating, the nature of these snacks was examined and the mean energy and nutritive values are shown in Table 5. The standard deviations are shown only for kilocalories and protein to illustrate the wide range in snacking habits of the subjects. The mean caloric values of snacks for all subjects range from 175 for the 12 year old females in 1975 to 1373 for the 14 year old males in 1977. In each group the caloric value of the snacks increased in 1977 as did all nutrients, except vitamin A for the 14 year old males and vitamin C for the 13 year old females. The range of intake of vitamins A and C was greater than other nutrients due to high values of such snack foods as carrots and oranges. The consistent increase in thiamin could be due to the new standards of enrichment that occurred in 1975 that were used in conversion of the 1977 data from Handbook 456. The increased supplementation with iron of many ready-to-eat cereals could be influential on the higher mean iron intake in 1977.

It can be seen in Table 6 that snacks contributed between 9% and 26% of the total daily intake of energy while the contribution of the total intake of protein ranged from 4-14%. The range of contribution to calcium was 5-20% and to iron it was 7-16%. Wider ranges can be noted in the vitamins. Since riboflavin intake is closely associated with that of calcium, and niacin is associated with protein, those two nutrients are omitted from the table. These results are in agreement with those of others (16, 19) that although large quantities of the empty calorie foods associated with between-meal eating are consumed annually, on the basis of existing data, that the place which such foods occupy in the diets of students has been exaggerated. A tabulation of the frequency of consumption of separate snack items identified candy and cookies as the foods chosen most often (Figure 1). When food selection in 1977 was tabulated for each sex (Figure 2), cookies were chosen more often by the males and candy more by the females. A higher consumption of crackers and bread by the females was observed, but the males chose fruit and milk more frequently than did the females. Availability and cost of these snack items could be studied by nutrition educators.

Anthropometry

The classification of the subjects measured in 1975 according to Jelliffe's (15) standard values is shown in Table 7 where 6% of the 199 sub-

jects were underweight, whereas 27% were 110% or more of standard weight with 10% classified as overweight and 17% were considered obese. Categorization within a group was made when weight for age and height plus one other measurement, either arm circumference or triceps skinfold, indicated underweight, overweight, or obesity. The charts and tables of height-weight age relationships from the combined data of Stuart (Boston) and Meredith (Iowa) that were taken from Jelliffe were found regularly in journal articles. As recently as 1979, Trowbridge utilized Jelliffe, Stuart, and Meredith tables as standards when comparing clinical, biochemical, and anthropometric measurements (20). Others (21, 22) have contended that the standards were not satisfactory for all groups as they were based on earlier generations of limited populations.

An alternative method of growth assessment was provided with the publication of new percentile curves and charts by the National Center for Health Statistics Task Force. These charts were constructed from measurements made on large nationally representative samples of children during Cycles II and III of the Health and Nutrition Examination Survey and from the Fels Institute. The percentage of 1975 subjects placed in each of the eight NCHS percentile distributions from identical measurements utilized in the Jelliffe standard comparison is shown in Tables 8-10. Comparisons of NCHS standards were made according to sex and age for height, weight, and triceps skinfold. In Table 8 where the subjects are classified according to height for age, the trend toward a population that is shorter is observed with 58% of the subjects being less than the fiftieth percentile. In the 6 year old group the entire population is less than the fiftieth percentile while 87% of the 7 year old children are also less than the fiftieth percentile. Overall, 25% of the children are in the twenty-fifth percentile group with only 21% falling in the fiftieth percentile where the largest number is predicted.

Since the triceps skinfold measurement is used by some workers (21) for an indication of overweight while others (23) recommend weight for height, both measurements were considered in Tables 9 and 10. Although the percentage of subjects classified in the fiftieth percentile is in agreement by both measures, the values for the ninety-fifth percentile range from 6% for weight to 9% for triceps skinfold. Since Hamill (22) stated that for children in the ninetieth percentile referral for medical evaluation may be indicated, the sums of 11% according to weight and 14% according to triceps skinfold could be in agreement with the 17% of the subjects shown to be more than 120% of the Jelliffe standard in Table 7. The fact that only 8% of the subjects were categorized in the ninetieth and ninety-fifth percentiles for height (Table 8) indicates the need for a longitudinal growth study on those subjects falling in the high percentile groups for weight and triceps skinfold measurements.

Another indication that the subjects in this study tend to be shorter and heavier than the national standards may be found by comparing the total percentage of subjects in the fiftieth percentile and greater for weight (Table 9) which is 51% with the comparable percentiles for height (Table 8) which is 43%. A variable that could confuse the interpretation of the data is the definition of chronological age, which may become important during periods of rapid growth (24). In this study and in NCHS charts age was brought to the nearest birthday so "12 years" might include any age between 11½ and 12½ years. In the longitudinal analyses, the fact that three measurements were made from January to March of every other year could provide a more narrow definition of chronological age.

The analyses of the measurements made in 1977 utilizing the NCHS standards are shown in Tables 11-13. The distribution according to height percentiles in Table 11 does not show the predominance of shorter subjects observed in 1975. It appears that omission of the younger children (six to eight years), shown in Table 8 in the lower percentiles, accounts for the difference.

The report that obese adolescents have 80% chance for being obese adults (25) demands attention for the 12% of the population (Table 12) that is in the ninetieth and ninety-fifth percentiles with the 12, 13, and 14 year old groups having higher percentages of obese individuals than the younger groups. Nationally, ten to twenty percent of all adolescents are in the obese classification (26). Table 13 is of value only to warn researchers to standardize techniques for measuring triceps skinfold measurements for all phases of the study. The distribution demonstrates consistency in that the same individual made all measurements and they were high. The possibility that measurement of the right arm instead of the left arm from which NCHS percentiles were constructed was considered. Burgert and Anderson (21) presented data that suggest that it is appropriate to consider right and left arm measurements equivalent for heterogeneous groups of males and females.

In Table 14 a comparison of the percentage of subjects falling into five groups in 1975 and 1977 is based on interpretation of data plotted against NCHS percentiles. Hamill, et al. (22) stated that measurements between the twenty-fifth and seventy-fifth percentiles are likely to represent normal growth. Measurements between the tenth and twenty-fifth, and the seventy-fifth and ninetieth percentiles may or may not be normal. They recommended that values above the ninetieth and below the tenth percentiles should be carefully checked for measurement and recording accuracy and that referral for medical evaluation might be indicated. These five groups include *Low* for individuals in < 5 and 5th percentiles, *Moderately Low* for the tenth percentile, *Normal* for the twenty-fifth

and fiftieth percentiles, *Moderately High* for the seventy-fifth percentile, and *High* for the ninetieth and ninety-fifth percentile. The percentages shown in Table 14 represent totals of percentage of subjects classified according to sex and age into appropriate precentiles. The interpretation of these data requires further study and a survey of individual records to determine if the height and weight channels of percentiles are in agreement.

SUMMARY AND CONCLUSIONS

A protocol for interviewing students in classroom groups as a part of the Glenburn nutrition education program was developed. The procedures for assessment of dietary intakes and anthropometric measurements at two year intervals have been described. It was found that group interviewing in grades four through eight provided dietary records that could be computerized for comparison with the RDA. A system for classifying anthropometric measurements into NCHS percentiles was developed for future surveillance of populations.

The nutrient intakes of the males were higher than those of the females for all nutrients except vitamin A in 1977 and vitamin C in both years. The subjects reported significantly greater intakes of energy, protein, fiber, calcium, iron, and niacin in 1977 than in 1975, although intakes of protein, calcium, and niacin were more than adequate in 1975. The possible effect of the nutrition education on the increase in dietary intake remains hypothetical since there was no attempt to measure the actual food consumption. Perhaps at the least, the fact that it was recorded does reflect an increased awareness which may be a realistic goal for nutrition educators in elementary schools.

Although the subjects consistently consumed less than 100% RDA for energy, the only nutrient with a mean less than 67% RDA was iron. The mean iron intake for 11-14 year old females in 1975 was 7.7 mg which could pose a problem for individuals in the adolescent growth stage. The increase to a mean intake of 12.1 mg in 1977 could be due to the increased enrichment practices or it could reflect the nutrition education in which high iron foods were stressed. Since the percentage contribution to energy of the foods eaten between meals was higher than that contributed to iron, educators need to plan activities to stress the protective foods. Three of the five most frequently consumed snack foods were bread/crackers, fruit, and milk but they were chosen less frequently than candy and cookies.

Although agreement between Jelliffe's standards and the NCHS percentiles was demonstrated, the decision was made to utilize the NCHS percentiles for comparison of growth data and for identification of individuals requiring medical evaluation. Summary tables for height, weight, and triceps skinfold measurements showed distribution of the subjects

within the eight NCHS percentiles based on individual comparison to standard for age and sex. A comparison of subjects in 1975 and 1977 showed an increase over time in the percentage of subjects who were in the ninetieth and ninety-fifth percentiles for height with little change in the percentage who were in the ninetieth and ninety-fifth percentiles for weight. No measure of activity levels was made, but it is interesting to note that the addition of a physical education program occurred early in this study.

Since 11-12% of the individuals were in the high weight group and present greater risk for adult obesity, they should be studied further. There should be a comparison of the height and weight of these individuals to standards and assessment of their dietary status. In addition, it is recommended that there be a continuation of collection of longitudinal growth data, of standardization of measurement techniques, and of development of instructional materials to improve food selection.

REFERENCES CITED

1. Burgess, A. and Dean, R.F.: Malnutrition and Food Habits. N.Y.: Macmillan, 1962.
2. Wateki, Catherine E.: Building consensus for nutrition education Research. J. Nutr. Ed. 11: 7, 1979.
3. Snowman, M.K.: Nutrition component in a comprehensive child development program. J. Am. Dietet. A. 74: 124, 1979.
4. Frank, G.C., Berenson, G.S., Schilling, P.E. & Moore, M.C.: Adapting the 24-hour recall for epidemiologic studies of school children. J. Am. Dietet. A. 71: 26, 1977.
5. Vital and Health Statistics Series 11, No. 120, 123, 124, & 132. DHEW publication no. (HSM) 73-1602, 1605, 1606 & no. (HRA) 74-1614.
6. Food and Nutrition Board. Recommended Dietary Allowances. Eighth Revised Edition. Washington, D.C.: Natl. Acad. Sci., 1974.
7. Watt, B.K., and Merrill, A.L.: Composition of Foods — Raw, Processed, Prepared. Rev. USDA Agric. Handbook no. 8, 1963.
8. Adams, C.F.: Nutritive Value of American Foods in Common Units. USDA Agric. Handbook no. 456, 1975.
9. Cobb, J.B., Merrow, S.B. & Howard, B.C.: Composition of Food. Dept. of Home Econ., Univ. of Vermont, Burlington, Vt., 1969.
10. Asp, E.: Computer Assisted Instruction. Food Science & Nutrition Department. University of Minnesota, St. Paul, 1978.
11. Bergan, J.G., Caldwell, M., & Brown, P.T.: NUTR-0776. Univ. of R.I., Dept. of Food Sci. & Tech. Nutrit. & Dietet., 1976.

12. Nie, N.H., Hull, C.H., Jenkins, J.G., Steinbrenner, K., & Bent, D.H.: Statistical Package for the Social Sciences. 2nd ed. N.Y.: McGraw-Hill Book Co., 1975.

13. Fomon, S.: Guidelines for Screening Children. USDA HEW 17, 1971.

14. Hamill, P.V., Johnston, F.E., & Grams, W.: Height and Weight of Children. Pub. Health Soc. Pub. No. 1000 Series 11- No. 104, 1975.

15. Jelliffe, D.B.: An Assessment of Nutritional Status, Geneva: WHO, 1966.

16. Brown, P.T., Bergan, J.G. and Murgo, C.F.: Current trends in food habits and dietary intakes of home economics students in three junior high schools in Rhode Island. Home Ec. Res. J. 7: 324, May, 1979.

17. Food and Nutrition Board. Recommended Dietary Allowances. Ninth Revised Edition. Washington, D.C.: Natl. Acad. Sci., 1980.

18. Koh, E.T. and Caples, V.,: Nutrient intakes of low income black families in southwestern Mississippi. J. Am. Dietet. A. 75:665, 1979.

19. Thomas, J.A. and Call, D.L.: Eating between meals — a nutrition problem among teenagers? Nutrition Reviews 31: 137, 1973.

20. Trowbridge, T.L.: Clinical and biochemical characteristics associated with anthropometric nutritional categories. Am. J. Clin. Nutr. 32: 785, 1979.

21. Burgert, S.L. and Anderson, C.F.: An evaluation of upper arm measurements used in nutritional assessment. Am. J. Clin. Nutr. 32: 2136, Oct., 1979.

22. Hamill, P.V.V., Drizd, T.A., Johnson, C.L., Reed, R.B., Roche, A.F., & Moore, W.M.: Physical growth: National Center for Health Statistics percentiles. Am. J. Clin. Nutr. 32: 607, 1979.

23. Anderson, M.A.: Comparison of anthropometric measures of nutritional status in preschool children in five developing countries. Am. J. Clin. Nutr. 32: 2339, 1979.

24. Martin, E.A. and Beal, V.A.: Roberts' Nutrition Work with Children, 4th ed. Chicago, Univ. of Chicago Press, 1978.

25. Abraham, S. and Nordsieck, M.: Relationship of excess weight in children and adults. Public Health Reports 75: 263, 1960.

TABLE 1

Mean Energy and Nutrient Intakes of 7-15 Year Old Students

Age (years)	No.	Energy (kcal.)	Protein (g.)	Calcium (mg.)	Iron (mg.)	Vitamin A (mg.)	Thiamin (mg.)	Riboflavin (mg.)	Niacin (mg.)	Vitamin C (mg.)
7-10										
1975	54	1561 ± 462*	63.5 ± 21.7	871 ± 494	7.9 ± 2.9	6241 ± 2906	1.1 ± 1.2	1.8 ± 2.2	11.5 ± 4.7	67 ± 52
1977	36	1977 ± 490	74.2 ± 20.2	1063 ± 407	12.2 ± 3.6	4754 ± 2506	1.2 ± 0.4	1.9 ± 0.6	14.5 ± 4.7	66.4 ± 42.1
11-14										
Males										
1975	34	1947 ± 563	74.4 ± 21.9	1061 ± 385	10.6 ± 5.0	6173 ± 5532	1.2 ± 0.4	1.9 ± 0.6	13.3 ± 5.4	92 ± 78
1977	61	2297 ± 584	89.5 ± 20.4	1198 ± 569	15.1 ± 4.2	5211 ± 6406	1.4 ± 0.4	2.2 ± 0.7	19.1 ± 6.5	74.5 ± 45.3
Females										
1975	39	1603 ± 480	63.4 ± 19.6	833 ± 341	7.7 ± 2.6	4163 ± 2682	1.1 ± 1.1	1.5 ± 0.6	11.0 ± 4.6	105 ± 119
1977	58	1856 ± 605	69.4 ± 22.4	966 ± 811	12.1 ± 4.9	5571 ± 5858	1.1 ± 0.4	1.7 ± 0.7	14.4 ± 5.2	91.2 ± 60.3
15										
Males										
1975	3	2414 ± 1142	97.5 ± 31.7	1120 ± 565	15.0 ± 5.8	9708 ± 7822	1.4 ± 0.7	2.1 ± 0.9	19.0 ± 5.1	122 ± 115
1977	5	2294 ± 117	95.0 ± 17.7	1302 ± 524	15.0 ± 0.2	4332 ± 1786	1.2 ± 0.1	2.6 ± 0.5	21.1 ± 6.1	55.3 ± 26.8
Females										
1975	4	1578 ± 250	54.2 ± 17.3	981 ± 394	6.8 ± 2.8	4794 ± 4194	0.9 ± 0.4	1.6 ± 0.6	9.6 ± 3.6	117 ± 102

*Standard deviation of the mean

TABLE 2

Percent Recommended Dietary Allowance (RDA)* of Mean Energy and Nutrient Intakes of Glenburn Students Age 7-15

Subjects	Number	Kcal	Protein	Ca	Fe	Vit A	Vit B_1	Vit B_2	Niacin	Vit C
7-10 years										
1975	54	65	176	109	79	189	92	150	72	168
1977	36	82	206	133	122	144	100	158	90	166
11-14 years										
Males										
1975	34	69	169	88	58	123	86	126	74	204
1977	61	82	203	100	84	104	100	146	106	166
Females										
1975	39	67	144	69	43	104	92	115	69	233
1977	58	77	158	80	67	139	92	131	90	203
15 years										
Males										
1975	3	80	180	93	83	194	93	117	95	271
1977	5	76	176	108	83	87	80	144	106	123
Females										
1975	4	75	113	82	38	120	82	114	68	260

*1974 NRC RDA

TABLE 3

Comparison of Mean Energy and Nutrient Intake of Glenburn Subjects in 1975 and 1977

Nutrient	1975[a]	1977[b]	Difference
Kilocalories	1689 ± 515[c]	2070 ± 596	381.00**
Protein (g.)	66.7 ± 21.2	79.0 ± 22.8	12.40**
Fiber (g.)	2.48 ± 1.30	3.36 ± 1.69	.87**
Calcium (mg.)	920.5 ± 412	1085.0 ± 641	165.00*
Iron (mg.)	8.6 ± 4.0	13.4 ± 4.0	4.80**
Vitamin A (I.U.)	5473 ± 4989	5196 ± 5406	−277.00
Thiamin (mg.)	1.1 ± 1.0	1.2 ± 0.9	0.10
Riboflavin (mg.)	1.7 ± 1.0	2.0 ± 1.0	0.30
Niacin (mg.)	11.9 ± 5.0	16.7 ± 7.0	4.80**
Vitamin C (mg.)	87.5 ± 83	78.2 ± 51	−9.30

[a] 1975 n = 134
[b] 1977 n = 160
[c] Standard Deviation of the Mean
* Significantly different at $p < 0.01$ level
** Significantly different at $p < 0.001$ level

TABLE 4

Percentages of Subjects With Energy and Nutrient Intakes at Levels Below Two-thirds of the Recommended Dietary Allowances* by Age and Sex Based on 2 and 3 day records

	age and sex					
	7-10 years		11-14 year males		11-14 year females	
Nutrient	1975 n=54	1977 n=36	1975 n=34	1977 n=61	1975 n=39	1977 n=58
	Percent below ⅔ of RDA					
energy	54	22	44	25	56	38
protein	2	0	0	0	8	0
calcium	26	8	24	10	54	50
iron	39	3	76	25	92	55
vitamin A	30	17	35	49	33	33
thiamin	39	17	35	10	39	24
riboflavin	7	0	3	2	8	10
niacin	46	19	35	8	49	24
ascorbic acid	19	17	21	8	15	7

*1974 NRC RDA

FIGURE 1

Ten Food Items Most Commonly Chosen for Snacks, Listed in Order of Frequency

1975	1977
Candy	Cookies
Fruit	Candy
Cookies	Crackers/Bread
Crackers/Bread	Fruit
Milk	Milk
Cake/Doughnuts	Soda
Ice Cream	Cake/Doughnuts
Chips	Ice Cream
Gum	Gum
Soda	Chips

TABLE 5

Mean Energy and Nutritive Values of Between-Meal Snacks

Age	Sex	Group	Energy (kcal)	Pro (g)	Ca (mg)	Fe (mg)	Vit A I.U.	Thiamin mg.	Ribo mg.	Niac mg.	Vit C mg.
9	M[a] & F[b]	A[c]	466 ± 325*	12.1 ± 9.5	128	2.5	711	.19	.24	2.3	19
		B[d]	1359 ± 740	34.0 ± 29.5	525	4.2	1124	.53	1.11	6.0	23
10	M & F	A	481 ± 357	12.7 ± 14.6	204	1.6	651	.22	.32	2.1	42
		B	1145 ± 990	24.5 ± 21.4	567	3.6	1111	.34	.66	3.8	25
11	M	A	456 ± 293	10.9 ± 10.6	206	2.2	289	.13	.31	2.4	2
		B	1096 ± 858	22.6 ± 23.2	329	4.2	964	.37	.62	5.4	32
	F	A	503 ± 309	12.5 ± 10.1	253	1.2	419	.19	.37	1.8	9
		B	1117 ± 612	21.4 ± 13.8	321	3.6	1955	.35	.51	4.9	15
12	M	A	469 ± 222	13.8 ± 10.3	178	2.0	402	.19	.28	2.4	15
		B	1084 ± 660	21.8 ± 13.5	332	3.7	703	.34	.52	5.1	20
	F	A	175 ± 77	2.5 ± 1.8	55	0.6	100	.07	.06	.7	11
		B	943 ± 625	15.6 ± 11.6	278	2.9	636	.28	.45	2.5	13
13	M	A	612 ± 269	15.5 ± 12.2	239	2.2	418	.18	.37	2.4	4
		B	1347 ± 1208	30.1 ± 31.6	525	3.2	913	.42	.90	8.2	35
	F	A	799 ± 518	11.4 ± 8.7	280	2.4	570	.29	.38	2.1	80
		B	1340 ± 976	32.3 ± 33.3	452	4.5	864	.54	.70	10.8	49
14	M	A	1177 ± 1400	26.6 ± 32.6	591	2.5	1809	.36	.89	4.1	19
		B	1373 ± 980	37.7 ± 44.3	669	4.4	1238	.52	1.12	6.9	43
	F	A	594 ± 464	12.2 ± 13.4	223	1.6	463	.23	.33	1.5	10
		B	986 ± 579	23.6 ± 12.3	374	3.6	1285	.45	.64	5.4	53
15	M & F	A	532 ± 484	10.5 ± 10.6	199	1.4	1041	.17	.31	1.7	1
		B	1630 ± 1349	40.9 ± 34.3	713	6.3	2495	.70	1.18	9.7	36

[a]M = Males
[b]F = Females
[c]A = 1975
[d]B = 1977
*Standard Deviation of the Mean

TABLE 6

Average Percent Contribution of Between-Meal Snacks to the Daily Nutrient Intake of Students in Glenburn School in 1975 and 1977

Age (Years)	Sex	Group	Kcal	Protein	Ca	Fe	Vit A	Vit B[1]	Vit C
					Percent	Total	Intake		
9	M[a] & F[b]	A[c]	13	10	5	16	9	10	17
		B[d]	25	17	19	18	14	19	20
10	M & F	A	15	10	12	10	5	10	12
		B	17	10	14	10	9	9	8
11	M	A	12	7	10	11	3	6	2
		B	18	9	10	13	11	8	18
	F	A	14	8	13	7	6	9	5
		B	19	10	10	12	13	11	5
12	M	A	15	11	11	14	9	10	12
		B	16	8	11	10	9	11	10
	F	A	9	4	7	7	3	8	11
		B	17	8	11	10	5	9	4
13	M	A	15	10	10	10	5	16	3
		B	16	10	12	7	9	11	12
	F	A	26	10	18	16	9	18	44
		B	23	14	15	16	11	17	17
14	M	A	21	14	16	11	12	12	13
		B	19	13	15	11	13	14	11
	F	A	16	10	11	13	6	14	5
		B	21	13	17	14	11	14	20
15	M & F	A	15	11	12	8	6	10	1
		B	21	13	20	13	12	15	7

[a]M = Males
[b]F = Females
[c]A = 1975
[d]B = 1977

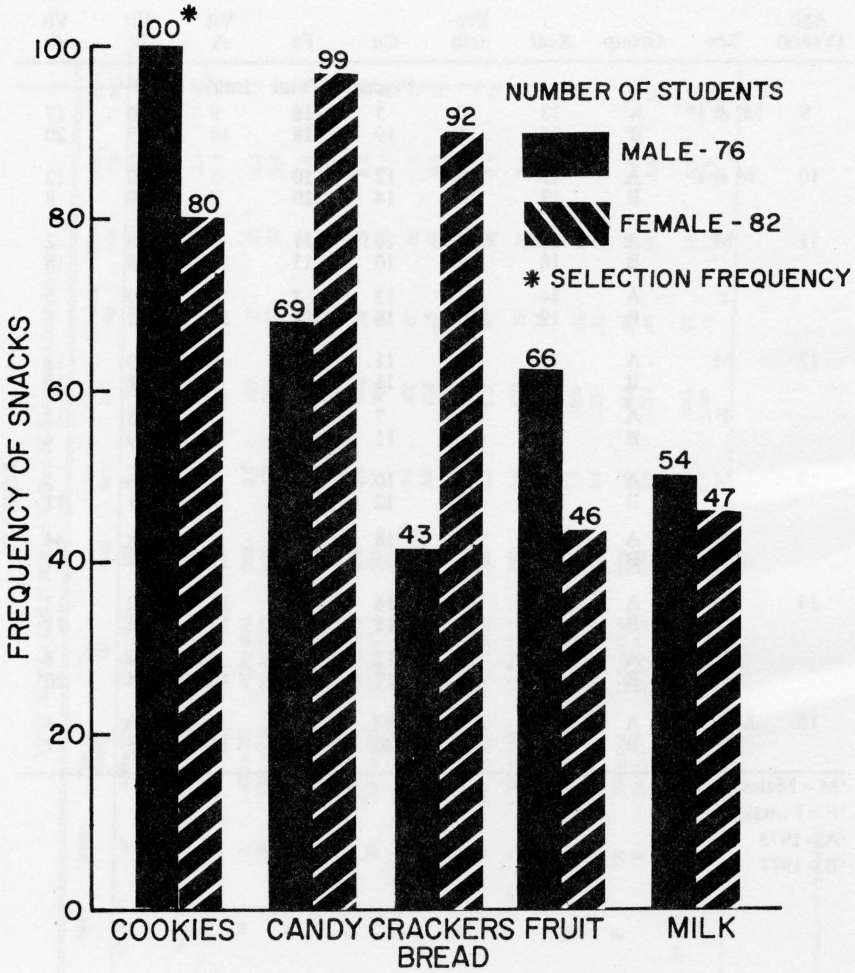

Figure 2. Cumulative snack frequency according to sex, 1977

TABLE 7

Comparison with Jelliffe Standards[1] for Weight, Arm Circumference, and Triceps Skinfold of Children 6-15 years, 1975

Age (Years)	Number	≤90% Standard	91-109% Standard	110-119% Standard	≥120% Standard
		% Subjects			
6	20	0	70	20	10
7	12	0	100	0	0
8	16	12	56	19	13
9	13	8	69	0	23
10	21	5	57	5	33
11	39	5	62	15	18
12	27	4	78	4	15
13	22	14	65	5	18
14	21	5	62	14	19
15	8	0	88	0	13
TOTAL	199	6	68	10	17

[1]Jelliffe, D.B., An Assessment of Nutritional Status p. 231, 233, 237

TABLE 8

Percentage of Children 6-15 Years Classified by NCHS Percentiles of Height for Age, 1975

Age (Years)	Number	Percentile							
		<5	5	10	25	50	75	90	95
		%							
6	10	0	20	30	50	0	0	0	0
7	8	12	12	25	38	0	0	0	12
8	13	8	0	8	23	46	8	0	8
9	12	17	8	8	25	25	8	0	8
10	18	0	6	17	39	22	11	11	6
11	24	8	17	8	17	21	21	4	4
12	15	7	7	27	7	33	13	0	7
13	10	0	30	10	0	10	40	10	0
14	13	23	0	15	31	0	31	0	0
15	7	0	14	14	43	0	14	0	14
TOTAL	130	7	11	15	25	21	14	3	5

TABLE 9

Percentage of Children 6-15 Years Classified by Percentiles (NCHS) of Weight for Height, 1975

Age	No	Percentile							
		<5	5	10	25	50	75	90	95
		% Subjects							
6	10	0	0	30	20	30	20	0	0
7	8	0	0	0	50	38	12	0	0
8	13	0	0	15	23	23	23	0	15
9	12	17	0	0	17	33	17	8	8
10	18	0	0	17	33	6	22	11	11
11	24	8	0	17	17	29	21	4	4
12	15	0	0	27	20	33	7	7	7
13	10	30	0	20	20	20	10	0	0
14	13	15	8	15	15	8	15	15	8
15	7	0	0	14	57	14	14	0	0
TOTAL	130	7	1	16	25	23	17	5	6

TABLE 10

Percentage of Children 6-15 Years Classified by Percentiles (NCHS) According to TSF, 1975

Age	No	Percentile							
		<5	5	10	25	50	75	90	95
		% Subjects							
6	10	0	0	0	40	20	40	0	20
7	8	0	0	38	13	0	50	0	0
8	13	0	8	46	8	39	0	0	0
9	12	25	0	33	0	25	0	17	0
10	17	12	12	35	0	18	6	0	18
11	24	0	0	8	21	38	8	8	17
12	15	7	0	13	33	27	13	0	7
13	10	0	10	20	30	10	10	10	10
14	13	0	15	8	15	23	23	8	8
15	7	14	0	0	43	29	0	0	14
TOTAL	129	5	5	20	19	24	13	5	9

TABLE 11

Distribution of Glenburn Subjects Age 9-15 According to NCHS Height Percentiles Based on Age, 1977

Age	No	NCHS PERCENTILES							
		<5	5	10	25	50	75	90	95
		Percent							
9	10	0	0	20	30	20	30	0	0
10	25	0	0	16	16	20	32	4	12
11	39	3	3	10	15	33	13	10	13
12	20	5	5	10	30	10	15	0	25
13	14	0	0	14	21	7	29	7	21
14	16	6	6	0	25	25	31	0	6
15	3	0	33	0	0	33	0	0	33
TOTAL	127	2	3	11	20	22	22	5	14

TABLE 12

Distribution of Glenburn Subjects Age 9-15 According to NCHS Weight Percentiles Based on Height and Sex, 1977

Age	No	NCHS PERCENTILES							
		<5	5	10	25	50	75	90	95
		Percent							
9	10	0	20	20	30	10	20	0	0
10	25	0	12	12	16	36	16	8	0
11	39	3	10	21	18	23	18	3	5
12	20	10	0	25	20	20	10	10	5
13	14	7	0	0	21	21	21	14	4
14	16	13	6	6	19	19	25	0	13
15	3	33	0	0	33	33	0	0	0
TOTAL	127	6	8	15	20	24	17	6	6

TABLE 13

Distribution of Glenburn Subjects Age 9-15 According to NCHS Triceps Skinfold Based on Age and Sex, 1977

Age	No	NCHS PERCENTILES							
		<5	5	10	25	50	75	90	95
		Percent							
9	10	0	0	0	0	0	10	20	70
10	24	0	0	0	4	0	8	17	71
11	38	0	0	0	0	8	13	37	42
12	26	0	0	0	4	15	23	19	39
13	31	0	0	0	3	19	32	19	26
14	21	0	0	0	14	19	24	14	29
15	4	0	0	0	0	25	50	0	25
TOTAL	154	0	0	0	4	12	20	22	42

TABLE 14

Percentage of Glenburn Subjects Grouped According to Placement in NCHS Percentiles for Height and Weight According to Age and Sex

Groups	Height		Weight	
	1975	1977	1975	1977
	Percent			
Low[a]	18	5	8	14
Moderately Low[b]	15	11	16	15
Normal[c]	45	42	48	44
Moderately High[d]	14	22	17	17
High[e]	8	19	11	12

[a] < 5 and 5th percentiles
[b] 10th percentile
[c] 25th and 50th percentiles
[d] 75th percentile
[e] 90th and 95th percentiles

APPENDIX

Appendix A

Protocol for instructions to elementary school children for keeping food records.

1. Introduction of investigators and statement of objectives of study, relating the outcomes to advantages perceived as valuable by the subjects at various developmental stages represented.
2. Distribution of three page instrument for food intake records (Appendix C). A separate page is utilized for each day with spaces provided for food, method of preparation and amount for 3 meals and 3 snacks.
3. Display of commonly used dishes with a comparison of sizes of such items as small, medium, and large glasses used for juice and milk; and cereal bowls ranging from traditional fruit saucer to soup bowl to "plastic butter tub". Measuring cups and spoons are displayed and related to commonly used containers and metric measurements are introduced when appropriate.
4. Display of food models for visualization of amounts eaten.
5. Demonstration of label reading for determination of contents, utilizing ½ pt. milk cartons, candy wrappers, potato chip bags, and other snack food items.
6. Instructions include:
   - — Write your name at top of each page.
   - — List every bite you have eaten today on the first page, entering the name of the food; such description as fried, cooked cereal, frozen or canned fruit or vegetable; and the amounts based on the containers you have seen in the display.
   - — When milk is listed, identify it as skim, low fat, homogenized or chocolate by reading the label.
   - — When bread is listed, identify it as white, whole wheat, rye, or corn.
   - — Describe packaged products that come from a mix box or can such as macaroni and cheese or Spaghettios® by the brand name.
   - — When your mother makes food from basic ingredients, please list them for such foods as American chop suey, vegetable soup, and other homemade dishes.
   - — List such condiments as sugar, margarine, ketchup, salad dressing and jelly or jam.
   - — If you eat sandwiches, please list all parts and give amounts, e.g.

Bread	Bonnie Maid	White	2 slices
Peanut Butter	Staff	Chunky	2 Tbsp

— In listing snack items such as candy bars, gum, or peanuts, record the brand name of the item, the company, and the weight given on the package.

7. While the subjects are recalling and recording foods eaten at breakfast and mid-morning snacks, the investigators and the teacher should circulate through the classroom to answer questions and to provide food models or measuring instruments or dishes to assist in decisions of amounts consumed. Each record should be quickly examined to allow input by investigator for additional descriptive information.
8. A discussion of the lunch menu offered in the school lunchroom will include examination of the listing on the board of all items on the menu and amounts of standard portions.
9. Procedures for listing all foods eaten in the next 3 days will include:
   — When you return from the lunch room, please record the food and amount that you ate.
   — Leave the record sheets in your desk and add to them each morning.
   — Please use a separate sheet of paper for recording everything that you put into your mouth from the time you leave school until you return in the morning.
   — Ask your parents to assist in recording accurate amounts of all your snacks; beverages and ingredients of food served at home. Use measuring cups and spoons; measure the size with a ruler; or draw a picture of the actual size.
   — If you eat in a restaurant or drive-in, please give the name of the establishment, the name of the items as ordered, the size of the item, and how much of the portion you ate.
10. Following collection of the dietary record forms at the end of the third day, the investigator should examine the entries for such obvious omissions as listing of dry cereal without milk or listing of hamburger and no bun. The subjects who turned in incomplete records should be interviewed individually for clarification.

APPENDIX B TABLE 1

Coding Directions for Average Nutrient Values and Anthropometric Measurements

Code	Column	Code	Column
Subject Number	1-4	Subject Number	1-4
Age	6-7	Niacin	6-12
Sex	9	Ascorbic Acid	14-20
kcal	11-16	Weight (Kg)	23-26
Total Protein	18-24	Height (Cm)	29-33
Fiber	26-30	Arm Circum.	36-39
Ca	32-39	Triceps Skinfold	42-45
Fe	41-47	Cholesterol	47-51
Vit A	49-57	Card Number	80
Thiamin	59-65		
Ribloflavin	67-73		
Card Number	80		

TABLE 2

System for Coding Glenburn Subjects According to Age, Sex and Percentage RDA

AGE	CODE (X)	PERCENT RDA	CODE (Y)
4-6, male and female	1	Greater than or = 100%	1
7-10, male and female	2	67–99%	2
11-14, male	3	34–66%	3
11-14, female	4	0–33%	4
15-18, male	5	Greater than ⅓ more than	
15-18, female	6	standard of RDA for kcal	5
19-22, male	7		
19-22, female	8		

Where X is equal to the age group

Where Y is equal to one of the groups representing percentage of the NRC Recommended Daily Dietary Allowances, 1974

TABLE 3

Coding System Used for Percentiles for Anthropometry

< 5th Percentile = 1	50th Percentile = 5
5th Percentile = 2	75th Percentile = 6
10th Percentile = 3	90th Percentile = 7
25th Percentile = 4	95th or > Percentile = 8

APPENDIX C

Three Day food Intake. Day I

NAME: _____ Please list every food that you put in your mouth for one day, including snacks and meals. Describe the food, how it was prepared and amounts eaten.

Breakfast	Amount	Snack	Amount
		Dinner	Amount
Snack	Amount		
Lunch	Amount		
		Snack	Amount

APPENDIX C — Continued

Three Day food Intake. Day II

NAME: _____ Please list every food that you put in your mouth for one day, including snacks and meals. Describe the food, how it was prepared and amounts eaten.

Breakfast	Amount	Snack	Amount
		Dinner	Amount
Snack	Amount		
Lunch	Amount		
		Snack	Amount

APPENDIX C — Continued

Three Day food Intake. Day III

NAME: _____ Please list every food that you put in your mouth for one day, including snacks and meals. Describe the food, how it was prepared and amounts eaten.

Breakfast	Amount	Snack	Amount
		Dinner	Amount
Snack	Amount		
Lunch	Amount		
		Snack	Amount

APPENDIX D

Student Record for Longitudinal Study

Name _____ Male Female

Birthdate _____
year month day

Date examined	*Age*	*Height (cm)*	*Weight (kg)*
1			
2			
3			
4			
5			

Arm Circumference (cm)	*Triceps Skinfold (mm)*			
	1	*2*	*3*	*Recorded*
1				
2				
3				
4				
5				

Percent Above Ideal Weight	*Weight Class*
1	
2	
3	
4	
5	

Obese — O
Overweight — OWT
Normal — N
Underweight — U