NUTRITIONAL ASSESSMENT OF CHILDREN ENROLLED IN A STRUCTURED CHILDCARE SETTING

By

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Abstract

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Determining the nutrition status of children in a structured daycare setting will reflect their health status. Children who have proper nutritional status are generally in better health and have a decreased risk for developing disease in the future. A nutritional assessment can detect any abnormal ranges at an early age so that lifestyle changes can take place before the problem elevates into something more serious with adverse consequences. The purpose of this study was to provide a nutritional status profile of children who attend the Child and Family Study Center at UW-Stout.

This cross-sectional study, descriptive in nature, involved children between the ages of 12 to 71 months who attended the University of Wisconsin-Stout's Child and Family Study Center from August 2000 to May 2001. The components of a nutrition assessment were: income level, list of medications, height, weight, BMI, blood pressure, blood glucose levels, total cholesterol level, hemoglobin levels, and a food frequency questionnaire on fruit and vegetable intake. Of the 34 participants, 26 were involved in biochemical testing.

After pilot testing, height, weight, and blood pressure were measured by a registered dietitian. Glucose, cholesterol, and hemoglobin were measured by a Medical Technician and

performed at the Nutrition Assessment Laboratory for Education and Research (NALER). NALER is a Clinical Laboratory Improvement Amendments (CLIA)-approved laboratory. Of the children, 25, 27, and 33 had height, weight, weight-for-length values between the 5th and 95th percentile, respectively. Mean hemoglobin level of 12.5mg/dL was normal; 11.5% of the children had a level below 11mg/dL (n=3). The mean cholesterol was 157 mg/dL, while 32% of the children (n=8) had borderline cholesterol. Mean glucose and blood pressure readings were normal at 98mg/dL and 92/58 mmHg, respectively.

Extremely high mean serving sizes and percentages of fruits and vegetables that met the Food Guide Pyramid (FGP) were reported by the parents in a Food Frequency Questionnaire. The average fruit intake was 454% (9 servings) of the minimal servings of the Food Guide Pyramid's recommendations. Ninety percent of the children met the recommendations of the Food Guide Pyramid for fruit intake (2 servings). The average vegetable intake was 89% (2.7 servings) of the minimal servings of the Food Guide Pyramid's recommendations. Thirty-seven percent of the children met the recommendations of the Food Guide Pyramid for vegetable intake (3 servings). The average combined fruit and vegetable intakes were 235% of the "5 A Day" recommendations. Eighty percent of the children met the recommendations of "5 A Day" for combined intakes of fruits and vegetables.

Pearson correlations revealed that the percentage of fruits that met the Food Guide Pyramid had an inverse statistical association with diastolic blood pressure ($r=-.52$, $p=<.05$) and hemoglobin ($r=.44, p=<.05$). Also, an inverse statistical association was discovered between diastolic blood pressure and the percentage met for fruits and vegetables according to the "5 A Day" recommendations ($r= -.49$, $p=<.05$).

Average income was $59,500. In this study, given a good income, nutritional status was good, but borderline cholesterol was found in a certain number. Limited current nutritional research studies on the nutritional status of preschool-aged children indicate further research is needed. Data from all components of a nutritional assessment are crucial to provide a full review of children's nutritional status.

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List of Abbreviations

A.S.C.P. -	American Society of Clinical Pathologist
BMI -	Body Mass Index
CDC -	Center for Disease Control
CFSC –	Child and Family Study Center
CLIA -	Clinical Laboratory Improvement Amendments
CSFII -	Continuing Surveys of Food Intakes by Individuals (CSFII)
CVA -	Cerebral Vascular Accident
CVD -	Cardiovascular Disease
DASH -	Dietary Approaches to Stop Hypertension
FFQ -	Food Frequency Questionnaire
mg/dL -	Milligrams per deciliter
M.T. -	Medical Technician
NALER -	Nutrition Assessment Laboratory for Education and Research
NCES -	Nutrition Counseling Education Services
NCHS -	National Center for Health Statistics
NHANES -	National Health and Nutrition Examination Survey
R.D. -	Registered Dietitian
USDA -	United States Department of Agriculture
UW -	University of Wisconsin-Stout

Introduction

Assessment of nutritional status in the pediatric population is useful to estimate growth patterns and identify signs and symptoms associated with malnutrition or excessive nutritional intake. Nutritional status is determined from a nutritional assessment of anthropometric, biochemical, clinical, dietary, socioeconomic, and drug-nutrient interaction effects. Each of these components reflects a child's nutrient requirements for optimal health and nutritional status (Mahan & Escott-Stump, 2000).

Nutrition plays an important part in the etiology, management, and recovery of several medical conditions. Determining nutritional status can lead to early detection of nutritional deficiencies that can lead to increased morbidity and mortality. Early nutritional support can improve nutritional status, minimizing the chances for innocuous problems becoming more serious. Nutritional assessment should be a routine procedure for people of all ages and including young children demonstrates a preventive stance.

Enrolling preschool-aged children in daycare is a common practice throughout the United States. Due to employment trends and welfare reform initiatives, more families are placing their children in out-of-home daycare and relying on them to meet their child's nutritional needs including teaching them how to eat healthy. In 1995, 31% of children under the age of five were in a structured childcare setting and 14% of children under the age of five were in family childcare homes (Briley, Jastrow, Vickers, Roberts-Gray, 1999).

The children in this study were enrolled in the University of Wisconsin-Stout's structured childcare program at the Child and Family Study Center from August 2000 to May 2001. The Child and Family Study Center (CFSC) was founded in 1926, where its, "philosophy includes an emphasis on social, emotional, physical, as well as intellectual development, enhancing the child's self-concept, developing skills in problem-solving, improving motor coordination, and facilitating concept formation" (Ryan, 2001). The National Academy of Early Childhood Program has accredited the Child and Family Study Center for complying with the criteria to provide a safe and nurturing environment while supporting the development of the young child physically, socially, emotionally, and intellectually. Seventy percent of the six-week-old infants to the six-year-old children are from parents who are students attending the University of Wisconsin-Stout and the remaining 30% are children from parents who are faculty at the University or from the community. Children at the CFSC are provided with nutritious meals and snacks. The meals are made and delivered by the Menomonie School system, which the menu consists of healthy food choices and is also served to the elderly with Meals on Wheels. The snacks are planned by and prepared on the premise by the Child and Family Study Center staff.

Significance of this study

Adequate nutrition is important among children because it affects the achievement of growth and development. Furthermore, a child's nutritional status can have an effect on their response to illness. Therefore, a nutritional assessment should be conducted on children so that their nutrition status, in turn, their health status can be identified (Mascarenhas, Zemel & Stallings, 1998). In order to determine if children who participate in a structured childcare setting are getting proper nutrition and have adequate nutritional status, a nutritional assessment reviewing anthropometric measurements, biochemical testing, blood pressure, and dietary intakes is needed. The anthropometric component of this assessment includes: height, weight, body mass index (all plotted on the Center for Disease Control (CDC) and the National Center for Health Statistics (NCHS) growth charts). Total cholesterol, blood glucose levels, and hemoglobin levels consist of the biochemical components used in this assessment. The clinical component will include the measurement of blood pressure. The dietary component of this assessment will be a Food Frequency Questionnaire (FFQ) focusing on fruits and vegetables due to research showing fruit and vegetable intake by children to be less than the recommended standards (Munoz, Krebs-Smith, Ballard-Barbash, & Cleveland, 1997). The results from this study will help characterize the nutritional status; hence the nutritional needs of children who attend the Child and Family Study Center at University of Wisconsin-Stout.

Problem Statement

Current nutrition research studies reveal a paucity of research on nutritional status of children who attend a structured childcare setting. A nutrition assessment can determine a child's nutritional status by using various anthropometric, biochemical, clinical, and dietary measurements. Determining a child's nutritional status is important because it helps define the child's health status. Proper nutrition levels are generally associated with better health status among children and later health when these children reach adolescence and adulthood. For example, a growing body of research demonstrates that many disease states in later life have their origin in childhood. Hypertension, hypercholesterolemia, glucose intolerance, orthopedic and psychosocial disorders have been associated with childhood obesity and overweight (Dietz 1998; Dietz Jr., Grss, Kirkpatrick Jr., 1982). The goal of this study was to identify the nutritional status of children who attend the University of Wisconsin-Stout's Child and Family Study Center (CFSC).

Nutritional Assessment of Children Enrolled in a Structured Childcare Setting

The primary goal was to provide a nutritional status profile of children who attend the Child and Family Study Center at UW-Stout.

The specific objectives of this study were to:

1) profile the hemoglobin, glucose, and cholesterol levels in children who attend a structured childcare center;
2) compare fruit, vegetable, and/or combination of these intakes consumed by the children to the recommended dietary intake of "5 A Day" and the Food Guide Pyramid;
3) test the associations of fruit, vegetable, and/or combination of these intakes consumed by the children with overall nutritional status as measured by blood pressure, hemoglobin, cholesterol, and glucose levels, and BMI; and
4) describe weight and height status of this sample.

Assumptions of the Study

It was assumed that the parents answered the Food Frequency Questionnaire with honesty, validity, and accuracy. The assumption was made that the children at the Child and Family Study Center felt comfortable with the examiner conducting the nutrition assessments due to the countless hours spent with the children at the daycare. Also, it was assumed that all equipment (HemoCue® and Cholestech® machines, balance-beam scale, wall stadiometer, sphygmomanometer) was calibrated and appropriate control testing was performed prior to using to yield valid and reliable results.

Limitations of the Study

Findings from this study may be affected by factors influencing the accuracy of measurements. Although measures were taken to follow exact procedures and enlist and record data collected as such, lack of cooperation among the children posed a difficulty collecting blood pressure, heights and weights. Some children would not let the examiner place the blood pressure cuff on their arm and/or moved their arm when the cuff was inflated.

Findings were limited due to some parental failure to complete all survey questions. Questions related to numbers of adults and children in the household and yearly income were frequently not completed.

Limitations were also related to use of a food frequency questionnaire to estimate fruit and vegetable intake. A common limitation with a food frequency questionnaire is the inability of the parents to accurately describe their child's usual intake while attending the Child and Family Study Center. Also, grouping certain fruits together, such as cantaloupe, watermelon, and other melons limits these foods by joining them instead of using them as single listings. Also, society tends to overestimate the consumption of nutritious foods, such as fruits and vegetables, and underestimate the consumption of less nutritional foods.

Other limitations in this study pertain to the small sample size. Small sample size causes the inability to perform certain statistical testing. Since the sample size was small, lack of diversity occurred in the sample with regards to income and ethnicity.

Organization of the Thesis

This thesis is divided into five chapters. The review of literature is the second and next chapter. The research methods are presented next in chapter III. Chapter IV reports the results, including a description of the participants, succeeding are the descriptive profiles, and the associations tested. The fifth chapter consists of the discussions, along with the conclusions, considerations for conducting nutritional assessment studies with children, and recommendations for future research.

Review of Literature

The current nutritional status of preschool-aged children

Adequate nutrition is an important requirement for children because it affects their growth and development. Furthermore, a child's nutritional status can have an effect on their response to illness. Because of this, researchers are interested in the relationship of nutrient intake in childhood to the development of later chronic disease. A nutritional assessment should be conducted on children so that their nutrition status, in turn, their health status can be identified (Mascarenhas, Zemel & Stallings, 1998).

Because of the importance of adequate nutrition for children, researchers are beginning to assess nutritional offerings for children in various settings. Structured childcare settings are examples of such settings. In order to determine whether children who participate in a structured childcare setting are receiving proper nutrition for adequate nutritional status, researchers must use nutritional assessments reviewing anthropometric measurements, nutrient blood levels, blood pressure, and dietary intakes.

A thorough search of the current literature on the nutritional status of preschool-aged children identified a minimal number of studies conducted on the nutritional status of groups of preschool-aged children using a full nutritional assessment. Although these were studies on nutrient intake in children, these studies usually focused on the dietary component rather than incorporating other components of a nutrition assessment. This review of the literature describes the research studies done on the dietary component of nutritional assessment.

Skinner et al. (1999) used a longitudinal design for a study on the nutrient and food intakes of 72 Caucasian preschool children primarily from families of middle and upper socioeconomic status and to compare children's nutrient intakes with the current recommendations. Skinner et al. determined that preschool children aged 24 to 60 months consistently consumed less than the RDA/AI for energy, zinc, folate, and vitamin D and E. Also, energy, carbohydrate, and fat consumptions were highest at 60 months while vegetables had the lowest variety scores at 60 months as well as all other ages (Skinner et al., 1999). Munoz, Krebs-Smith, Ballard-Barbash, and Cleveland (1997) sought to determine the amount of youth consuming adequate foods from each food group to meet national recommendations along with identifying food intake patterns. This study included of 3307 low-income subjects aged 2 to 19 years living in the 48 conterminous states. Munoz et al. (1997) concluded that the mean numbers of servings per day for the food groups were below the minimum recommendation with the exception of dairy for children ages two to eleven years. Other findings showed that the fiber intake was generally low among this population. Furthermore, less than one percent of the children in this study met the national recommendations of the food guide pyramid. They found that intakes of foods from the fruit and dairy group increased with higher incomes (Munoz et al., 1997).

The results of these two studies support other studies that found that preschool children have low intakes for vitamins A, C, and E, and minerals calcium, iron, and zinc (Munoz et al., 1997). Therefore, a greater proportion of nutritious foods need to be emphasized with preschool-aged children. This is especially true when children consume large amounts of food that is high in sugar, calories, and fat and not enough nutritious foods full of micronutrients, such as fruits, vegetables, whole-wheat grains, and other plant-source food.

According to Albertson, Tobelmann, Engstrom and Asp (1992), from 1978 to 1988, children aged 2 to 10 increased their percent of fat from calories slightly and consisted of 36 percent, 6 percentage points above the recommended 30 percent. Albertson et al. (1992) also reported that the percent of protein from calories decreased over this ten-year period by one point to almost 15%, while the percent of carbohydrates from calories remained the same at 50%, still short of the recommended 55 to 60%. Almost all of the micronutrient decreased among 2 to 10-year-olds during the ten-year period except for vitamin C and vitamin B6. A 17 percent decrease in calcium was the biggest decrease between 1978 and 1988. Vitamin A, riboflavin, vitamin B12, phosphorus, magnesium, and copper were other micronutrients that decreased more than ten percent. Even though, there were a large amount of nutrients that decreased over the ten-year period, 100 percent of the RDA's were met in the 2- to 10-year-olds for all nutrients except for calcium, zinc, and vitamin B6. In general, calcium and zinc intakes have been consistently lower than the RDA for preschool children and are the greatest concern (Albertson, Tobelmann, Engstrom, & Asp, 1992).

Drake (1991) studied 124 children enrolled in full-time daycare and homecare. Parameters studied include anthropometry and biochemical iron indexes. In 1991, Drake evaluated the total daily nutrients of 124 children during their enrollment in a full-time daycare and at home. Anthropometric and biochemical indexes were used to assess growth and to determine the nutritional status of iron. The nutrient and energy component of this study was compared to meeting two-third of the Recommended Dietary Allowances (RDA) while in daycare. All nutrients met 75 percent of the RDAs for each age group except for iron and folic acid. Only 50 percent of the RDA was met for each age group in both iron and folic acid. According to the Frisancho's Standards of Weight by Height, 93 percent of the children's height and weights were within normal limits. Poor nutritional status for iron was indicated in 18 percent of children aged one to three years and 12 percent in children aged four to six years.

Although few research studies have been conducted on nutritional assessment in the pediatric population, the studies that have been completed indicate that there is a need for more research in this area. Additional research studies are needed to determine children's nutritional status for proper detection of any early disease development. Early detection can lead to the awareness of some nutritional conditions that could affect the child's lifelong health.

Current nutritional problems with preschool-aged children

Weight Status

A large number of research studies have indicated that childhood overweight increased noticeably in the last years and the problem continues to increase. Being overweight as a child can increase the child's risk of being overweight as an adult. This may develop into long-term health conditions, lower quality of life, increased medical costs, and higher morbidity and mortality rates (Christoffel & Ariza, 1998). The major causes for children being overweight in the United States are excess energy intake, low energy expenditure, or both (Ogden et al., 1997). According to the National Health and Nutrition Examination Survey (NHANES), the mean energy and fat intakes among preschoolers has not increased during the last 20 years (Ogden et al., 1997); however, the physical activity among children has decreased causing an imbalance of energy input and output. Since the prevalence of childhood overweight and obesity is increasing, the emphasis to encourage and maintain daily physical activity cannot be stressed enough (Schlicker, Borra, & Regan, 1994).

NHANES III on weight status. The National Health and Nutrition Examination Survey, also known and abbreviated as NHANES, represents the 50 states and the district of Columbia's total civilian noninstitutionalized population ages 2 months and older. These surveys are commonly used by researchers in the medical and nutritional fields to compare with their patient population and/or research results. The National Center for Health Statistics (NCHS) of the Center for Disease Control (CDC) has conducted all of the NHANES. The third NHANES is the seventh in the cross-sectional series and most recent survey used for comparison.

When reporting the prevalence of children who are overweight, the percentage above the 95th percentile of weight-for-length or weight-for-stature from the NCHS growth curves is used. Both the NHANES and the Pediatric Nutrition Surveillance from the US Department of Health and Human Services of CDC define overweight as weight-for-height above the 95th percentile. The results of the most recent prevalence of preschool-aged childhood overweight are based on the highly reliable, standardized measures of weight, stature, and length from the third NHANES. It reveals that 9.6% and 11% of boys and girls respectively under the age of 12 months are classified as being overweight. Of the 1-2 year old children, 7.5% of boys and 11.5% of girls are overweight. In both of these age groups, Mexican-American children have the highest percentages of being overweight when compared to non-Hispanic black and non-Hispanic white children. Also, in both of these age groups, more girls are overweight than boys of their same race. As for children ages 2-3 years, 2.1% of boys and 4.8% of girls are classified as overweight. These percentages increase from the 2-3 year olds to the 4-5 years olds, where 5% and 10.8% of boys and girls respectively are overweight. Again, the highest percentage of children who are overweight occurs in Mexican-American children ages 2-3 years and 4-5 years; along with, girls being more overweight than boys of their same race (Ogden et al., 1997).

There are numerous increasing trends of overweight children displayed by the first NHANES series in 1960. Increases in the percent of children above the 95th percentile for weight-for-height occurred in children younger than the age of one year by 4.0-7.5% in boys and 6.2-10.8% in girls from NHANES II to NHANES III. Again, girls are more overweight than boys. Also, the prevalence of overweight girls is increasing versus boys. For instance, girls aged 1-2 years whose weight was above the 95th percentile increased from 6.1-9.5% between NHANES I and NHANES III, where as there was no significant change in the boys' ages 1-2 years who were above the 95th percentile. There was an increase in the prevalence of children being overweight in 4-5 year olds from NHANES I to NHANES III. The increase was more noticeable in girls. However, there was no significant change in the prevalence of childhood overweight in 2-3 year old children of both sexes from NHANES I to NHANES III (Ogden et al., 1997).

Given the findings that the prevalence of overweight children in the United States increased, especially in 4-5 year olds, nutrition education has become more important. Furthermore, these findings suggest that initial education should begin at an earlier age, in the preschool setting, instead of initial education being in the school setting. The promotion of the prevention of young children being overweight can start by encouraging, increased physical activity and healthy food choices.

Iron Deficiency Anemia

In addition to the problem of children becoming overweight or obese, iron deficiency anemia can also exist in young children. Today, children are selecting foods that are higher in fat and calories and low in micronutrients. Because of their choices, certain nutritional deficiencies have been identified. The most common nutrient deficiency in the pediatric population is iron deficiency anemia (Kleinman, 1998). Detection of iron deficiency anemia can be accomplished through a nutritional assessment.

Several studies have shown that iron deficiency among children impairs learned motor behaviors and cognitive function (Lee & Nieman, 1996). The children with iron deficiency also scored significantly less on psychomotor testing than children without iron deficiency. Prevention of iron deficiency must be emphasized due to iron treatment not correcting or reversing some children with iron deficiency. Iron treatment can correct developmental deficits to some extent in some children, but not all (Kleinman, 1998; Med2000, 2000).

Combinations of different laboratory tests are used to assess the iron nutritional status of a child (e.g. serum ferritin, erythrocyte protoporphyrin, transferrin saturation, transferrin receptors, hemoglobin, and hematocrit). Not one of these tests can determine the iron status of a child, but all provide different aspects of iron metabolism. Currently, the most popular approach in the general pediatric practice for anemia screening uses hemoglobin or hematocrit test results to define iron deficiency for the practical purposes. Anemia is defined as, "a hemoglobin or hematocrit level below the 5^{th} percentile of an age- and sex-specific United States representative sample after excluding persons with biochemical evidence of iron deficiency (Kleinman, 1998)." The following table is the estimated normal mean values and lower limits of normal (5^{th} percentile) for hemoglobin and hematocrit. The table can be used as a quick reference for classification of iron deficiency in the pediatric population.

Table 1

Estimated Normal Mean Values and Lower Limits of Normal (5th percentile) for Hemoglobin and Hematocrit*

	Hemoglobin, g/dL		Hematocrit, %	
Age, y	Mean	Lower Limit	Mean	Lower Limit
0.5-1.9	12.3	11.0	35.9	33.0
2.0-4.9	12.5	11.2	36.3	34.0
5.0-7.9	12.8	11.4	37.2	34.5
8.0-11.9	13.2	11.6	38.4	35.0
Female				
12.0-14.9	13.4	11.8	39.0	35.5
15.0-17.9	123.5	12.0	39.0	38.0
≥18	13.5	12.0	39.0	38.0
Male				
12.0-14.9	14.0	12.3	40.5	37.0
15.0-17.9	14.8	12.6	43.0	38.0
≥18	15.3	13.5	44.5	40.0

Note. * All data are based on venous blood samples after excluding individuals with laboratory evidence of iron deficiency or inflammatory disease. From Kleinman, (pg 239). Reproduced with permission by the *American Journal of Clinical Nutrition.*© Am J Clin Nutr American Society for Clinical Nutrition.

This definition of anemia needs to be used with caution due to 5% of the children in a population without iron deficiency would be classified as anemic. False-positive cases of iron deficiency can result when iron deficiency anemia is uncommon. Current or recent infections in young children, mild hereditary anemia (especially among African American and Asian American populations), inadequate testing instrument, and inadequate capillary blood sampling are circumstances that can cause milk false-anemia in children. Therefore, a second test or venous puncture should be completed to confirm the anemia.

NHANES III on Iron Status. According to the report, "Dietary Intake of Vitamins, Minerals, and Fiber of Persons Ages 2 Months and Over in the United States; Third National Health and Nutrition Examination Survey, Phase I, 1998-1991" the mean iron intake among 2-11 month old, non-breastfed infants was 15.5 milligrams. The mean iron intake decreased for children aged 1-2 years with 9.53 milligrams intake daily and slightly increased to 11.86 for children aged 3-5 years. Mean iron intakes gradually increase as children's ages increase. Non-Hispanic Black children consistently had higher levels of iron intakes than non-Hispanic White and Mexican Americans for all preschool-ages, 2-11 months, 1-2 years, and 3-5 years. Also, males always had higher mean iron intakes than females for all age groups, yet these results were not extremely noticeable until after the age of 5 (National Center for Health Statistics, 1994).

Fiber intake and fruit and vegetable intakes

Current nutritional problems with the preschool-age population also relates to the other nutritional problems currently discussed (overweight and iron deficiency). Low levels of fruits and vegetables poses as a nutritional problem with children in today's society. The preschool-age population is no exception. Skinner et al. (1999) and Munoz et al. (1997) have shown that children consume decreased amounts of vitamins A, C, D, E, folate, calcium, iron, and zinc while Ogden et al. (1997) have shown that childhood obesity is on the rise. Both of these nutritional problems (decrease vitamins and minerals and increase in childhood obesity) could be prevented with increased intakes of fruits and vegetables (Skinner et al., 1999; Munoz et al., 1997; Ogden et al., 1997).

The recommendation for dietary fiber intakes for children has not yet been defined. There are many different theories about the appropriate amount of fiber. The most current recommendation made by the American Health Foundation is the "age plus 5" rule. This pertains to children over the age of two years, who should consume five grams of dietary fiber in addition to their age until the age of 20 years. For instance, if a child is five years old, (s)he should consume ten grams of dietary fiber a day. Once 1500 or more calories are consumed a day by a child, 25 grams of fiber is then recommended (Med2000, 2000). Hampl, Betts, and Benes (1998) discovered that the children who met "age plus 5" rule had greater intakes of energy by about 400 calories, and had greater intakes of nutrients (vitamins A and E, folate, magnesium, and iron) than those children who did not met the rule. From their study, they concluded that the majority of children did not meet their recommendations and had low intakes of dietary fiber, indicating possible future risk for certain chronic diseases.

Other recommendations for fiber requirements in children come from the American Academy of Pediatrics, which estimates are close to the "age plus 5" rule. None of these recommendations is that children should consume no more than 0.5 g of dietary fiber per kilogram of body weight. The other recommendation is that for every 1000 calories a child consumes, 10 grams of dietary fiber should also be consumed. There is concern that too much fiber in a child's diet may have an adverse effect on essential minerals (Hampl, Betts, & Benes, 1998).

Fiber is the "the amount of plant material remaining after treatment with digestive enzymes and reduction with acid and alkali" (Escott-Stump & Mahan, 2000). It is difficult to define fiber due to the fact that not all fiber consists of the same structures. Soluble and insoluble fibers categorize fiber by the ability to hold water. Soluble fibers are those that dissolve in hot water. Some examples would be some hemicellulose, pectin, gums, and mucilages. Soluble fibers delay gastrointestinal transit time, delay glucose absorption, and lower blood cholesterol. Fibers that do not dissolve in hot water are referred to as insoluble fibers.

Cellulose, hemicellulose, and lignins are insoluble fibers that accelerate the gastrointestinal transit time, increase fecal weight to promote bowel movements, slow starch hydrolysis, and delay glucose absorption (Whitney & Rolfes, 1999).

Several United States governmental and private organizations recommend the increase in dietary fiber due to the research that has proven fiber to have beneficial health effects. Fiber's physiological functions improve the health of children and adults of all ages. The hypolipidemic effects of lowering the lipid levels in the blood are valuable for the prevention of atherosclerosis. The hypoglycemic effects are very advantageous for slowing the carbohydrate absorption rate for diabetic individuals. Constipation, cancer, and other gastrointestinal problems can be prevented by sufficient amounts of fiber. Also, individuals struggling with weight maintenance have the ability to use fiber for its abilities to delay gastric emptying, which provides satiety that allows a restricted caloric intake (Groff & Gropper, 2000).

<u>National Cancer Institute's Recommendations of Fruit and Vegetable Intake.</u> Fruits and vegetables have an abundance of fiber along with many micronutrients. Fruits and vegetables are the only two food groups that have repetitively shown a correlation with disease prevention, including cancer, cardiovascular disease (CVD), diabetes, stroke, hypertension, hypercholesterolemia, and ischemic heart disease. Fruits and vegetables provide various beneficial micronutrients for protection to human health and the improvement in the health-related quality of life. Low intakes of fruits and vegetables could increase the risk of the development of 15 different types of cancer; therefore, the National Cancer Institute formed the "5 A Day for Better Health" campaign to publicize and announce the promotion of consuming five or more fruits and vegetables daily (Havas et al., 1998). However, food items, such as ketchup, sports drinks, jelly, and pie fillings, should not count toward to a person's goal of 5 A

Day as these foods contain very little micronutrient significance with increased values in energy, dietary fat, sodium, and simple sugar. According to the National 5 A Day requirements, potato chips and french fries are also excluded towards 5 fruits or vegetables daily (Cullen, Baranowski, Baranowski, Hebert, & deMoor, 1999).

This campaign promotes a promotion of a combination of five fruits and vegetables daily. For example, the consumption of three fruits and two vegetables in a day, or an intake of four vegetables with one fruit is promoted. The 5 A Day campaign is directed to people of all ages, including school-aged children due to children establishing their food preferences and eating habits in the early years of their lives (Kirby, Baranowski, Reynolds, Taylor, Binkley, 1995). When five fruits and vegetables are consumed in a day, many important vitamins and minerals, fiber, phytochemicals, antioxidants, and carotenoids are consumed. Carotenoids, such as lutein, β-carotene, and lycopene, can be obtained from all, but root fruits and vegetables. For example, lycopene, which is an important antioxidant, is found in fruits and vegetables that origin with red color. Lutein, another carotenoid that aids in resisting disease, is found in green leafy vegetables. Overall, the great qualities of fruit and vegetable's components can be associated with decreasing or maintaining weight to aid in disease prevention.

Research has shown that foods high in fiber, such as fruits and vegetables, can lead to decreased risks of childhood obesity. The relationship of this statement is between dietary fiber and dietary fat. Foods that are high in dietary fiber are generally not the same foods that are high in dietary fat. Dietary fiber causes the stomach to fill faster and satiety is achieved sooner. As a result of eating foods high in fiber, energy, fat, and cholesterol consumption is decreased and less snacking may occur. It is suggested that increasing dietary fiber over long periods of time can beneficially treat obesity through modified energy intake. Therefore, the consumption of fruits and vegetables can prevent the consumption of foods high in dietary fat. This is important for weight maintenance or loss for children and adults and over long periods of time, can treat childhood obesity (Williams, 1995).

Despite all the research and knowledge about the importance of fruit and vegetable intakes, many children (and therefore when adults) consume amounts far below the recommended dietary allowances (American Dietetic Association, 1999). One possible outcome is that the number of American children who are overweight has more than doubled in the last three decades. A child's food choices are influence by their food preferences. These food preferences are learned over a period of time and need a minimum of eight to ten repetitive exposures for the child to have an increased desire for that food. Therefore, if children do not have the repetition of fruits and vegetables in their younger years, the food preferences may be set and could affect the child's dietary habits for the rest of their life. Recommendations have been established for children to increase their fruit and vegetable intake to five servings (American Dietetic Association, 1999). Recommendations to increase the consumption of fruits and vegetables in the diet have also been stressed by researchers who review the results of nutrition surveys.

Continuing Surveys of Food Intakes by Individuals; USDA United States Department of Agriculture. The USDA's 1989-1991 Continuing Surveys of Food Intakes by Individuals (CSFII) is a popular survey used in the literature for estimating children's (aged 2-19) food intakes. The USDA used a separate 12-month survey for each of the three years and combined them to form one large nationally representative dataset. The overall results from this nation-wide survey show that with the exception of the dairy group, children aged 2-11 did not meet the national recommendations for the food groups. One percent of children in this survey met all the recommendations for each of the food groups, yet sixteen percent of the children did not meet the recommendations for any of the five food groups. Overall, 30 percent of the children met the recommendations for the fruit, grain, meat, and dairy group and 36 percent met the vegetable recommendations (Munoz, et al., 1997). Of these food groups, fortified foods (especially ready-to-eat cereals) provided the most vitamins and minerals and low nutrient-dense foods provided the most energy, fats, and carbohydrates. Among the top ten sources of energy, fat, and protein were milk, yeast bread, cakes/cookies/quick breads, donuts, beef and cheese. Among the top ten sources of carbohydrates were yeast breads, soda drinks, milk, ready-to-eat cereals, cakes/cookies/quick breads/donuts, sugars/syrups/jams, fruit juices, and pasta. On the whole, more nutritious foods, such as whole grains, fruits, and vegetables, should be emphasized with dietary guidance and parental role models (Subar, Krebs-Smith, Cook, & Kahle, 1998).

The characteristics of nutritional assessment

In order to determine any nutritional problems children may be experiencing, such as decrease fruit and vegetable intakes, increase in weight, or decrease in iron status, a nutritional assessment is needed. Previous studies have indicated the need for nutritional assessments; however, not all of them have conducted a full nutritional assessment using anthropometrics, biochemical, clinical, and dietary information. By using a full nutritional assessment, certain detections can be verified. When utilizing the dietary components of nutritional assessment, the biochemical and clinical components may be more valuable when used together. For example, if a child's dietary recall shows that (s)he lack foods with iron in them, testing the child's hemoglobin and/or hematocrit could verify that his/her child's body is lacking iron. Furthermore, performing a clinical examination may help confirm this with the observation of koilonychia.

The definition of a nutritional assessment is "an evaluation of the nutritional status of individuals or populations through measurements of food and nutrient intake and evaluation of nutrition-related health indicators" (Lee & Nieman, pg 4, 1996). The overall function of a nutritional assessment is to correctly identify problems early and provide education to treat the problem and prevent it from becoming a larger problem (Scott, Artman, & St. Jeor, 1992). The promotion of health and well being to prevent disease in children is the goal of nutrition education. Studies have shown that problems in nutritional status that are acquired in childhood, which continue through adolescence and into adulthood, can place these young adults at risk for chronic diseases, such as, cardiovascular disease, cancer, non-insulin-dependent diabetes mellitus, and stroke (Bronner, 1996). Nutritional status cannot be defined by a single method of a nutrition assessment but rather a combination of different methods (Mascarenhas, Zemel, & Stallings, 1998). Therefore, a nutritional assessment typically consists of anthropometrics, biochemical data, clinical data, dietary data, socioeconomic demographics, and drug- nutrient interactions.

The components of a nutritional assessment

Anthropometrics

Anthropometrics means measurements; more specifically, it means the measurement of the physical aspects and composition of the body. The accuracy of these measurements is essential to properly assess growth and development of the human body. Therefore, regular calibration of equipment by trained personnel is emphasized to ensure valid findings (Mascarenhas, Zemel, & Stallings, 1998; Zemel, Riley, & Stallings, 1997). The positive aspects of an anthropometric assessment are that the measurements are quick to perform, inexpensive, and a ubiquitous way of determining both short- and long-term nutritional status.

Anthropometrics can be applied to compare the child's quality and quantity of protein and energy intakes to an appropriate reference, detect changes in measurements over time, and determine if there are any risks to acquiring any health complications (Grant & DeHoog, 1992; Zemel, Riley, & Stallings, 1997). Results from these measurements are sensitive and are used as indicators of health for adults and children.

Growth is the number one important indicator of overall nutritional status for a child. Weight is a measurement commonly used to estimate nutrition status. Typically, weight is the first to be affected if there is undernutrition in a child; however, if it is prolonged to long periods of time, stature will also be affected (Scott, Artman, & St. Jeor, 1992). Weight alone does not provide adequate information without comparing it to height. Weight for length, height for age, weight for age are standard comparisons that are obtained in children. Weight and height also are important measurements to calculate indices, creatinine height index, and caloric needs (Lee & Nieman, 1996). Also, height and weight can be recorded on growth charts as a percentile in children under the age of 18. The percentile reflects the percentage of the total population of children of that same sex and age who are at or below that percentage (Grant & DeHoog, 1999). Growth charts reflect normal and abnormal growth patterns, which are most useful over a period of time. Nutrition intervention may be needed if the following growth patterns on the growth charts are present: weight loss, weight and/or stature below the tenth percentile or above the ninetieth percentile for age, weight for stature below the tenth percentile or above the ninetieth percentile for age, rate of weight gain less than expected for age, rate of gain in stature less than expected for age, and failure to maintain growth in percentile or decreases within the percentile over time (Grant & DeHoog, 1992).

Body mass index or BMI is a height to weight index of the ratio of weight in kilograms to height in meters squared. Also, known as the Quetelet's index, BMI is the most commonly used height-weight index. BMI is used to assess obesity in children. It is difficult to assess obesity in children as some children have different amounts of body fat although they may weigh the same as others. Therefore, percent body fat is important to identify. Tricep skinfold measurements are shown to correlate better with body fat than height-weight indices, however, the accuracy of tricep skin folds on children is minimal secondary to large measurement errors in the reproducibility of measurements, the ability to have the same examiner obtaining results, and the high levels of body fat (Gerver & de Bruin, 1996). Measurement errors in tricep skinfold occur more often than in any other anthropometrics (Gerver & de Bruin, 1996). Although, BMI does not measure the fatness of a child, it is still used to access obesity in children due the high reliability with height and weight measurements and the convenience of the availability of the measurements. (Dietz & Bellizzi, 1999; Bronner, 1996; Gerver & de Bruin, 1996) In children, a BMI above the 85th percentile for age is used as a screening index for being overweight. A BMI above the 95th percentile for age is used as an index for childhood obesity (Med2000, 2000). The following is a table of these percentiles with age for children.

Table 2
BMI and Children

Age	85^{th} Percentile	95^{th} Percentile
2	18	19
3	17	18
4	17	17.5
5	17	18
6	17	18.5
7	17.5	19.5
8	18	21
9	19.5	22
10	20.5	24
11	21.5	25
12	22	25.5
13	22	26
14	23	26
15	23.5	26.5
16	24.5	26.5
17	25.5	27.5
18	25.5	30

Note. From Med2000, 2000

Biochemical

Anthropometrics, such as BMI, are important to determine growth and development. However, the detection of a single nutrient deficiency or toxicity can be discovered quicker in biochemical testing than in anthropometric testing. Interpretation of anthropometrics can be enhanced with the use of other data, such as biochemical results. The biochemical component of a nutrition assessment is the most quantitative and objective data of the nutritional status of a child. Biochemical tests can be used for many different interpretations. As mentioned above, a single nutrient can be tested in the blood; however, most useful is the interpretation of the test in an ongoing sequence. Also, dietary intake, clinical symptoms, 24-hour urine samplings, or other testing should be combined with biochemical testing as supportive information when assessing the nutritional status of a child (Grant & DeHoog, 1999; Lee & Nieman, 1996).

Not only is the use of a single test insufficient, other disadvantages of biochemical testing should be notified. The use of certain medications and the pathological conditions in the body may influence the results of the testing. There is contradiction about using venous blood or skin puncture blood when measuring cholesterol. The fingerstick procedure to collect skin puncture blood requires less training and has fewer adverse consequences than venous collection (Warnick, 1991).

Having the children become upset, experience pain or fear, bruise or bleed are consideration when performing biochemical testing on children. In the study by Davies, Collins, Gregory, and Clarke (1996), 20-27% of the children experienced bruising and bleeding. Davies et al also discovered that half of the children were upset by the attempt to take blood, although that only lasted for less than five minutes. The cause of most upsets was in the children whose attempt to take blood was unsuccessful (Davies, Collins, Gregory & Clarke, 1996). Biochemical testing is still important to perform on a child so that it can be used in conjunction with the other components of a nutritional assessment (anthropometric, dietary, and clinical).

Biochemical testing can aid in the detection of risk factors associated with certain medical conditions, such as hypercholesterolemia or iron deficiency. Ranade (1993) suggests that cholesterol screening should be completed on those preschool-aged children whose parents or grandparents are 55 years or less, gone through a coronary arteriography, and were discovered to have coronary atherosclerosis. A study by Boulton (1990) confirms Ranade's recommendations. Boulton discovered a positive association between the child's total cholesterol level (n=391) at birth to two years of age with the parent's, suggesting a familial influence. Also, there was significance with the male children's total cholesterol and low lipoprotein (LDL) cholesterol levels with the parent's total cholesterol levels. Therefore, cholesterol screening at a young age is encouraged.

Iron deficiency can also be detected through biochemical testing. In a recent study by Eden & Mir (1997), the prevalence (n=485) of iron insufficiency in children one to three years of age was 35 percent. The prevalence of iron deficiency with and with out anemia in this sample size was ten and seven percent, respectively. Iron deficiency with anemia was classified as hemoglobin below 11mg/dL, while iron deficiency without anemia was classified as erythrocyte protoporphyrin level below 35.0 µg/dL and iron insufficiency was considered as ferritin below 10 µg/L. As mentioned above, iron deficiency can lead to delayed psychomotor, intellectual, and cognitive abilities and that screening for prevention should be strongly encouraged secondary to treatment to iron deficiency may not correct the deficits in the children (Kleinman, 1998).

<u>Clinical</u>

Clinical assessment focuses on the nutritional status of a child through the physical examination, including measuring blood pressure, medical history, and the examination for signs and symptoms of nutrient deficiency or toxicity. Nutrient deficiencies can decrease the child's growth while leaving the child with painful, bodily damage. For example, vitamin D deficiency could lead to rickets or osteomalacia while the toxicity can lead to constipation, renal stones, and myostitis ossiferous. Any findings of a nutrient deficiency or malnutrition should be further analyzed and confirmed with anthropometrics, biochemical tests, and dietary analysis (Kleinman, 1998).

Blood pressure is a part of a clinical inspection in a nutritional assessment. Hypertension is a common risk factor for numerous cardiovascular and renal diseases, such as coronary heart disease, cerebrovascular and peripheral vascular disease, congestive heart failure, and renal insufficiency. Childhood hypertension can identify children who are more likely to become hypertensive as adults (Pipes & Trahms, 1997). Maternal high blood pressure is correlated with children's blood pressure. According to Bergel, Haelterman, Belizan, Villar & Carrolli (2000), not only did they find a strong correlation between maternal blood pressure and children's blood pressure, but there was also a strong correlation between the children's systolic blood pressure and their body mass index. An elevation of 5.0mmHg in the children's systolic blood pressure was associated with one standard deviation increase in the children's body mass index (BMI). Positive association between maternal blood pressure during pregnancy and children's blood pressure was also discovered in numerous studies (Bergel et al., 2000).

Goals during childhood are surveillance, prevention, and identification. Universal screening is not recommended, yet well-child check-up should measure blood pressure the visit. At risk children can be identified overtime and treatment, intervention, and education can be addressed. Prevention of hypertension in childhood is to avoid becoming overweight, encourage physical activity, and consume moderate sodium intakes. In adults, the decrease in blood pressure is most effective and significant with the degree of weight loss (Kleinman, 1998; Pipes & Trahms, 1997).

Other recommendations for the prevention of high blood pressure is a diet high in fruits and vegetables is recommended as the DASH (Dietary Approaches to Stop Hypertension) diet from the National High Blood Pressure Education Program. The DASH diet consists of an increase of fruits and vegetables (between eight and ten servings combined daily), low-fat grains (seven to eight servings daily), low-fat dairy foods (two servings daily), and low-fat protein foods (no more than two servings daily). Typically, this diet is known as the high-fruit-and-vegetable, low-fat diet. This diet supplies amounts greater than the usual American diet of fiber, potassium, calcium, magnesium, protein, while low in fat, saturated fat, and cholesterol. The components of this diet have made it the newest tool to lowering blood pressure. Studies have shown that a decrease of 11.4/5.5mmHg in hypertensive patients and a decrease in 3.5/2.1mmHg in non-hypertensive patients with the DASH diet (Svetkey et al., 1999). Scientists believe it is the high intakes of potassium that have cause the majority of the drop in blood pressure; however, tests were always completed with the consumption of food groups rather than individual micronutrients. Hence, it is not exactly known what about the high-fruit-and-vegetable, low-fat diet that lowers blood pressure, yet the minerals, potassium, magnesium, and calcium are suggested as reasons. Nevertheless, establishing the appropriate eating habits bountiful in fruits and vegetables can be advantageous for lowering risks to chronic disease including hypertension (Tufts University Health & Nutrition Letter, 1997).

Dietary

The dietary component of a nutritional assessment consists of the assessment of food intake. Dietary data collection provides information on a child's current food intake and can be use to estimate the child's usual intake, compare the child's nutrient intake to different group references or standards, and to rank the child within the group reference. The dietary data collection can be done using different instruments and methods. For example, the 24-hour food recall, diet history, three to seven day food record, and food frequency questionnaire are some of the instruments available. The choice of the instrument depends on the purpose of the study, the convenience to both the examiner and examinee, and the cooperation and complexity (Lee & Nieman, 1996).

Food Frequency Questionnaire. A food frequency questionnaire is a form that evaluates the frequency of certain food intakes. It is used to focus on the intakes of food groups rather than specific nutrient intakes; however, to make it easier for evaluation, organization of the form should be in food groups that have similar nutrients (Briefel et al., 1992). Not only is the grouping of foods important when designing a food frequency questionnaire, but also whether or not the information of portion sizes is provided.

Research has shown to strengthen the food frequency questionnaire assessment by using biochemical indicators, if possible. It is also advised to not design a food frequency questionnaire larger than 150 food items. Other advise about food frequencies and their strengths are that one can be inexpensively designed so that it can be self-administered, machine readable, while still being modestly representable (Lee & Nieman, 1996; Willet, 1994). Although there are numerous strengths in using a food frequency questionnaire, there are also many weakness and suggestions why not to use a food frequency questionnaire. Portion sizes may be misrepresented by the respondent, along with over reporting socially acceptable foods and the inability of the respondent to accurately describe the diet are common flaws when utilizing a food frequency questionnaire. Also, the intake data is often conciliated when multiple foods are grouped into single nutrient listings (Kreb-Smith, Hiemendinger, Subar, Patterson, & Pivonka, 1995; Lee & Nieman, 1996).

<u>The need to assess children's nutritional status</u>

Current nutrition research studies reveal a paucity of research on nutritional status of children who attend a structured childcare setting. A nutrition assessment can reveal a child's nutritional status by using various anthropometric, biochemical, clinical, and dietary measurements. Determining a child's nutritional status is important because it helps define the child's health status. Proper nutrition levels are generally associated with better health status among young children and later health when these children reach adolescence and adulthood.

For example, a growing body of research demonstrates that many disease states in later life have their origin in childhood. It is essential to detect childhood obesity at a young age as that can relate to the development of cardiovascular disease, cancer, and diabetes in adulthood (McPherson, Montgomery, & Nichaman, 1995). The goal of this study is to identify the nutritional status of children who attend the University of Wisconsin-Stout's Child and Family Study Center (CFSC).

As discussed above, the need for a research study with a complete nutritional assessment to find the nutritional status of preschool children is essential. The proposed research study included height, weight, and body mass index (BMI) as anthropometrics components, which are the most important nutritional and growth indicators. Biochemical indicators that were used in this study are cholesterol, hemoglobin, and glucose. Blood pressure was used as the clinical component; however, clinical signs of nutrient deficiencies also are clinical indicators. Also, a food frequency questionnaire on fruit and vegetable intakes was distributed to the parents as the dietary component. Socioeconomic demographics and drug-nutrient interactions were addressed. The results of this nutrition assessment can be used to monitor the children's growth and nutritional status so that initial problems can be identified at an early stage and intervention can be provided for prevention and/or treatment (Scott, Artman, & St. Jeor, 1992).

Research in the first part of this review of literature has shown that children eat less fruits and vegetables than the recommended from the food guide pyramid (Skinner et al., 1999). Also, Drake (1991) has indicated that 93 percent of the one- to six-year-olds in her study were within the normal limits for height and weight, although 18 and 12 percent of one- to three-year-olds and four- to six-year-olds were found to have poor nutritional iron status respectively. Therefore, an expectation in the proposed study was that the children may not meet the recommendations for fruits and vegetables recommended by the food guide pyramid. Another expectation was that the majority of the preschool children would be within normal limits for height and weight. Furthermore, it was expected that hemoglobin levels would be lower, especially in the younger children. The results of this nutritional assessment were provided to the parents of the children and the Child and Family Study Center.

Research Methods

Introduction

Preschool-aged children were chosen as subjects in this nutritional research study titled, "Nutritional Assessment of Children Enrolled in a Structured Childcare Setting." In this study, six components of a nutritional assessment were used for collecting data; anthropometric, biochemical, clinical, dietary, socioeconomical demographics, and drug-nutrient interactions. Collecting data from these six components were needed to provide an accurate description of the subject's nutritional status. The potential for a longitudinal study with this cohort will contribute to the study of the influence of childhood nutritional status on growth, development, and later health status.

This chapter consists of methods and procedures, which includes the research design, subject recruitment, subject protection and safety, data collection, the instrumentation, pilot testing, and data analysis.

The purpose of the study was to provide a nutritional status profile of children who attend the Child and Family Study Center at UW-Stout.

The specific objectives of this study were to:

1) profile the hemoglobin, glucose, and cholesterol levels in children who attend a structured childcare center;

2) compare fruit, vegetable, and/or combination of these intakes consumed by the children to the recommended dietary intake of "5 A Day" and the Food Guide Pyramid;

3) test the associations of fruit, vegetable, and/or combination of these intakes consumed by the children with overall nutritional status as measured by blood pressure, hemoglobin, cholesterol, and glucose levels, and BMI; and

4) describe weight and height status of this sample.

Research Design

This was a cross-sectional study, descriptive in nature, that sought to construct a profile of the nutritional status of preschool-aged children enrolled in a structured daycare setting. This study represented the nutritional status of preschool-aged children living in Menomonie, Wisconsin, a small, rural town in the mid-western part of the United States. As part of a cross-sectional study, a descriptive design on the profile of the nutritional status of daycare children was also performed. This type of profiling was important due to lack of empirical studies profiling nutritional status of children in daycare settings. Since this was a descriptive study, there was no manipulation of an independent variable.

As part of the descriptive design, pilot testing was conducted to prevent any problems that could occur with young children. Hereafter, descriptive and quantitative data related to the objectives were gathered. The quantitative data pertained to the number of fruit and vegetable servings consumed by the subjects. This was measured from the food frequency questionnaire and compared to the national recommended guidelines. Height, weight, body mass index (BMI), hemoglobin, cholesterol, glucose, systolic and diastolic blood pressure measurements were included as descriptive data. The nutrition assessment form and food frequency questionnaire measured these variables for profiling and testing associations with fruit and vegetable intakes.

Subject Recruitment

The sample size for this study consisted of 78 children between the ages of 12 months to 71 months who were enrolled at the University of Wisconsin-Stout's Child and Family Study Center from August of 2000 to May of 2001. The subject's parents were promised the results of their child's measurements and nutritional status provided they would participate. The researcher, who was a Registered Dietitian, provided these results. The inclusion criterion for the subjects was that the child must attend the Child and Family Study Center. Exclusion criteria for the subjects were: 1) children attending other childcare centers in Menomonie, Wisconsin 2) children with a chronic illnesses, such as asthma.

The subjects at the Child and Family Study Center were selected due to the convenience of the population and age-range of the children. Advertisement and an informatory letter were distributed to the parents pertaining to a meeting about this study. Two parents attended. Refer to appendix C for the initial letter distributed to the parents. For further enrollment in the study, all other parents were contacted by phone for explanation of the study. One hundred percent sampling of the population was the goal; however, 34 (44%) children participated in the study. Of those 34 children in the study, 26 (33%) were involved in the biochemical testing. There were a total of 17 (50%) boys and 17 (50%) girls in this study. Of those boys and girls, there were 4 one-year-olds, 7 two-year-olds, 7 three-year-olds, 12 four-year-olds, and 4 five-year-olds. Approximately, seventy percent of the children who attend this childcare center had parents who were students enrolled at the University of Wisconsin-Stout. The remaining thirty percent of the children were from the faculty members at the university or the community.

Subject Protection and Safety

Numerous measures were taken to maximize the children's safety and protection. Required from the University of Wisconsin-Stout when conducting a research study was the approval from UW Stout's Institutional Review Board (IRB) for the protection of subjects. This study was approved by the IRB before collecting data. As will be described later in the procedures section of the methodology, the children were made to feel safe, comfortable, and secure throughout the study. Measures that were taken began when the researcher spent approximately two to four hours a week during the first semester (18 weeks) of the school year with the children and their parents. During this time, the children took field trips to the University of Wisconsin-Stout's Nutrition Assessment Laboratory for Education and Research (NALER). This laboratory was used to collect the data on the children and therefore, it was viewed important that the children received a tour to provide comfort and familiarization. Refer to the journal in appendix D for documented journal notes. Although the journal notes and experience proved to be of extreme value when collecting data, the qualitative data was not analyzed at this time.

The time and participation that the researcher devoted to being involved in daily activities with the children and their parents had many benefits. For example, the researcher easily achieved cooperation from the children during the data collection period. When working with children, gaining their trust was advantageous due to children fearing strangers. Also, the researcher wanted to gain the acceptance and comfortability from the parents to give consent to this research study. Overall, this achieved cooperation from the children and acceptance from their parents.

Utilizing the children's teacher for walking the children to and from the NALER also provided them with additional security and comfort. In addition, rewarding the children for participation in the study made them feel proud and appreciated.

Parental Contact

In order to conduct a study involving children, parental consent was needed. One hundred percent sampling was the goal of this study. To gain the parents trust in the examiner, the examiner spent time interacting and participating in activities at the Child and Family Study Center with their child. Please refer to the procedures section for further description of parental contact.

Data Collection

Data collection was carried out at the Nutrition Assessment Laboratory for Education and Research (NALER) and the Child and Family Study Center (CFSC) preschool and infant and toddler sites. The laboratory was a state certified laboratory and Clinical Laboratory Improvement Amendments (CLIA)- approved from the Department of Health and Human Services with the Health Care Financing Administration. NALER is located on the fourth floor in the Home Economics building. Although small, this laboratory has the capacity and ability to conduct research measuring nutritional status. NALER functions to all students and faculty at the University of Wisconsin-Stout interested in nutrition assessment.

The preschool and infant and toddler sites of the Child and Family Study Center are located on the University of Wisconsin-Stout's campus in the Home Economics building on the first floor. The preschool for the three-, four-, and five-year-old children is also located on UW-Stout's campus in a separate building one block from the Home Economics building. The CFSC was a licensed center that offers childcare for children aged 6 weeks to 6 years of age. This center offers developmentally and culturally appropriate preschool programs for all children. It has the capacity for 100 children at one time.

Instruments

The data needed to fulfill the objectives of profiling the nutritional status of preschool-age children attending a structured childcare setting derived from components of all areas in a nutritional assessment. The researcher developed a nutritional assessment report record, which included all parts of a nutritional assessment. This was designed to fulfill the objectives of profiling the nutritional status of preschool-aged children and to test the association of fruit and vegetable intakes with overall nutritional status. Therefore, height, weight, BMI, hemoglobin, cholesterol, glucose, systolic/diastolic blood pressure measurements, fruit and vegetable intakes, age, sex, income, and medication had to be addressed. Pilot testing allowed the researcher to pretest the nutritional assessment instrument for further accuracy. Please refer to appendix A to view the nutrition assessment instrument design. A description of the equipment use for each measurement is depicted ahead in the equipment section.

Anthropometric data used for this study were height, weight, and BMI. These measurements were chosen because they allowed the objectives of the study to be met and because the researcher's interest in children's weight and knowledge about the link between BMI and disease risk. Cholesterol, glucose, and hemoglobin were the biochemical data used in this study primarily due to the laboratory's equipment. Clinical data as blood pressure was chosen for a variable to determine any possible correlations to fruit and vegetable intakes. This was of extreme interest due to the research of fruit and vegetable intakes correlation with hypertension (Harsha et al., 1999).

A food frequency questionnaire was used to measure the fruit and vegetable intake of the subjects. This was of interest secondary to the research indicating that children lack in fruit and vegetable consumption. A food frequency questionnaire has the ability of it being self-administered and eliminating on-site supervision from the researcher. Other benefits and reasons for using a food frequency questionnaire were the modest demand on respondents, inexpensiveness, and representation of usual intakes versus recording all food consumed for three to five days. For further details pertaining to the measurement procedure of a food frequency questionnaire and dietary guidelines, see appendix G.

The researcher developed a quantitative food frequency questionnaire because of the necessity of knowing the exact serving sizes of fruits and vegetables consumed each day. These serving sizes could then be compared to the national guidelines. The specific fruits and vegetables on the food frequency questionnaire were chosen due to their popularity in society and the availability in grocery stores. Refer to appendix A for the food frequency questionnaire.

Numerous socioeconomical demographic questions were asked on the second nutrition assessment form developed by the researcher. This form was sent to the parents for completion, which included information, such as age, birth weight, income, and number of people in the household. Current medication usage was also indicated on the nutrition assessment form and reviewed for any possible drug-nutrient interactions. Please see appendix A for this form.

Equipment. Several instruments utilizing CLIA-waived laboratory analysis were used to gather data on nutritional status. Table 3 reports the instrumentation used for each of the data.

Table 3
Instrumentations used for data collection.

Instrument	Criteria Measured
Anthropometrics	
Balance-Beam	Weight
Recumbent Stadiometer	Length
Wall Stadiometer	Height
Biochemical	
Cholestech®	Cholesterol Glucose
HemoCue®	Hemoglobin
Clinical	
Single-tubed Sphygmomanometer	Blood pressure
Stethoscope	Blood pressure
Dietary	
Food Frequency Questionnaire	Fruit and Vegetable Intake
Socioeconomical Demographics	
Nutritional Assessment Form	Age, gender, income, prematurity, weeks gestation, etc
Drug-nutrient Interactions	
Nutritional Assessment Form	Medications

Each instrument was calibrated before conducting any measurements on the subjects. Calibration of the balance-beam scale was accomplished by using the 45-pound weights and instructions provided by the company for calibration. The stadiometer was measured from the floor to a specific measurement to double-check its accuracy. Control Level 1 and Level 2 provided by the Cholestech® Corporation, Hayward, California for calibration of the Cholestech machine were completed before testing cholesterol and glucose levels. The use of the "Control Optics Cassette" was also performed on this machine as part of the calibration process to assure adequate readings. Before using the HemoCue® machine by Ryan Diagnostics, Inc, Naperville, IL proper methods of calibration were also performed using LO and HI Hemotrol, along with a Control Cuvette. A newly purchased stethoscope and sphygmomanometer were used in this study. All calibration methods, materials, and processes were documented in each instrument's logbook for verification.

Procedure

In order to obtain supplies (cassettes and cuvettes) for laboratory measurements, a total of six hundred dollars were granted and awarded to the examiner from two sources: the John and Debra Wesolek Graduate Student Research Support Scholarship and the University of Wisconsin-Stout's Student Research Grant. Also, the Cholestech Corporation donated two boxes of cassettes (8 cassettes in a box) to measure cholesterol and glucose. Ryan Diagnostics, Inc. donated one bottle of cuvettes (50 cuvettes in a bottle) to measure hemoglobin. After purchasing the necessary additional cassettes for the Cholestech® machine, extra monies were utilized for controls of each equipment, band-aids®, gauze, paper copies, office supplies, reward stickers and pencils.

Once the monies for the supplies had been obtained, the researcher spent time with the children at the Child and Family Study Center (CFSC) participating in their daily activities. As mentioned before, this was viewed as most beneficial for the acceptance and consent from the parents of the children attending the CFSC and cooperation from the children when conducting the study.

In January, a meeting notification was publicized for parents to discuss this nutritional study titled, "Nutritional Assessment of Preschool-aged Children Enrolled in a Structured Childcare Setting." As mentioned before, since only two parents attended this meeting, the consent papers were sent to 78 parents with a follow-up phone call to discuss the study and any questions. See appendix C and B for publication notice and consent forms distributed to all the parents, respectively. Those parents who expressed interest on the phone, but had not returned the consent form, were contacted one more time with a promotional letter asking for consent (appendix C). Thirty-four consent papers were returned with acceptance to the study. After all consent papers were returned, a second informatory letter about the start of the study was distributed to the parents through their child's mailbox at the childcare center. Appendix C contains this letter.

In March, efforts were made by the researcher to create a child friendly atmosphere in the laboratory. Decoration of balloons, posters of the children's Food Guide Pyramid, and various stuffed animals were used. Once this had been accomplished, data collection for height, weight, and blood pressure occurred. This data collection took place on March 7 and 8, 2001. Two days (Tuesday and Wednesday) were required for data collection due to the subjects attending the Child and Family Study Center on those specific days. Also, the availability of the student teachers' assistance was satisfied on those two days.

A student teacher and/or head teacher assisted in transporting one child at a time from the infant and toddler site on the first floor to NALER's location on the fourth floor of the Home Economics Building. A constant rotation between two teachers each transporting one child from one place to the other occurred during days of data collection. Due to both sites being in the same building, the process required less time. Since there was no need to dress these children in coats, hats, mittens, and boots (as with the three-, four-, and five-year-olds), more time was saved in the transportation process. However, more supervision (one teacher per child) was required when working with one- and two-year-olds versus the three-, four-, and five-year-old children.

The children (three-, four-, and five-year-olds) located at the Child and Family Study Center just one block from the Home Economics building were under close supervision while walking from one building to the other. Again, a constant rotation between two teachers transporting children took place. A teacher escorted two to three children to the laboratory in the Home Economics building. Since this process required more time walking, the teacher would bring two to three children at one time. As one child's data was collected, the other children would listen to a story read by the teacher while waiting for their turn.

One of the difficulties encountered in this study was the lack of cooperation from the children when taking off their shoes, mittens, and/or coat for the measurement of height, weight, and blood pressure. Numerous child games had to be played with those children by the examiner and the teacher to gain the child's cooperation for measurements. Approximately, thirty seconds to ten minutes can be expected to devoting time to these situations.

Measurement Procedures for Anthropometrics and Clinical Testing

Measurement of Stature. For children older than two years of age, stature was measured using the wall stadiometer. Length was the other form of stature; also referred to as recumbent length. This measurement was taken while the child was lying down. These measurements were taken on children less than 24 months of age. Recumbent length could be taken on children up to 36 months who cannot stand up right without difficulty or assistance; however, there were no children between 24 and 36 months who did not stand up right without difficulty. Nevertheless, there were two children between the age of 24 and 36 months who were too short for the wall stadiometer and therefore, their statures were taken using the recumbent method. The importance of knowing this was essential because the growth charts used for infants from birth to 36 months old are based on the recumbent length, and the growth charts used to the ages two to eighteen are based on a height stature. Appendix F is comprised of the United States Center for Disease Control (CDC) Age-related Growth Charts developed by the National Center for Health Statistics (NCHS) in collaboration with the National Center for Chronic Disease Prevention and Health Promotion. Appendix G contains further measurement procedures when determining the stature on a child.

Measurement of Weight. Weight was measured using a balance-beam scale on any child who was capable of standing unsupported, which pertained to all of the children in this study. A balance-beam scale was recommended, yet an electronic scale could be used. However, a spring scale was discouraged, along with a balance-beam scale with wheels for it has to be recalibrated every time it is moved (Lee & Nieman, 1996). The balance-beam scale was calibrated for proper accuracy before use in this study. Refer to Appendix G for measurement procedures for weight.

Calculation of BMI. BMI or body mass index was calculated using the ratio of weight in kilograms to height in meters squared. Also, known as the Quetelet's index, BMI is the most commonly used height-weight index. BMI was used to assess obesity in children. In children, a BMI above the 85^{th} percentile for age on the CDC growth charts was used as a screening index for being overweight. A BMI above the 95^{th} percentile for age was used as an index for childhood obesity (Med2000, 2000).

Measurement of Blood Pressure. From three months of age to adolescence, blood pressure readings will increase. Therefore, the definition of hypertension in children changes with age. According to the American Heart Association, classifications of blood pressure in children have age-, sex- and height-specific systolic and diastolic blood pressure percentiles. However, classifications used for an infant as normal systolic and diastolic blood pressure as 74-100mmHg and 50-70mmHg respectively; for a toddler as 80-112mmHg and 50-80mmHg; for preschool-age children as 82-110mmHg and 50-78mmHg are normal for systolic and diastolic; and for school-aged children as 84-120mmHg and 54-80mmHg (Jackson & Saunders, 1993). Please refer to Appendix G for the procedure used to measure blood pressure.

Measurement Procedure for Biochemical and Dietary testing

On March 20 and 21, 2001, biochemical testing (cholesterol, glucose, and hemoglobin) was completed. Three children were unexpectantly unable to attend the Child and Family Study Center on those days. As a result, a follow-up date on April 4, 2001 was set and fulfilled. Again, two days (Tuesday and Wednesday) were required for data collection due to the subjects attending the Child and Family Study Center on those specific days. Two days were also needed for the availability of the Medical Technician and the student teachers whom assisted in this study.

The skills, expertise, and knowledge of a medical technician (M.T., A.S.C.P.-American Society of Clinical Pathologists) were used for biochemical testing in this study. This Medical Technician directed a Level I, CLIA-waived highly-complex laboratory at a small community hospital. The examiner was a Registered Dietitian, who had completed graduate level courses in nutritional assessment and worked as a clinical dietitian. Due to a medical technician's experience with finger sticks and handling blood, this part of the nutrition assessment performance went smoothly. Expectations of possible lack of cooperation during the data collection of the biochemical information were anticipated secondary to the lack of cooperation some children displayed during the anthropometric data collection. Therefore, after the pilot test, both the examiner and the medical technician quickly developed approaches to ease the child's expectations of the finger stick by being extremely sympathetic while making the child feel tremendously proud of their finger stick accomplishment. Comments such as, "Do you know what color your blood is?" or "Did you know that your blood could do magic tricks?" (as watching their blood accelerate up the capillary tube) were often spoke to ease the child's fears of this procedure. Refer to appendix E, which describes the finger stick procedure used.

Hemoglobin. Hemoglobin values were measured by the HemoCue® machine. The normal range used for serum hemoglobin is 11-16mg/dL for a child and 10-15mg/dL for an infant (DeHoog & Grant, 1999). The laboratory value of hemoglobin is expressed by the total amount in a given volume (100mL or 1L) of whole blood, plasma plus within the red blood cells (RBC). This is due to hemoglobin's function as transporting the oxygen and carbon dioxide in the RBC; this makes up 90% of the RBC. Hemoglobin concentration reveals the direct indication of the oxygen-transport capacity of the blood (DeHoog & Grant, 1999).

Cholesterol. Cholesterol levels were measured by the Cholestech® machine. High levels of serum cholesterol have been associated with the development of premature coronary heart disease in adults. Yet, the need for universal testing of children's serum cholesterol should be done with caution (American Academy of Pediatrics, 1998; Kleinman, 1998). An increased level of a child's cholesterol value is a risk factor for an increased level of serum cholesterol as an adult, which sequentially is a risk factor for coronary vascular disease (Kleinman, 1998).

Recommended cholesterol levels in children were lower than the recommended cholesterol levels in adults. The National Cholesterol Education Program's recommendations used in this study for a serum cholesterol level were: below 170mg/dL represents an acceptable value, a serum cholesterol level between 170-199mg/dL as borderline high, and a serum cholesterol level above 200 mg/dL is classified as high (Kleinman, 1998).

Glucose. Glucose values were measured by the Cholestech® machine. Serum glucose levels can monitor glucose tolerance in children. Glucose intolerance is the inability of the body to properly regulate glucose. Often times, this inability can lead to hyperglycemia. Testing for glucose tolerance is an important way to detect the diagnosis of diabetes mellitus. The fasting serum glucose ranges for children used in this study were 70-110mg/dL (3.9-6.1 mmol/L) and the 2-hour postprandial used was <150mg/dL (8.4mmol/L). The diagnostic criteria for diabetes mellitus can be made if the fasting serum glucose value is above 200mg/dL and symptoms of diabetes are present (polyuria, polydipsia, polyphagia, weight loss, blurred vision, etc) (Lee & Nieman, 1996). Also, if the fasting serum glucose is above 126mg/dL on two occasions, the diagnosis of diabetes can be made (Franz, 1999).

After the child completed the data collection, a reward of a sticker, colorful band-aid®, and a pencil with an apple eraser attached was given while in the laboratory.

Measurement of Dietary Data

While the anthropometric, biochemical, and clinical information were being collected on the children; questions about dietary, socioeconomical demographics, and medication were sent to the parents for completion. The dietary component of a nutritional assessment consisted of the assessment of food intake. This dietary data collection provided information on a child's current food intake and was use to estimate the child's usual intake, compare the child's nutrient intake to different group references or standards, and to rank the child within the group reference.

Food Frequency Questionnaire. The food frequency questionnaire form was used to evaluate the subject's frequency of fruit and vegetable intakes. This form focused on the intakes of food groups rather than specific nutrient intakes. However, some suggest making the evaluation easier by organizing the form in food groups that have similar nutrients (Briefel et al., 1992). Not only was the grouping of foods important when designing a food frequency questionnaire, but also whether or not the information of portion sizes was provided. See appendix A for the design of the food frequency form.

The parents of the children who participated in this study received a copy of their child's results to the anthropometric, biochemical, clinical, and dietary measurements, along with brief comments and/or suggestions from the researcher, a Registered Dietitian. The form used is located in appendix C.

Pilot Test

Pilot testing was necessary when working with children. It provided the researcher with the experience needed to better prepare for the tasks that needed to be accomplished without any unexpected events occurring. The two main purposes of the pilot test were: 1) to organize and achieve a smooth process in the nutritional assessment procedures and 2) to test the length of time for the children to walk to the Nutrition Assessment Laboratory for Education and Research (NALER) for the completion of nutritional assessment procedures, and to be transported back to the daycare. Knowing the amount of time required to walk the children to and from NALER provided essential information in the organization of the data collection process. Due to the small sample size and the pilot testings purposes, the subjects in the pilot test were included in the study's sample. These subjects' data were not counted twice.

The food frequency questionnaire was also pilot tested on six adults with preschool-aged children from a different childcare center than the one used in this study. Pilot testing of this instrument served as the following purposes: 1) to examine the usefulness of the serving sizes, 2) to determine the clarity of the directions, and 3) to test the understandability of the instrument.

Data Analysis

Computer software used for data entry and analysis was SPSS (Statistical Procedures for Social Sciences) version 10.0, SPSS, Inc., Chicago, Illinois. SPSS does not require variables to be altered or changed in any way for acceptance in the program. Descriptive analyses (mean, median, standard deviation, minimum and maximum range) were utilized to profile certain quantitative nutritional measurements by running frequencies. The profiling was accomplished through the data collected with the nutritional assessment form. These analyses provided information to compare to other nutritional studies and the national recommended guidelines for each variable.

When analyzing the fruits and vegetables reported on the Food Frequency Questionnaire, numerous variables were developed to determine if the child met the recommendations of the food guide pyramid. For recording purposes, fruits and vegetables were categorized using three measurements: tablespoons, ounces, and pieces of fresh fruit. Variables were derived from these categories as total amount of tablespoons, ounces and pieces of fresh fruit. Age-adjusted serving sizes were used to establish variables determining how many servings the child consumed for foods reported in tablespoons, ounces, and pieces of fresh fruits. Lastly, all serving sizes were combined per child as a variable to determine the total servings for fruits and/or vegetables.

For example, all foods reported in tablespoons were tallied. A serving size of one tablespoon per age was used to design a variable regarding servings for both fruits and vegetables. If a parent of a two-year-old indicated that their child consumed ¼ cup of sliced peaches (4 tablespoons) daily, the serving size used for a two-year-old was 2 tablespoons per day. Therefore, this child consumed 2 servings of fruit per day in peaches. This process was completed on all fruits and vegetables. Then, all serving sizes were combined for total servings per day that child consumed.

The same design was used to calculate the serving sizes of fruits and vegetables reported in ounces and pieces of fresh fruit. Serving sizes used for ounces and pieces of fresh fruit were based from the USDA's Food Guide Pyramid and Nutrition Counseling Education Services' Pyramid handout for kids ages one to ten. (NCES, 1994).

Pearson correlations were utilized for comparison tests by using the r-value and p-value as proof of statistical significance. The 0.05 alpha level was used for significant correlation between the comparison of fruit and vegetable intakes with health status. This data came from the food frequency questionnaire and was linked to the variables; height, weight, BMI, hemoglobin, cholesterol, glucose, systolic and diastolic blood pressure for testing associations. The 0.01 alpha level was used for significant correlations between fruit and/or vegetable intakes with "5 A Day" recommendations. Three variables (food guide pyramid percentage that was met for fruit, food guide pyramid percentage that was met for vegetables, and five a day fruit and vegetable percentage that was met) were used in determining these statistics.

Results

Socioeconomical Demographics of Subjects

Questions regarding the child's age, gender, birth weight, family's income, the number of adults and children in the household, birth weight and if the child was prematurely born were recorded. Demographic information is presented in table 4 and 5. Table 4 profiles the subjects' age and gender while Table 5 describes other household demographics of the subjects in the sample.

Table 4
Gender Frequency grouped by Age.

	1	2	3	4	5	Total
Subject's gender						
- Female	4	3	5	5	0	17
- Male	0	4	2	7	4	17
Total	4	7	7	12	4	34

Table 5
Household Demographics.

	# adults & children in household	Annual family income of household
Mean	3.74	$59,500.00
Median	4.00	$57,500.00
Std. Deviation	.81	$34,466.51
Min.-Max.	2-6	$3,000-170,000
n	27	26

As shown in Table 5, the average yearly household income was $59,500.00. When comparing income levels to the 2001 Federal poverty guidelines, eight percent (n=2) of the household's from this study had an income below the poverty guidelines, which compares to 11.9 percent and 9.2 percent poverty in the general population of Dunn County and Wisconsin, respectively (U.S. Census Bureau, 2002). There were no households between the 100 and 125 percent of the poverty guidelines. There were 29 out of 34 parents who answered the question pertaining to premature births. Of those parents who answered the question, five children (17.2%) were reported as born prematurely. Although nonsignificant because of small sample size, an interesting observation was that 4 of the 5 premature births were females and one was male. Thirty-seven weeks gestation was the mean of the premature births (36-38 weeks were the minimum and maximum). Also, the mean birth weight for the prematurely born children was 105 ounces (84 and 185 ounces were the minimum and maximum).

During this study, 13 out of 29 children were taking some form of medication and/or multivitamin (five subjects failed to provided data). Of those 13 children, five children (17.2%) were taking a multivitamin, three children (10.3%) were taking fluoride, three children (10.3%) were taking a combination of the multivitamin and fluoride, one child (3.4%) was taking Claritin® (an antihistamine) with the multivitamin and fluoride, and one child (3.4%) was taking just amoxicillin. Overall, one-third of the children in this study took a multivitamin.

Descriptive Profiles and Comparison to Recommended Guidelines

Anthropometrics, biochemical, clinical (blood pressure), and dietary components of a nutritional assessment were also measured. The following tables profile the results of these measurements and their comparison to national guidelines pertaining to each of the criteria.

Anthropometrics

Table 6
Anthropometric data (height, weight, and BMI) for each age group in years.

Subject's Age in years			Median	Mean	Std. Deviation	Min.-Max.
Length (cm)	1	n=4	80.0	82.4	7.34	76.5-93.0
Height (cm)	2	n=7	88.0	87.6	8.50	77.3-98.0
	3	n=7	97.4	96.7	4.28	88.5-103.0
	4	n=12	108.7	107.7	4.37	99.0-116.0
	5	n=4	115.8	115.8	3.5	112.7-119.1
Weight (lb.)						
	1	n=4	24.4	25.2	4.65	20.7-31.2
	2	n=7	28.5	29.7	4.77	24.0-35.7
	3	n=7	34.7	33.4	5.60	26.5-43.2
	4	n=12	38.3	39.8	4.69	32.5-48.0
	5	n=4	48.1	49.4	6.60	42.7-58.5
BMI						
	2	n=7	17.7	17.5	0.92	16.2-18.5
	3	n=7	16.5	16.2	1.76	13.4-18.1
	4	n=12	15.8	15.6	1.76	13.4-18.1
	5	n=4	16.3	16.7	1.54	15.3-18.7

Height, weight, and weight-to-height ratio variables were compared to the United States, Center for Disease Control (CDC), growth charts developed by the National Center for Health Statistics (NCHS) in collaboration with the National Center for Chronic Disease Prevention and Health Promotion. Refer to appendix F for an example of each gender age-related charts. Following established protocol, normal values for height, weight, and weight-for-heights were considered as above the fifth percentile and below the 95th percentile. Table 7 compares the subject's anthropometric data to the CDC growth charts while indicating the percent of children who had anthropometric data within normal values.

Table 7
Comparison of anthropometrics: height for age, weight for age, and weight-for-height.

Measurement	%<5th percentile	%5-25th percentile	%25-50th percentile	%50-75th percentile	%75-95th percentile	%>95th percentile
Height-for-age n=34 Mdn=62nd %ile Min.-Max.= 0-100%ile	17.6	11.8	11.8	23.5	26.5	8.8
Weight-for-age N=34 Mdn=60th%ile Min-Max.=3-100%ile	8.8	14.7	14.7	35.3	14.7	11.8
Weight-for-height N=34 Mdn=69th%ile Min.-Max.=6-98%ile	0	20.6	14.7	23.5	38.3	2.9

Note. One child refers to 2.9% of the subjects.

Table 7 illustrates that the percent of children who had a percentile between the 5th and 95th percentiles for height-for-age was 73.7%; along with 82.4% and 97.1% percent of the children had a percentile between the 5th and 95th percentiles for weight-for-age and weight-for-height, respectively.

Body Mass Index is a weight-for-height calculation similar to the weight-for-length ratios. Research studies show that body mass index (BMI) can be used to assess the measurement of fatness in children and adolescents. Dietz & Bellizzi (1999) recommend that the standards used to identify overweight and obesity in children and adolescents be the same as those standards used to identify grade 1 and grade 2 overweight in adults, BMI of 25 and 30, respectively. Since the highest BMI in this study was 18.75, there were no children classified as grade 1 or grade 2 overweight.

Biochemical

Biochemical measurements are as important as anthropometrics to provide the researcher with a complete picture in evaluating children's nutritional status. In this study, blood glucose, cholesterol, and hemoglobin were measured as the biochemical components. These biochemical measurements of blood glucose, cholesterol, and hemoglobin were chosen due to the importance of monitoring these laboratory values for the prevention of diabetes, premature cardiovascular problems, and iron deficiency, respectively. Also, the laboratory in which these measurements were obtained only had equipment to measure these blood levels. Table 8 profiles these three biochemical measurements for each age group.

Table 8
Biochemical data (blood glucose, cholesterol, hemoglobin) for each age group

Subject's Age in Years			Median	Mean	Std. Deviation	Min.-Max.
Blood Glucose						
Normal value (70-110mg/dL)	1	n=3	87.0	93.3	10.97	87-106
	2	n=5	100.0	98.2	7.222	86-104
	3	n=6	103.0	106.0	20.45	85-143
	4	n=8	96.0	104.0	20.40	83-136
	5	n=3	76.0	75.0	10.54	64-85
Cholesterol						
Normal value (100-170mg/dL)	1	n=3	125.0	141.0	43.28	108-190
	2	n=5	153.0	152.4	23.38	123-188
	3	n=6	170.5	171.2	7.76	163-185
	4	n=8	151.0	156.1	26.26	122-195
	5	n=3	153.0	156.7	10.97	148-169
Hemoglobin						
Normal value (11-16mg/dL)	1	n=4	11.4	11.2	1.10	9.7-12.1
	2	n=5	12.4	12.3	0.64	11.5-12.9
	3	n=6	12.7	12.3	0.84	10.7-12.8
	4	n=8	13.0	13.0	0.53	12.3-14.0
	5	n=3	14.4	13.9	0.95	12.8-14.5

Note. Subjects were not fasting before laboratory measurements.

Glucose. When comparing the laboratory results for each measurement to the standard guidelines, the mean levels were used for each age group. Normal blood glucose levels used in this study were 70-110mg/dL (Grant & DeHoog, 1999). The mean (average) blood glucose levels for each age group of children indicate normal blood glucose levels. Please refer to Table 8. However, further investigation of the data across individuals' blood levels indicated that there was one child who had a blood glucose level below the recommended 70mg/dL (64mg/dL). Also, there were three children who had blood glucose levels above the recommended 110mg/dL (135mg/dL, 136 mg/dL, 143 mg/dL). The laboratory testing was conducted from 8:30 to 10:30 in the morning, which may be reason why these few blood glucose values were out of the recommended range. The parents and childcare staff were questioned about when breakfast was consumed in those three children who had blood glucose levels above 110mg/dL. All three of the children had finished eating breakfast within fifteen to twenty minutes before the laboratory testing was discovered.

Cholesterol. Cholesterol levels were compared to the National Cholesterol Education Program guidelines. The interpretations of these values for children were: below 170mg/dL represents acceptable levels, 170-199mg/dL indicates borderline levels, and >200mg/dL indicates high levels (Kleinman, 1998). Table 9 illustrates the comparison of cholesterol levels of the children in this study to the National Cholesterol Education Program.

Table 9
Comparison of biochemical data: serum cholesterol and hemoglobin levels for each age to specific guidelines

Subjects' Age Groups	Mean	Within Guidelines	Not within Guidelines
	Cholesterol (mg/dL)		
1-year-olds n= 3	141.0	2	1 (190mg/dL)
2-year-olds n= 5	152.4	4	1 (188mg/dL)
3-year-olds n= 6	171.2	3	3 (171;173;185mg/dL)
4-year-olds n= 8	156.1	5	3 (174; 183;195mg/dL)
5-year-olds n= 3	156.7	3	0
	Hemoglobin (mg/dL)		
1-year-olds n= 4	11.2	2	2 (9.7mg/dL; 10.9mg/dL)
2-year-olds n=5	12.3	5	0
3-year-olds n= 6	12.3	5	1 10.7mg/dL)
4-year-olds n= 8	13.0	8	0
5-year-olds n=3	13.9	3	0

Note. Numbers in parentheses represent actual biochemical results for those children not within recommended guidelines.

The profiled results of the cholesterol levels show that 68 percent of the children met the guidelines recommendations of 170mg/dL or less. The remaining 32 percent had borderline levels of cholesterol between 170mg/dL and 200mg/dL, and none of the children were found to have high levels of cholesterol above 200mg/dL.

Hemoglobin. Hemoglobin levels were compared to the long-standing recommended levels as 11-16mg/dL documented recently in "Nutrition Assessment Skills and Tools" by Grant and DeHoog, (1999). Hemoglobin was used as an indicator of iron status, protein status, and fluid status. Anemia is defined as hemoglobin below the fifth percentile per age and gender of the child. Table 9 illustrates the percent of children per age group that met the guidelines for hemoglobin as 11-16mg/dL. Overall, three children (11.5%) out of 26 had hemoglobin levels below 11mg/dL. The remaining 23 (88.5%) children had hemoglobin levels within normal range (11-16mg/dL); hemoglobin levels above 16mg/dL were not discovered in the children of this study. A second test of hemoglobin would be advised for confirmation of anemia (Kleinman, 1998).

Clinical

As the biochemical component was an important element of the nutritional assessment in this study, the clinical component added further information about the children's nutritional status. The biochemical component was measured by the children's blood pressure. According to age, normal systolic and diastolic blood pressure for an infant is 74-100mmHg and 50-70mmHg respectively. Normal blood pressure for a toddler systolic and diastolic is 80-112mmHg and 50-80mmHg. For preschool-age children, blood pressure readings between 82-110mmHg and 50-78mmHg are normal for systolic and diastolic. Also, 84-120mmHg and 54-80mmHg are normal systolic and diastolic blood pressure readings for school-aged children (Jackson & Saunders, 1993). Table 10 provides an overview of the profiled blood pressure measurements per age group.

Table 10
Blood pressure measurements for each age group

Subject's Age		Median	Mean	Std. Deviation	Min.-Max.
Systolic (mmHg)					
	1 y.o. n=2	87	87	4.24	84-90
	2 y.o. n=3	88	88	0.00	88-88
	3 y.o. n=6	90	90	8.45	78-100
	4 y.o. n=11	90	93	6.89	86-106
	5 y.o. n=4	93	94	5.89	88-102
Diastolic (mmHg)					
	1 y.o. n=2	61	61	1.41	60-62
	2 y.o. n=3	58	56	3.46	52-58
	3 y.o. n=6	56	54	8.39	42-64
	4 y.o. n=11	58	58	4.58	52-66
	5 y.o. n=4	59	60	2.83	58-64

Dietary

Fruit and vegetable consumptions were assessed in this study through the use of a quantitative Food Frequency Questionnaire. The first and second most popular fruits were applesauce and grapes (red and green combined). Carrots and corn were the first and second popular vegetables. Fruits and vegetables were compared to the Nutrition Counseling Education Services' (NCES) Pyramid handout for kids ages one to ten (Appendix J) and the "5 A Day" recommendations using children's serving sizes. Below, in table 11, are the results to the dietary component reported in percentages that met the minimal servings of fruits (2 servings) and vegetables (3 servings) the food guide pyramid and "5 A Day" recommendations. The mean servings for fruits and vegetables are also reported.

Table 11
Dietary data (% of fruit and/or vegetable consumption met and servings) for each age group

Subjects Age	Mean %	(Servings**)	Std. Deviation	Min.-Max.
% Fruit met according to FGP				
1 y.o. n=3	574	(11.5)	81.00	483-639
2y.o. n=7	584	(11.7)	448.61	74-1429
3 y.o. n=6	574	(11.5)	432.39	114-1339
4 y.o. n=12	298	(6.0)	179.74	60-570
5 y.o. n=2	398	(8.0)	134.47	302-493
% vegetable met according to FGP				
1 y.o. n=3	148	(4.4)	41.67	100-172
2 y.o. n=7	123	(3.7)	83.45	18-246
3 y.o. n=6	68	(2.1)	47.17	31-150
4 y.o. n=12	70	(2.1)	60.82	3-209
5 y.o. n=2	53	(1.6)	37.80	26-79
% fruit & vegetable met according to the "5 A Day" organization				
1 y.o. n=3	318	(*)	57.02	253-359
2 y.o. n=7	309	(*)	213.12	69-682
3 y.o. n=6	271	(*)	199.90	66-626
4 y.o. n=12	161	(*)	97.56	26-353
5 y.o. n=2	192	(*)	75.11	138-244

Note. * Mean servings for "5 A Day" are not possible to develop.
** Serving sizes were based from one tablespoon per year of age recommendations.

When completing the questionnaire on the frequency of fruits and vegetables, portion sizes were also provided to the parent to use as a reference of how much their child usually eats. A small, median, and large portion were provided with specific amounts in tablespoons, ounces, and pieces of fresh fruit. When analyzing the data, one tablespoon per year of age was used as the serving size (Trahm & Pipes, 1997). The total servings of fruits and vegetables were compared to the handout prepared by the NCES' Pyramid for kids ages one to ten. Age appropriate serving sizes displayed in this handout were used for juice and pieces of fresh fruit. Please refer to appendix J to view the NCES handout. Therefore, the appropriate age-based serving size for each child was calculated and used in determining compliance to the "5-A-Day" and Food Guide Pyramid recommendations.

All fruits and vegetable servings for each child in this study were tallied to determine if the total servings met the "5 A Day" and/or Food Guide Pyramid recommendations. In some cases, the total servings exceeded the recommendations, resulting in percentages beyond 100 percent. For example, the Food Guide Pyramid had a minimum of two servings per day to meet its recommended servings of fruit. In this study, the average one-year-olds' fruit servings were 11.5. When 11.5 servings were compared to the Food Guide Pyramid's recommendations, a percentage of 574 of fruits were found.

Associations of fruit and vegetable and/or combination of these intakes with overall nutritional status.

The following measurements were used to compare fruit and vegetable intake with overall nutritional status: height, weight, BMI, cholesterol, glucose, hemoglobin, and systolic and diastolic blood pressure.

Table 12
Nutritional assessment variables used for comparison of fruit and vegetables with health status using Pearson correlations (r).

	% Fruit met by the FGP	%Vegetable met by the FGP	"5 A Day" fruit & vegetable % met
Child's Stature	-.25 (n=30)	-.33 (n=30)	-.29 (n=30)
Child's Weight	-.25 (n=30)	-.30 (n=30)	-.28 (n=30)
Child's BMI	.12 (n=30)	.11 (n=30)	.04 (n=30)
Child's Hemoglobin	-.44* (n=23)	.18 (n=23)	-.41 (n=23)
Child's Cholesterol	-.01 (n=22)	.05 (n=22)	.00 (n=22)
Child's Glucose	-.27 (n=22)	-.17 (n=22)	-.26 (n=22)
Child's Systolic BP	.13 (n=22)	.21 (n=22)	.16 (n=22)
Child's Diastolic BP	-.52* (n=22)	-.21 (n=22)	-.49* (n=22)

Note. * Correlation is significant at the 0.05 level (2-tailed).

These results show that three correlations were statistically significant by indication of the (*) asterisk. The percentage met for fruits according to the Food Guide Pyramid had an inverse statistical association with hemoglobin and diastolic blood pressure. Also, an inverse statistical association was discovered between diastolic blood pressure and the percentage met for fruits and vegetables according to the "5 A Day" recommendations. Therefore, as fruit and vegetable intake increase, hemoglobin and diastolic blood pressure decrease.

These correlations indicated that the fruit servings consumed by the children, not the vegetables, were the only significant predictors of a nutritional assessment. Significant findings for the "5 A Day" resulted from the confounding of fruit and vegetable intake in this measure. Further analysis demonstrated that the Food Guide Pyramid assessments were not only more precise measures, they were also highly reliable surrogates for the "5 A Day" procedures (r=.98, p=0.01 for the Food Guide Pyramid-fruit, and r=.76, p=0.01 for Food Guide Pyramid-vegetable).

The percent vegetable from the Food Guide Pyramid had an inverse association with the child's age (r= -.40, p >0.05) demonstrating that as the child grew older, the less vegetables the child consumed. Also, controlling for age did not affect the fruit and/or vegetable association with blood pressure. Table 13 displays the data indicating this.

Table 13
Associations between fruit and/or vegetable consumption and blood pressure with or without controlling for age using Pearson (r) .

	% Fruit met by the FGP	%Vegetable met by the FGP	"5 A Day" fruit & vegetable % met
	Without Controlling for Age		
Child's Systolic BP	.13 (n=22)	.21 (n=22)	.16 (n=22)
Child's Diastolic BP	-.52* (n=22)	-.21 (n=22)	-.49* (n=22)
	Controlling for Age		
Child's Systolic BP	.15 (n=19)	.26 (n=19)	.19 (n=19)
Child's Diastolic BP	-.52* (n=19)	.19 (n=19)	-.48* (n=19)

Note. * Correlation is significant at the 0.05 level (2-tailed).

More interesting statistical significance was discovered with the child's age pertaining to hemoglobin levels. A positive association between the child's age and hemoglobin level (r=.70, p>0.01) was statistically significant indicating that as the child grew older, his/her hemoglobin increased.

Income levels in this study showed no statistical significance with any other variables. This is demonstrated in the data shown in Table 14.

Table 14
Nutritional assessment variables used for comparison of income with health status using Pearson correlations (r).

	Income		Income
% Fruit met by the FGP	-.014 (n=26)	Child's Stature plotted	.029 (n=26)
% Vegetable met by the FGP	-.05 (n=26)	Child's Weight plotted	.056 (n=26)
5 A Day" fruit & vegetable % met	-.025 (n=26)	Child's Weight-for-Length plotted	-.075 (=26)
Child's Systolic BP	.081 (n=20)	Child's Hemoglobin	-.125 (n=20)
Child's Diastolic BP	-.208 (n=20)	Child's Cholesterol	-.208 (n=19)
Child's BMI	-.094 (n=26)	Child's Glucose	-.099 (n=19)
		Child's Age	.127 (n26)

With an r=.41, p=>0.05, a positive statistical significance was found between the child's gender and hemoglobin. This demonstrated that higher levels of hemoglobin were found in males than in females. Although it appeared that there was statistical significance between the child's gender and hemoglobin further analysis explained that finding. Using partial correlations revealed that the association between hemoglobin and gender was simply an artifact of observed effect of age or hemoglobin. Controlling for age eliminated the significant association between hemoglobin and gender.

Discussions

Introduction

When looking at the association or impact of fruits and vegetables with other nutritional measurements, statistical significance was found in this study. As originally hypothesized, this study found a statistical significance with an inverse statistical association between the consumption of fruits and vegetables and blood pressure, specifically diastolic blood pressure. Another association was discovered between the consumption of fruits and vegetables and hemoglobin; opposite of what was initially hypothesized. No other associations were found with fruit and vegetable intake and measurements of a child's nutritional status.

Discussion

A heterogeneous group of children participated in this research study. They represented different genders, income levels, and age groups (five age groups). Each child was unique and had a different nutritional status. Measurements of height, weight, serum cholesterol, hemoglobin, glucose, blood pressure, and fruit and vegetable intakes were recorded

Income

In this study, the average income was 59,500.00 dollars per year with a median income of 57,500.00 dollars per year (range $3,000-$170,000). According to the U.S. Census Bureau, in Dunn County and Wisconsin, the median income in 1997 was 35,947.00 and 39,800.00 dollars per year, respectively. Parents of the children from the Child and Family Study Center had higher incomes when compared to Dunn county and the state's statistics. Two factors must be considered when looking at the average income. The first factor is that 30% of the parents were professionals, business owners, or professors who have a higher income than Dunn County's median income. The second factor is that the majority (70%) of the children's parents were college students who may have received supplemental income or monies, such as from parents or grandparents of the students and/or financial aid packages. Some of these parents also worked while being a college student taking courses. Income levels in this study showed no statistical significance with any other variables. However, the United States Department of Agriculture's 1989-1991 Continuing Surveys of Food Intakes by Individuals concluded that fruit and dairy intakes of children 2 to 19 years of age increased as the income increased (Munoz, et al., 1997).

Anthropometrics

The children in this study met the normality of height and weight on the growth chart (between the 5th and 95th percentile) by 73.7%, 82.4%, and 97.1% for height-for-age, weight-for-age, and weight-for-height, respectively. The majority of the preschool-aged children in this study had normal height, weight, and weight-for-height. This finding supported the research done by Drake (1991) study. Drake found that 93% (n=124) of the research sample's preschool-aged children had height and weight measures within normal growth ranges when using the Frisancho's Standards of Weight by Height. Due to stature and weight being the most common measurements to assess in children, numerous nutritional studies perform these measurements. However, these studies rarely describe or profile their results of preschool-aged children's height and weight measurements despite recording these measurements.

The majority of the preschool-aged children had laboratory results within normal ranges; leaving only a small number of preschool-aged children having biochemical measurements outside the normal ranges for each laboratory level drawn.

Cholesterol

A recent study discovered a positive statistical association between the parents and children's (birth to two years of age) total cholesterol levels. These associations were stronger in boys than in girls; suggesting that there are some familial influences in children's cholesterol level besides environmental influences (Boulton, 1980). The process of cholesterol deposition can start in childhood. Therefore, it is recommended that cholesterol testing be completed in children, especially whose parents or grandparents are 55 years or less, gone through a coronary arteriography, and were discovered to have coronary atherosclerosis (Ranade, 1993). Also, it has been suggested to adult cardiologist to refer the children of patients who have the above conditions for cholesterol testing and continuing health care. Screening these children allows the whole family to better assess their risk for coronary vascular disease (Ranade, 1993).

Recommendations have been made to obtain blood samples for cholesterol testing after the age of two; levels of total cholesterol and low-density lipoprotein (LDL) cholesterol are subsequently consistent. As well, treatment recommendations for children under the age of two should not be made secondary to a two-year-old's rapid growth and development requiring fat and cholesterol (Ranade, 1993; American Academy of Pediatrics, 1998). Maternal cholesterol levels were not obtained in this study. However, 32% of the children in this study had borderline high cholesterol. The children in this study had a normal average cholesterol level of 157mg/dL.

Hemoglobin

Hemoglobin values are essential for adequate amounts of iron within the body. Without normal hemoglobin values children are at risk for iron insufficiency, iron-deficiency, and iron deficiency anemia. An inverse significant correlation between the child's hemoglobin and percentage met in fruit according to the Food Guide Pyramid was found in this study. Since this has not been found in other research, it will be discussed in detail later in this chapter.

Although the majority of the children in this study met the average hemoglobin levels and fell within a normal average level of 12.5mg/dL, two children ages one to three years (13.3%) had hemoglobin values below 11mg/dL.

Eden & Mir (1997) recently conducted a study determining the prevalence of iron insufficiency, iron-deficiency, and iron deficiency anemia in children ages one to three years. It was discovered that 35% of the children in this study (n=485) were iron insufficient, 7% were iron deficient, along with 10% had iron deficiency anemia; totaling 52% of the 1-3-year-olds having inadequate iron. Iron deficiency anemia was classified as those children with hemoglobin below 11 mg/dL. When comparing the Eden and Mir (1997) study's findings with the children in this study, two children, ages one to three years (13.3%) had hemoglobin values below 11mg/dL and no children, ages four and five, had hemoglobin values below 11mg/dL.

Normal formation of hemoglobin and other iron-containing compounds requires adequate amount of iron. Any amount less than adequate could lead to iron-deficiency anemia. Periods of rapid growth, especially brain growth (during infancy), adolescence, and pregnancy are those who are at more of a risk for iron deficiency. Anemia can lead to impaired body temperature regulation, weakened immunity to infections, impairment in behavior and intellectual performance, and susceptibility to lead poisoning (Lee & Nieman, 1996). Also, the effects of iron deficiency can be long lasting even after treatment of the deficiency. Therefore, it is suggested that physicians, educators, and parents make the extra effort to prevent the iron deficiency. This is especially true during the second year of a child's life when certain developmental situations occur, which could effect iron status; such as, switching from breast milk to cow's milk, decreasing the amount of iron-fortified cereals, and a decrease appetite for solid foods while an increase appetite for juice (Eden & Mir, 1997).

Clinical

When blood pressures values were measured of the children in this study, their average blood pressure was normal at 92/56mmHg. Furthermore, this study found that higher amount of fruits and vegetables were associated with a decrease in the diastolic blood pressure. Because of the significance of this finding, it will be discussed in detail later in this chapter.

Monitoring blood pressure levels throughout a person's lifespan is essential due to the relationship of elevated blood pressure levels with cerebrovascular accidents (CVAs or strokes), ischemic heart disease, and other medical problems. Therefore, assessing blood pressure during childhood ages is also beneficial (Kleinman, 1998). Blood pressure measurements were all within normal range in this study.

In a recent study by Bergel, Haelterman, Belizan, Villar, & Carroli (2000), numerous maternal and child characteristics were tested for significant association with five- to nine-year-old (n=518) children's blood pressure measurements. Among the characteristics tested, body mass index (BMI) and low birth weight were the main predictors of these Argentinean children's pressure. An association was shown for every standard deviation increase in the children's body mass index, a rise in the systolic blood pressure by 5.0 mmHg occurred. Low birth weight was the main predictor that those children would have high blood pressure. This evidence proved true only in those children who were in the upper quartile for body mass index. Overall, no other associations between birth weight and blood pressure were found with the exception to the evidence of low birth weight predicting high blood pressure in children in the upper quartile of BMI. It is recommended that this evidence be further researched (Bergel et al., 2000).

Dietary

As comparing the clinical data to specific guidelines, comparing dietary intake to recommendations is also of importance. Fruit and vegetable intake consisting of five servings per day has shown to have a decrease in risk for developing cancer and cardiovascular disease. The soluble fiber, nutrients, such as folate, and antioxidants, for instance phytochemicals and carotenoids, in fruits and vegetables decrease the risk of developing cardiovascular disease. Liu et al. (2000) discovered that higher amounts of fruits and vegetables were associated with protection against CVD. Therefore, the American Heart Association supports the recommendations for the consumption of five servings of fruits and vegetables daily (Liu et al., 2000).

More recently, the discovery of increased consumption of potassium, calcium, and magnesium may be more beneficial than the reduction of sodium chloride. A diet full of potassium, calcium, and magnesium can be found in fruits, vegetables, and minimal refined grains (Kleinman, 1998). As a result, fruit and vegetable consumption was assessed in this study through the use of a Food Frequency Questionnaire.

The children at the Child and Family Study Center consumed larger amounts of fruits and less amounts of vegetables. This finding coincides with Briley et al. (1999), who examined the meals and snacks of three- to six-year-old children at the childcare facility and at home. The conclusions from Briley et al. were that nearly all of the children (n=51) consumed the recommendations according to the Food Guide Pyramid for the meat group, milk group, and fruit group along with consuming approximately four serving per day from the fats, oil, and sweets group. Also, 96 percent of the children did not consume enough foods in the grain and vegetable group. Neither the parents nor the childcare facilities provided ample amount of grains and especially vegetables (Briley et al., 1999).

In this study, the amount of fruits and vegetables reported by the parents as usual intakes were extremely high, reaching 584 percent of the fruit recommendations from the Food Guide Pyramid; nearly six times the amount necessary to achieve the minimum fruit recommendations from the Food Guide Pyramid. When using food frequency questionnaire regarding socially accepted foods, especially fruits and vegetables, estimations from the interviewee are higher than on food records. Tendency to over-report societal viewed foods as "nutritious" may occur (Krebs-Smith, Heimendinger, Subar, Patterson, & Pivonka, 1995). It is felt that this tendency occurred in this study.

This current study may be limited due to the inability of the parents to accurately report what their child eats while away from home. Questions were received from the examiner by some parents expressing the concern of not knowing how many fruits and vegetables their child consumes away from home.

Further research may be needed to evaluate the validity of fruit and vegetable intakes using a food frequency questionnaire. However, Blum et. al., 1999 concluded that a food frequency questionnaire can be used to by the parent to reasonably measure their child's food intake. Blum et. al., 1999 did not focus on only fruits and vegetables.

Associations of Fruit and Vegetable and/or combination of these intakes with overall nutritional status

The results from this study found statistical significance with an inverse statistical association. As fruit and vegetable intakes increased, the hemoglobin and diastolic blood pressure decreased. The association between fruits and vegetables and blood pressure has been concluded in previous studies. The most recent research on fruit and vegetable intakes and blood pressure are the results of the DASH (Dietary Approaches to Stop Hypertension) diet. This study discovered that higher amount of fruits and vegetables were associated with a decrease in the diastolic blood pressure. The DASH diet has shown significance between consuming ten servings of fruits and vegetables and decrease in both systolic and diastolic blood pressure in 459 adults. Following this diet has proven a decrease in the diastolic blood pressure by 3.0 mmHg. It has been concluded that dietary patterns of increased amounts of fruits and vegetables with low-fat dairy products will reduce blood pressure (Harsha et al., 1999).

The inverse significant correlation between the child's hemoglobin and percentage met in fruit according to the Food Guide Pyramid has not been found in other research. This inverse significant correlation indicates that as the percentage of fruits consumed that met the Food Guide Pyramid rose, the child's hemoglobin decreased or as the percentage of fruits consumed that met the Food Guide Pyramid decreased, the child's hemoglobin increased. This inverse significant correlation was also discovered in servings of fruit per day according to the Food Guide Pyramid and the child's hemoglobin. This correlation proposes the opposite from the long-standing research discoveries that Vitamin C aids in the absorption of non-heme iron and therefore, this inverse statistical association is not consistent with this discovery (Lee & Nieman, 1996; Escott-Stump & Mahan, 2000). However, specific analyses of Vitamin C intakes of these children were not conducted. An interesting observation noted that fruit and vegetable juice servings per day had no statistical significance when compared to other nutritional measurements.

Also, applesauce and grapes were the top two fruits respectively while carrots and corn were the top two vegetables consumed by the children in this study. These four fruits and vegetables are not high in Vitamin C. This also may be a reason for the inverse association discovered between hemoglobin and the fruits consumed according to the Food Guide Pyramid.

Large amounts of fruits reported by the parents may contribute to the inverse correlation of fruits with hemoglobin. Another interesting factor was that one-third of the children in this study were taking a multivitamin. Overall, the sample size was too small to show substantial findings.

The objectives of this study were defined. The overall profiles of all the children at the Child and Family Study Center were described as:

- 73.7% of the children had a height or length with in the 5th and 95th percentiles; along with 82.4% and 97.1% percent had a percentile between the 5th and 95th percentiles for weight and weight-for-height, respectively.
- the average hemoglobin levels was at a normal level of 12.5 mg/dL, the average cholesterol level was normal at 157mg/dL, and the mean glucose level was also normal at 98 mg/dL.
- blood pressure was normal at 92/58 mmHg.
- 37% met the recommendations of the Food Guide Pyramid for vegetable intake. The average vegetable intake was 89% of the minimal servings of the Food Guide Pyramid's recommendations (3 servings).
- 90% met the recommendations of the Food Guide Pyramid for fruit intake. The average fruit intake was 454% of the minimal servings of the Food Guide Pyramid's recommendations (2 servings).

- 80% met the recommendations of "5 A Day" for combined intakes of fruits and vegetables. The average combined fruit and vegetable intakes were 235% of the "5 A Day" recommendations.
- the average income was 59,500.00 dollars per year.
- The average birth weight was 7 pounds 9 ounces.
- 5 out of 29 (17%) children were prematurely born.
- 9 out of 29 (31%) children were taking a multivitamin.

Overall Conclusions

In this study, given a good income, nutritional status was good, but borderline cholesterol was found in eight children. Secondary to conclusive studies not indicating that preschool-aged children had high blood cholesterol level, it was not expected to discover 32% of this study's sample with borderline high cholesterol levels.

Another discovery in this study was the small number of children who had low hemoglobin levels. There were 11.5 % (n=3) of the children who had hemoglobin below 11mg/dL in this study (n=26). In the study by Eden & Mir (1997), it was discovered that 10% of the children in that study (n=485) had iron deficiency anemia. Iron deficiency anemia is classified as having a hemoglobin level below 11mg/dL. The discovery by Eden & Mir's study coincides with this study's results of 11.5% having an average hemoglobin value below 11mg/dL.

Also, there were large amount of servings and percentages of children who fulfilled the fruit and vegetable recommendations, especially the fruit. Perhaps this was due to the theory that parents tend to overestimate the amount consumed with foods that they think are nutritious for their children, such as fruits and vegetables, while underestimating the amount of foods consumed that are not viewed as nutritious for their children, such as potato chips, soda, and french fries (Lee & Nieman, 1996).

The goal and four objectives of this study were met. The demographics were also included in this study. With more research studies using all components of a nutritional assessment with the preschool-aged population, further detection and prevention of early disease indicators can occur.

Considerations for conducting nutritional assessment studies with children

When conducting a research study involving preschool-aged children, certain precautions should be noted. The researcher took extreme measures to protect the safety of the children by being cautionary in the wording of materials being reviewed by the parents and when conducting research with children. Also, the researcher was very prepared, organized and descriptive when introducing and answering question about the study to the parents and the children. Finally, the researcher met the Institutional Review Board (IRB) requirements for conducting research that involved preschool-aged children.

The issue of timing with preschool-aged children was a consideration for the researcher. The children took longer periods of time to accomplish simple tasks, such as putting on coats, hats, and mittens. To receive children's full cooperation, the researcher familiarized herself with the children's names and personalities before gathering data. Even with this involvement with the children, the researcher found that some had difficulty cooperating, which lead the examiner to engage in some child-like, imaginary games to gain cooperation.

Organization and expertise were keys to conducting laboratory work with preschool-aged children. Being organized offered a smooth process when preparing, collecting and recording laboratory results, which allowed more expertise. Davies et al. (1996) pointed out the importance of being an expert in collecting blood from preschool-aged children to decrease to the amount of upset. In a study of 1157 preschool-aged children who had blood taken, over 50 percent of them were upset, lasting for five minutes. Bruising or bleeding was experienced by 20-27 percent of the children. Davis et al.'s results were taken into consideration before conducting this study.

Recommendations for Future Research

Due to a limited amount of current nutritional research studies on the nutritional status of preschool-aged children, further research is needed. Using data from all components of a nutritional assessment is advised as most beneficial to provide a full review of a child's nutritional status; hence, their health status.

Important variables to measure in future research studies should obtain more food groups, especially the grain group secondary to the conclusions from Briley et al.,1999. Also, further analysis of cholesterol levels through a lipid panel is recommended, particularly for those with borderline high or high cholesterol. Conducting a study using the exact methodology while involving only children from low-income families is suggested to determine if good nutritional results will be also obtained.

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Appendix A

Instruments

Nutrition Assessment Laboratory for Education and Research
Pediatric Nutrition Assessment and Demographic Form

Food Frequency Questionnaire Dietary Form for the Parents

NALER #____________________ Date: ________________ Time:____________

CHILD'S DEMOGRAPHIC INFORMATION	
A. Gender: (Circle one) Male Female	**B.** Age:________year __________months
C. How many adults and children are in your household combined?	
D. Please indicate the annual family income of this child's household, rounded to the nearest $1000. Ex. Income of $14,368 would be $14,000. $_________________	
E. What was your child's birth weight? _____lb. ______oz Was your child born premature? YES NO If yes, how many weeks gestation?_________ or number of weeks early ________	
F. List child's current medications (including inhalers, vitamins, creams, etc)	
DO NOT COMPLETE BELOW THIS LINE.	

ANTHROPOMETRIC DATA	BIOCHEMICAL DATA
Height: Stadiometer (in/cm) – Recumbent (in/cm)-	**Hemoglobin:**
Weight: Balance Beam Scale (lb/kg) –	**PLACE** **CHOLESTECH** **STICKER** **HERE**
BMI: Calculations -	

CLINICAL DATA		
Blood Pressure:		
Notes: **Hair**	**Eyes**	**Mouth**
Nails	**Skin**	

Office Use Only:
NALER #: ________________

Dietary Form

To obtain the best assessment possible of your child's nutritional status, some information on usual eating habits is needed. To complete the table think about your child's usual intake, then think about how frequently your child eats these fruits and vegetables. An example is shown below. In this example, the child usually eats 5 tablespoons of pears once a day and eats 3 tablespoons of green beans three times in a week.

	Your Serving Size			HOW OFTEN?			
FOOD ITEM	**S**	**M**	**L**	**Day**	**Week**	**Month**	**Rarely**
Pears –fresh or canned	1 Tbsp	3 Tbsp	5 Tbsp				
Green Beans –fresh or canned	1 Tbsp	3 Tbsp	5 Tbsp				

A portion of a specific fruit or vegetable is displayed as a serving size to **guide** and help you estimate amounts eaten; these are not necessarily the recommended servings. Please only circle one box for your serving size and please only write one number in a box per fruit or vegetable.

VEGETABLES							
	Your Serving Size			**HOW OFTEN?**			
	S	**M**	**L**	**Day**	**Week**	**Month**	**Rarely**
Asparagus	1 Tbsp	3 Tbsp	5 Tbsp				
Beets	1 Tbsp	3 Tbsp	5 Tbsp				
Broccoli	1 Tbsp	3 Tbsp	5 Tbsp				
Carrots –raw or cooked	1 Tbsp	3 Tbsp	5 Tbsp				
Cauliflower	1 Tbsp	3 Tbsp	5 Tbsp				
Celery	1 Tbsp	3 Tbsp	5 Tbsp				
Corn	1 Tbsp	3 Tbsp	5 Tbsp				
Green Beans -fresh or canned	1 Tbsp	3 Tbsp	5 Tbsp				
Green/Yellow/Red Peppers	1 Tbsp	3 Tbsp	5 Tbsp				
Lettuce/Green Salad	1 Tbsp	3 Tbsp	5 Tbsp				
Mixed Vegetables	1 Tbsp	3 Tbsp	5 Tbsp				

Peas/Lima Beans -fresh or canned	1 Tbsp	3 Tbsp	5 Tbsp				
Spinach	1 Tbsp	3 Tbsp	5 Tbsp				
Sweet Potatoes/Yams/Squash	1 Tbsp	3 Tbsp	5 Tbsp				
Tomatoes -fresh or canned	1 Tbsp	3 Tbsp	5 Tbsp				
Tomato/V-8 juice	1 Tbsp	3 Tbsp	5 Tbsp				

FRUITS							
	Your Serving Size			**HOW OFTEN?**			
	S	M	L	Day	Week	Month	Rarely
Apples	½ apple	1 Small	1 Large				
Applesauce	1 Tbsp	3 Tbsp	5 Tbsp				
Bananas	½ bana.	1 Small	1 Large				
Blueberries	1 Tbsp	3 Tbsp	5 Tbsp				
Fruit Cocktail	1 Tbsp	3 Tbsp	5 Tbsp				
Grapes -red and green	1 Tbsp	3 Tbsp	5 Tbsp				
Grapefruit	1 Tbsp	3 Tbsp	5 Tbsp				
Melons, cantaloupe, watermelon, etc	1 Tbsp	3 Tbsp	5 Tbsp				
Oranges, mandarin oranges	½ orang	1 Small	1 Large				
Peaches/Apricots -fresh or canned	1 Tbsp	3 Tbsp	5 Tbsp				
Pears -fresh or canned	1 Tbsp	3 Tbsp	5 Tbsp				
Pineapple	1 Tbsp	3 Tbsp	5 Tbsp				
Raisins	1 Tbsp	2 Tbsp	3 Tbsp				
Raspberries, Blackberries -fresh, canned, or frozen	1 Tbsp	3 Tbsp	5 Tbsp				
Strawberries	1 Tbsp	3 Tbsp	5 Tbsp				
100% Orange juice or Grapefruit juice	2oz.	4 oz.	6oz.				
100% Apple juice	2oz.	4 oz.	6oz.				
100% Grape juice or Cranberry juice	2oz.	4 oz.	6oz.				
Other 100% fruit juices	2oz.	4 oz.	6oz.				

Appendix B

Consent Forms

Parent Consent Form for Participation in a Nutritional Assessment Research Study at the Child and Family Study Center

Parent Consent Form for Talent/Participant Release of Child's Image in a Picture

Parent Consent for Participation in a Nutritional Assessment Research Study

The purpose of this study is to assess the nutritional status of your child.

The assessment will consist of:

- Measuring heights and weights
- Testing of hemoglobin, cholesterol, and glucose. **A finger stick procedure will be used to obtain a blood sample for these tests.**
- Blood pressure will be measured
- Estimated intake of fruits and vegetables using a survey

Risks

A small sample of blood from a finger stick is required for the laboratory testing. Thus, your child could experience a short period of soreness or be exposed to an infectious agent. There are emotional risks to your child during the finger stick due to the pain or fear of the procedure.

Measures have been taken to minimize these risks: The laboratory has been certified by the Wisconsin Department of Health and Human Services. The laboratory follows strict safety rules and has a policy to address blood borne pathogens. In addition to the examiner (Brooke Bauer), a teacher from the Child and Family Study Center will be with the child during the whole nutrition assessment process. You are encouraged to be with your child during this assessment, if you so desire. The examiner will use non-latex gloves during the finger stick procedure to protect both the child and the examiner. A sterile lancet will be used for the finger stick and a cotton ball and/or band-aid will be immediately applied to stop any bleeding. A biohazard sharps container will be used to dispose of the appropriate testing supplies. The most extreme professionalism will be practiced during the entire nutrition assessment process. A cordless telephone is available in the room to contact help if an emergency situation arises. Measures to ensure confidentiality will be followed (see Confidentiality section).

Benefits

The findings from your child's nutritional assessment may assist in making lifestyle and dietary changes that have been shown to improve health status and quality of life. Furthermore, a minor health risk could be detected now while your child is young and corrected before the health risk leads to a more serious problem. You will receive a copy of your child's results and any nutritional education/interpretations you would like regarding this nutritional assessment. Details on how you can get more information will be included with the results. A nominal award, such as a sticker, will be given to the participants to thank them for helping me with this study. This will be conducted on a one-on-one basis, so that awards are not given in a group setting.

Confidentiality

Nutrition assessment records will be kept in a locked area, unavailable to other participants, faculty, or persons not involved in this study. Only numeric identifiers will be on the outside of your child's file. The nutrition assessment form will also include only a numeric identifier. The list of matched names and numbers will also be kept in a locked area in the Nutrition Assessment Laboratory for Education and Research. However, when this study and possible future studies are completed, the records will be destroyed. A follow-up study would require your permission for participation again.

Information about the findings of your child's nutritional assessment **will not be made available to persons without your written consent to do so.**

Right to Withdraw or Decline Participation

You and/or your child's participation in this study are entirely voluntary, which gives either one of you the right to change your mind or withdraw from the study during any time, such as if your child is not feeling well or objects to a procedure.

Right to Decline or Accept having your child's image and voice videotaped or image photographed.
To educate practitioners and students about Nutritional Assessment issues related to children and to demonstrate nutritional assessment to future students in promotional materials, I am seeking your consent to have your child included in any pictures, video or audio recordings of these procedures. Your child's name will not be included with any pictures, videos, or audio recordings released. By signing the enclosed "Talent/Participant Release" form, you are indicating your permission to include your child in these visual and audio formats and to their use in printed educational and research presentations developed by the researcher or thesis advisors. These educational and research presentations will take place in conferences at the state and national level.

Any questions or concerns you may have about participation in this study can be addressed first to Brooke Bauer at 233-0690 or bauerbro@post.uwstout.edu, second to Dr. Amanda Branscombe 232-1478 or branscombea@uwstout.edu, and third to Dr. Ted Knous, Chair of UW-Stout Institutional Review Board for the Protection of Human Subjects in Research, 11 HH, UW-Stout, Menomonie, WI, 54751, phone (715) 232-1126.

Please check one of the following:

- ❑ I attest that I have read and understood the study titled, Nutritional Assessment of Children Enrolled in a Structured Childcare Setting", including the potential risks, benefits, and my child's right as a participant, and that all of my questions about the nutritional assessment study have been answered to my satisfaction. **I hereby give my informed consent for my child to participate in this nutritional assessment activity and have their picture taken or be videotaped for printed educational and research presentations.**

Parent/Guardian Signature ______________________________/Date ______________

Child's name__________________________________

- ❑ I attest that I have read and understood the study titled, Nutritional Assessment of Children Enrolled in a Structured Childcare Setting", including the potential risks, benefits, and my child's right as a participant, and that all of my questions about the nutritional assessment study have been answered to my satisfaction. **I hereby give my informed consent for my child to participate in this nutritional assessment activity, but not have their picture taken or be videotaped for printed educational and research presentations.**

Parent/Guardian Signature ______________________________/Date ______________

Child's name__________________________________

- ❑ **I do not give consent** for my child to participate in this study.

Parent/Guardian Signature______________________________/Date______________

Child's name __________________________________

By choosing this option, please feel free to write your concerns for not giving consent.

____

____

____

- ❑ Yes, I may be contacted for clarification of concerns.

Please indicate how you would like to be contacted that is easiest for you:____

____

TALENT/PARTICIPANT RELEASE

Date:_______________

I hereby give permission to the University of Wisconsin-Stout and its agents to use my child's image (whether still, motion picture, or video), recordings of his/her voice, and their name in association with the production designated below. My child's image will be used only for educational use and not for commercial gain.

I further agree to permit editing of the production medium (video, film, or audio tape) to the extent necessary for normal production purposes, provided that the intent of my child's performance is not altered.

I understand that my child will NOT be compensated for his/her part in this production.

PROJECT TITLE: ***Nutrition Assessment***

Name of Child:____
(please print)

Name of Parent or Guardian:____________________________________
(please print)

Signature of Parent or Guardian:_________________________________

Address:____

Phone:____

Learning Technology Services/
Video Production

Appendix C

Informational Letters

Initial Informatory Letter About the Nutrition Assessment Study And Examiners Distributed on February 15, 2001

Promotional Letter Distributed to those Parents Expressing Interest in the Nutrition Study after Conversation on the Phone on March 2, 2001

Second Informatory Letter about the Start of the Nutrition Assessment Study Distributed to those Parents who gave Consent for the Nutrition Study On March 2, 2001

Third Informatory Letter about Completing the Food Frequency Questionnaire and Demographic Questions Distributed to those Parents who gave Consent for the Nutrition Study on March 19, 2001, March 29, 2001 and April 4, 2001

Explanatory Letter Distributed to those Parents who gave Consent for the Nutrition Study about their Child's Results to Various Measurements and their Nutritional Status on May 4, 2001

February 15, 2001

Dear Parents,

Hello! My name is Brooke Bauer. I am a second year graduate student here at UW-Stout, majoring in Food and Nutritional Sciences. For my graduate research, I hope to involve the children attending the Child and Family Study Center. I am interested in researching the nutritional status of children. My studies and training have prepared me to do such a study. I am a registered dietitian and have worked as a dietitian with children at St. Joseph's Hospital in Marshfield, WI. My experience with children at the YMCA in Marshfield has helped me to realize how children need special treatment and attention when conducting an activity.

The activity I would like to complete is to obtain some measurements, samples, and information that will help me assess your child's nutritional status. This will help identify very early any potential problems and will provide an overview of the nutritional status of children attending the Child and Family Study Center. Nutrition education materials can be developed based on the findings and needs of the children.

The study will be conducted in the Nutritional Assessment Laboratory for Education and Research in Room 427 of the Home Economics Building. I am the graduate assistant for that laboratory and have completed a class on nutritional assessment and will be assisting an instructor with the course this year. I have had the opportunity to observe the children at the Child and Family Study Center since September and am planning to make certain that your child feels comfortable with me and the laboratory. The children will have some chances to go the lab to get familiar with it. The components I would like to use as part of this nutritional assessment are height, weight, body mass index (BMI), hemoglobin, cholesterol, and glucose levels, blood pressure and a dietary intake questionnaire.

All of the measurements of this nutrition assessment will be done with complete professionalism, carefulness, accuracy, and affection. Last semester, I completed the nutrition assessment course at UW-Stout, which took place in the Nutrition Assessment Laboratory for Education and Research. I have taken the appropriate training to perform a nutrition assessment. Your child's height will be measured by myself, which will be done with a wall stadiometer. A stadiometer is a device that has increments of inches escalating up the wall with movable flat headboard. If your child is 36 months or younger, your child's height will be measured with them lying down on a special board to check their height. Weights will be also be measured by myself on the balance-beam scale. An infant scale will be used if your child is one year of age.

Being a Certified Blood Pressure Screener, I will use a child's blood pressure cuff to determine blood pressure. Cholesterol and glucose levels will be measured using the machine called the Cholestech® machine. A HemoCue® machine will be used to determine hemoglobin levels. The procedures for these tests were developed under the advisement of Elna Johnson, RN Director of Patient Care and Kathy Markham, M.T. (ASCP) Directory of Laboratory Services at Myrtle Werth Medical Center. This laboratory has gone through the systematic process required to achieve state certification as an approved nutritional assessment laboratory. Staff practices extreme care and professionalism and strictly adheres to all state-mandated regulations regarding lab procedures. The dietary intake questionnaire will require you to indicate your child's usually consumption of fruits and vegetables.

I have been observing the children at the Child and Family Study Center since September 14, 2000. I have tried to see as many children as possible at these times. I want your child to know me, recognize me, and feel comfortable with me throughout the entire nutrition assessment process. I feel by establishing this relationship with your child is beneficial for this study.

I feel knowing your child's nutritional status is valuable to you because nutritional status of children helps define their health status, well-being, and response to illness. Proper nutrition levels are generally associated with better health status among children and better health status later on when they reach adolescence and adulthood. Current research has shown that many diseases that occur later in life have originated in childhood. You will get a copy of your child's results and any nutritional education you would like regarding this nutrition assessment. A nominal award, such as a sticker, will be given to your child to thank them for helping me with this study. This will be conducted on a one-on-one basis, so that awards are not given in a group setting.

I am asking you to think about having your child participate in my research project and let me assess your child's nutritional status. There will be no cost to you.
Thank you so much for taking the time to read this letter. I look forward to hearing from you and I am excited to work with you and your child!

I will be holding three meetings during the next week to discuss this study in greater detail and to answer any questions you may have. Due to space availability, the meetings will be held in the Library in the Child and Family Study Center. Please indicate which meeting you will be able to attend by checking a box below and returning the bottom to Patty by **Monday, February 19, 2001.**

Thanks again,

Brooke Bauer, RD
Graduate Student, Food and Nutritional Sciences

- -

Name: ____________________

- ☐ Tuesday, February 20, 2001 from 4:30 to 5:00
- ☐ Wednesday, February 21, 2001 from 11:30 to 12:00
- ☐ Wednesday, February 21, 2001 from 5:30-6:00

March 2, 2001

Dear Parent,

When talking with you on the phone regarding the study on the nutritional status of your child, you expressed some interest. I am sending this note as a little reminder that if you still want to know your child's results from my nutrition study, there is still time to turn in the parent consent form. Measurements of height, weight, and blood pressure will be done next Wednesday, March 7th and Thursday, March 8th. Kathy Markum, a Certified Laboratory Technician, will test for hemoglobin, cholesterol, and glucose on Tuesday, March 20 from 9:00-11:00 and Wednesday, March 21 from 9:00-11:00. Attached is a parent consent form for your convenience.
Thank you for your time.

Sincerely,

Brooke Bauer, RD

March 2, 2001

Dear Parents,

Thank you for agreeing to have your child in my research study to find the nutritional status of preschool aged children. I will be pilot testing on Tuesday, March 6 from 9:00-10:00. The agenda for the rest of the study will take place on Wednesday, March 7 from 9:00-11:00 and Thursday, March 8 from 9:00-11:00 for measuring height, weight, and blood pressure. Kathy Markum, a Certified Laboratory Technician, will test for hemoglobin, cholesterol, and glucose with a fingerstick on the following Tuesday, March 20 from 9:00-11:00 and the following Wednesday, March 21 from 9:00-11:00.

Thank you for your time. I look forward to contacting you again with your child's results.

Sincerely,

Brooke Bauer, RD

March 19, 2001

Dear Parents,

Thank you for being very cooperative with my nutrition study involving your child. The last part of the study entails a Food Frequency Questionnaire be completed regarding your child's fruit and vegetable eating habits along with some small background questions about your child.

It would be greatly appreciated if you could complete these two sheets stapled here by this Friday, **March 23, 2001**. You can drop off these sheets to Jessie or Kathy when completed. Next, you will receive a copy of your child's results to the various measurements that you agreed to.

Thanks again,

Brooke Bauer, RD

May 4, 2001

Dear Parents,

I would like to take this time again to "thank you" for allowing your child to be in my study on the nutritional status of preschool-aged children. I really enjoyed getting to know your child during the times I observed the children. As I mentioned in the beginning, you will receive a copy of your child's results to their nutritional assessment.

Date of Assessment:	**#:**
Height: , which is at the __________ on the Growth Charts	**Hemoglobin:** **Normal Range:**
Weight: , which is at the _____________ on the Growth Charts.	**Cholesterol:** **Normal Range:**
Blood Pressure: **Normal Range:**	**Glucose:** **Normal Range:**
BMI: , which is at the _____________ on the Growth Charts.	BMI stands for Body Mass Index, which is used to indicate disease risk and childhood obesity.
Fruits and Vegetables:	

Comments:

If you have any additional questions, please feel free to give me a call at (715) 233-0690 until May 15th. Also, Mary Murray and Melinda Hanson are two other Registered Dietitians who would like to assist in answering nutrition related questions. Both Mary and Melinda are qualified academic staff that are happy to answer your questions and can be reached at:

Mary Murray, M.S., R.D.	Melinda Hanson, M.S., R.D.
232-2088	232-1994
murraym@uwstout.edu	hansonmeli@uwstout.edu

Again, thank you very much for making this study so valuable. I greatly appreciate it beyond words.

Sincerely,

Brooke Bauer, RD

Appendix D

Journal of the Hours Spent with Children at the Child and Family Study Center (CFSC) between September 14, 2001 and February 23, 2001

Journal of Hours Spent with the Children at
The University of Wisconsin-Stout's
Child and Family Study Center.

Thursday, September 14, 2000 from 2:00-3:00:
Today was my first day with the three, four, and five year old afternoon children who attend UW Stout's Child and Family Study Center. I introduced myself to the secretary, the "teachers", and finally the kids. The children in the "Why Room" were in the process of eating snack, so I pulled up a chair and sat with two little girls, who both instantly asked me who I was. We got along fine asking each other a lot of questions while we ate tortillas with melted cheese, canned pears, and milk. The kids themselves served all foods. The teachers would hang on to the bowl or plate and the children would dish themselves. If the child touched something, they knew that they had to take that piece and eat it. Most kids ate what they had dished them on their plates. One girl on my table ate only the melted cheese on the tortilla, not the whole thing. After snack I socialized some more with other kids, getting to know there names, having them get to know me, and helping out with their demands. Next, we had large group time, which was a discussion on different games to play (Memory® and the "Goop".) After that, I attended and participated in the large muscle room activity with the children in the "Wonder Room" and ended my day playing outside with them all. Overall, it was a good first visit. Some characteristics I noticed about the children who participate in this childcare program were that they acted appropriate for their ages, did not look to be obese or even overweight, and did not seem very shy or intimidated.

Tuesday, September 19, 2000 from 10:00-11:00:
When I came today, the children in the "Wonder Room" were playing by themselves and instantly included me in their activities. Soon, it was clean up time, so that snack could be next. Most kids cleaned up or put the toys away that they were playing with, however, only three kids initially came to the table for the snack of blueberry yogurt, orange wedges, and orange juice. I sat on the table with the three kids, who all asked for seconds on the yogurt. At this time, a fourth child approached the table for snack, which she ate the yogurt, oranges, and juice and then left. When getting the snack or seconds, the children always asked a teacher if they could eat or have more. Then, they were told if they could or could not. In most cases, the child was allowed seconds unless it was getting close to 10:45. Lunch is served at 11:30 on the schedule. The oranges had their peelings on; therefore, the kids procrastinated eating them until one asked me to "get that stuff off" referring to the peeling. After I peeled one child's orange, soon the rest of the kids immediately wanted me to peel all of their oranges, which I did. Most everyone ate their oranges and drank the rest of their juice. Next, the kids in the "Wonder Room" took off for the large muscle room and I went to the "Why Room" where the children there were just getting done with snack. I sat on a table with three kids. They had the same snack, except they had some blueberry yogurt and some peach yogurt. One child was eating the blueberry yogurt, but since there was no more left, the other two children next to her had peach yogurt. Soon, one child wanted the "purple yogurt like hers". The teacher at the table quickly explained that there was no more purple yogurt left and that was why she had the peach yogurt. The little girl did not want the peach yogurt, so she continued to complain. Meanwhile, the other child with the peach yogurt on that table continued eating her peach yogurt. After, both children (one with the blueberry yogurt and the non-complainer with the peach yogurt) finished eating, then, the child,

who was previously complaining about the peach yogurt, tasted the yogurt and liked it, so she ate it all.

Thursday, September 21, 2000 at 2:00-3:00:
The children in the "Wonder Room" were busy doing their own things when I came today; I played cars and puzzles with some of them. Meanwhile, in the "Why Room" snack was going on, so I went over to that side of the room and sat on a small, square table with two boys. Every kid was sitting at a table and participated in snack. The snack was toast with peanut butter, crushed pineapple, and milk or water. As most kids finished up, which each of them cleaned up their spot at the table by throwing away their plates, cups, and spoons. Then, they washed their hands and went to play somewhere. In the "Wonder Room", snack was just starting. I sat with two girls and a teacher. Only one child did not eat snack this afternoon, instead she played quietly with marbles. One of the girls on my table told me that the crushed pineapple was too spicy, but she continues eating it anyways. Later, she told me, "Wooh, this is very, very sour!" In the meantime, the other girl on my table had asked for seconds in the crushed pineapple. When watching the kids finish and clean up, some had the pineapple left on their plate, however, everyone ate the peanut butter toast. I also noticed when they cleaned up that any liquid left in their cups, they disposed of down the sink drain and then they threw their cup in the garbage. All kids were very neat and precise when doing this. Afterwards, there was a story.

Tuesday, September 26, 2000 at 9:45 – 10:45:
I arrived today to the Child and Family Study Center a little bit earlier than I usually do on Tuesday mornings. A group of college students were playing a puddle game with the kids in the Wonder Room; they read a story to them, and then left. Next, I played the "Whiney the Pooh" computer game with two girls. During this game, I overheard another one little girl say that she was hungry. Snack was soon on the table, which a couple kids knew about and began to wash their hands. The teachers went around the room telling the children that snack was ready, but a lot of kids remained playing with their friends in a game. Soon, I went over and sat at the table. A boy told me that I could not sit at the table unless I washed my hands, so I did. It looks like the sanitation methods at the center are working and being practiced. The snack was bananas with peanut butter and milk. Soon, more place settings were added to the table and all kids participated in the snack. Most kids ate ½ to a whole banana. It was a snack well liked. There was one little girl who ate almost three bananas. The kids cleaned up their places just like before. Everything went smoothly. There were no children in the Why Room during my hour of visitation.

Thursday, September 28, 2000 at 2:00-3:00:
Snack was just being served in the Why Room when I arrived today. It seemed to be more hectic during this snack time compared to other days. Many children put their bowls on top of their head as they waited for the snack. The teachers did a good job in getting them to stop this. The snack was bananas, microwave popcorn, water, and milk. I sat at a table with two little girls, who quickly gave me an empty bowl, cup, and napkin. The kids really welcome me to their activities numerous times, which makes me feel good. Microwave popcorn was a big hit. It seemed like many children finished eating a bowl of popcorn at the same time and would all grab for the bowl at the same time too. This brought about some selfish wanting, but they all shared. However, you could see the eagerness or maybe hunger on their faces as they waited for their

turn to get some popcorn. After this incident, all went the same and snack was soon over. I read a couple of stories to a child and then headed over to the Wonder Room. Here, the kids were already eating snack, which they seemed to all enjoy. There were only two kids, who did not eat snack, which happens to be the same couple of kids that I mentioned before who did not eat snack. Snack ran smoother on this side of the room today. All went the same; clean up, wash hands, and go play. In comparing the two sides of the room, all of the children eat snack in the Why Room, yet in the Wonder Room, not all of the kids eat snack everyday. There is one little girl who I have not seen eat a snack yet. There are also a couple of other kids who eat it once in a while. Interesting!

Tuesday, October 3, 2000 at 10:00 to 11:00:
Today I went to the "Why Room" first, which all of the kids were already eating snack. I grabbed a chair by a table with two boys and a girl on. They were busy talking and eating butter crackers with American cheese and orange juice. The majority of the children would ask for seconds, especially on the cheese. Right away, seconds were distributed. After seconds, still a good majority would ask for more cheese without eating their crackers yet. Now, the teachers would say that they had to eat their crackers on their plates also, but yet still gave them cheese. Then, if the children wanted more cheese, the teachers said that they had to finish their cracker first and then they could eat more cheese. These children would eat their crackers without complaining, then ask for more cheese and crackers. A lot of children remained eating for a longer period than usual. Next, I went to the "Wonder Room", where they were in the middle of snack, but I didn't realize this because only two girls and one boy were eating, all others were playing with blocks, on the computer, or by themselves. I sat at the big round table with the three kids eating. Instantly, one little girl said, "You have to wash your hands first!" I did wash my hands and then sat back down. She immediately gave me the bowl of pears, which was their snack along with milk. More and more children are accepting me, going out of their way to welcome me. After snack, I colored with a little girl.

Thursday, October 5, 2000 at 2:15 to 3:00:
When I arrived to the Why Room today, the children were in the middle of an activity, so I roamed over to the Wonder Room, where snack had already started. First I played an imaginary game with two girls, but then quickly walked over to the table were snack of bagels with strawberry jam, canned peaches, and milk was already served. There was just typical kid talk going on. The children really did not add much into the conversation about the food. After snack, I went to the Why Room, but there were finishing up an activity and then getting ready to go outside, therefore, I didn't get to observe snack in the Why Room.

Tuesday, October 10, 2000 at 10:00-11:00:
The Why Room was the side I choose to enter first today. I noticed that snack was not served yet and that the Wonder Room teachers were just starting snack, therefore, I quickly went over to the Wonder Room to have snack with the kids. I was especially excited because the snack was animal crackers and milk, which I like. However, before I could eat, a teacher from the Why Room came into the Wonder Room and asked me while I was sitting at the table with the kids and some staff, "Is there a reason why you are on this side of the room when there are only 7 kids over here and not on the other side where there are 15 kids?!!!???" I immediately replied, no, but that I noticed the snack was served here first and that I am observing snack. I still got up

from the table and went to the other side. Here, the kids were playing so I sat at a table and played dominos with two boys and a teacher. Soon, snacks were served and we all sat at the tables. I ate the peach yogurt with the kids. Orange juice was also served. After this, small group of a story about houses came. When I sat down on the flood, immediately I had two girls want to sit on my lap, so I had both of them sit. Soon a third girl started leaning on me and then she tried sitting on me lap also! Well, the other two girls did not like that so then they all sort of argued. Finally, I just had to ask the third girl to sit on a different teachers lap. I felt bad doing that, but then I felt good that some of the girls are warming up to me.

Tuesday, October 17, 2000 at 9:30-10:30:
Today was the first day that I observed the children ages one to two. Instead of walking to the Child and Family Study Center, I went to Home Econ. Room 175, where the children who are 6 weeks old up to three years of age located. When I first arrived I introduced myself to Jamie, who is the head teacher of the one year olds. Then, Dr. Branscombe gave me a tour of the place. After that, the two year olds were ready for snack. I sat down at a table with two boys, two girls, and another teacher. We had cottage cheese, Ritz crackers, and milk. Everyone made me feel welcomed. At this table, both of the girls ate the cottage cheese and asked for more three times. One little boy was not that interested in snack. He kept wondering off of his chair and would mainly want to watch the water running out of the sinks when people would wash their hands. Therefore, he did not eat much. The other little boy tried his cottage cheese and instantly spit it out into his bowl; I guess he did like the taste, texture, temp., etc. He did eat his crackers and asked from more along with more milk. Overall, I thought the kids ate enough and handled their utensils appropriately. Most kids had their milk in a regular cup and some had tippy cup lids put on. Overall, it was good. Then, the teachers washed up the two year olds, so I scooted over to the one-year-old table. This was an interesting sight. I noticed before when the one of the one-year-olds got their bowl of cottage cheese, another kids took it because he wanted it. Immediately, this little girl began to fight back for the bowl, crying the whole time. Soon, a teacher gave the little girl another bowl, so then; this little girl instantly stopped crying and began eating with tears dropping off. Most of the kids had given up on using a spoon and decided to eat with their hands. All of the kids ate at the table, except one little boy who sat in the high chair. These kids were extremely messy; their cups were messy; it was a clutter. From what I could see, most of the one-year-olds ate their cottage cheese or at least half of it. No one refused the snack. Many crackers were giving out for seconds and milk was also poured a second time. It was interesting to see how the kids interact with snack at the different age groups. Also, it was interesting to see how the kids at this young of age where not afraid of me, or uncomfortable with me. Two little girls in the one-year-old group kind of scooted their butts onto my lap when I was playing a ball game with a little boy. By noticing this, I do think that visiting the lab would be the next step. Establishing rapport with these children was much easier than I thought due to them seeing so many different faces throughout the day.

Thursday, October 19, 2000 2:00-3:00:
Yogurt, orange juice, water, and crackers were set on the table for the children in the "Why Room" to have for snack. Some children had already started eating and some were still washing their hands. I sat in a seat on one of the smaller square tables to find out that I had taken some little boys spot who politely asked me to move because he was sitting there first. He still ate his snack just fine. Snack was quicker than usual on this side. Most kids ate only one helping and

then got up and threw their dishes away to then go and play. I quickly moved over to the "Wonder Room" and sat down on a small square table, which this time, I had taken the spot of a little girl, who also, politely asked me to move because she was sitting there first. Popcorn, apples, orange juice, milk and water was offered to the kids. Many kids enjoyed the popcorn and multiple bags had to be popped. As we were waiting for one of the bags, one little girl just out of the blue decided that she was going to pour water for a little boy who was sitting on the opposite side of the table from her. Due to her young age and the distance, she poured water everywhere one the table, which overflowed onto the floor. This to me, was a strange act. The children have never done anything like this or acted like they were going to. When kids ask for seconds, the other kids pass the food item to them, but have never actually given anything to the child. This kid didn't even ask for any water, just out of the blue a little girl decided to pour him some. I am sure that it was just because she wanted to share some food with the boy and merely nothing else.

Tuesday, October 24, 2000 10:00 – 10:45:
I came late today to observe the one/two year olds, not by choice. So they were already in snack, which was peaches, crackers, and milk. Most kids were just finishing up, so I don't know how much they ate. When I entered the room, three of the kids said "hi" to me, which was a nice greeting. After snack I help wash two little girls hands and faces. One of the little girls had special or different soap than the soap dispenser, which the other kids use to wash their hands. Also this little girl had lotion that she had to put on after washing. This process of washing hands after snack is something that is different from the three/four/five years old that I observe on Thursdays. All children of all ages wash their hands before the snack, but only the one/two year olds also wash their hands after the snack. This is an age-appropriate observation. After washing hands, I played with the two year olds. They had a pretend apple tree with apples laying all around. I asked several kids if they liked apples, which all of them did, and then, I asked them if they had apples at their house, which all of them did too.

Thursday, October 26, 2000 2:00-3:00:
Today I entered the Wonder Room first. I played with some bottles filled with different materials with a little girl. Soon snack of English muffins with peanut butter or jelly, orange juice, milk, or water was served. All of the children had snack today. One little boy requested they have peanut butter on the English muffins, instead of always jelly. That was interesting how the kids feel comfortable enough to ask for foods they like and that the staff reacted and did supply it. After this snack, I went to the Why Room to observe snack here. I sat with some children on a square table where tortillas with cheese were served along with orange juice or water. There were no seconds for this snack provided from the staff, yet no children asked for seconds either. Snack in the Why Room went very fast today.

Tuesday, October 31, 2000 9:30 – 10:30:
I met the new student and head teachers today. Learning new names again will be interesting. The two year olds ate their snack first like always. Pretzels, chocolate/vanilla bite-size cookies and orange juice was their snack. All children ate age-appropriately. The kids ate all their pretzels and cookies before they asked for seconds. Most times, both pretzels and cookies were given for seconds, not just cookies. Almost all of the two-year-olds were done eating before the one-year-olds started. This is not always the case. The one-year-olds had pretzels, bananas and

milk. Again, that same little boy was in a high chair. The teachers said he eats better being in the high chair because he doesn't get up so much to wonder. Most of the kids ate in a age-appropriate time frame except one little girl, who always is the last one to get done eating by about 10 minutes. This is fine and she is a good eater. She just no be a fast chewer, takes her time more, and does roam around a little bit more towards the end of snack. Snack covered the whole hour I was there, which was the first time that has happened also.

Thursday, November 2, 2000 2:00-3:00:
Today, I entered the Wonder Room where children commented on the time they went "Trick-Or-Treat"ing in the Home Economics building and saw me handing out candy with Mary Murray. After I talked with some of the children, I headed to the Why Room where snack was just beginning. The head teacher did not want to start snack until all of the children had their hands washed and were sitting at the table. It was their cooking lesson and the food item was "Ice Cream Sundaes." The children had to answer question about what ingredients make an ice cream sundae. Soon all of the children had an ice cream sundae with ice cream, chocolate syrup, nuts, whipping cream, cherries, and milk. I enjoyed the ice cream sundae also. After this snack, I went to the Wonder Room for their snack of peanut butter toast, crushed pineapple, milk and water. Most of the kids were done with this snack so one of the teachers started to read a book. There were three girls who were not done with their snack yet, but finished their snack and then sat on the ground with the rest of us to listen to the story. One little girl sat on my lap during the story. After the story, I left.

Tuesday, November 7, 2000 9:30 –11:00:
The two-year olds were already eating their snack of cookies, bananas, and orange juice when I arrived at the center today. Most of the children ate their entire snack, but I don't know if it was their first or second helping. The regular washing of the hands and face followed before the two-year olds could go and play. Soon, the one-year olds finished washing their hands so that they could start their snack of the same thing. There were 5 children in the one-year old group so that made it easier to observe them all. There was one little boy who constantly put a lot of food into his mouth. Most of the times, the teachers caught it, but if not, you could easily tell he had too much in his mouth because he would make funny faces like it was too hard to chew. There were a little boy and the same little girl who remained eating longer than the other children. After we washed hands and faces, I played with the kids for some extra time in the large muscle room.

Thursday, November 9, 2000 2:00-3:00:
The snack was already prepared for the Why Room when I arrived today, so I stayed on this side first anticipated that snack was next. Well, as it turned out, the teachers didn't start snack even though it was ready. So when we ate snack in the Why Room, snack was also being eaten in the Wonder Room. I ate on a table with another teacher and two little girls and we ate popcorn, bananas, milk, and water. After I ate there, I entered the Wonder Room for snack. There were only three girls left eating the same snack as the Why Room. I sat down with them, but then a little girl asked me to play on the computer with her so I gave in and did.

Tuesday, November 14, 2000 9:30- 10:30:
Today, I arrived long before snack; therefore, I helped wash the two-year-olds hands and sat with them on a table. We had Ritz crackers and apple slices with milk. I was very interesting to see how these children adapt to different textures of foods. Every child on the table I was sitting on except one little boy would not eat the peeling to the apple. Each child had a different strategy to avoiding the peeling. Some ate the apple slices like a watermelon slice, others took a bite and chewed up the food, swallowed the juice and then spit out the rest of the apple in their mouth, and one child refused to eat the apples. Next, the one year olds came for snack. They too had Ritz crackers, and milk, but with bananas and apples cut up into tiny pieces without the peeling. A different characteristic I discovered today was that the one-year-olds like to copy one another. If one starts shaken their head, another one will start. Today, one little boy kept touching another little girl with his cracker, so she followed that by doing the same thing the child next to her. This coping is also comes out when the first child is done eating. It is not too much further that the next child wants to be done too, even though they still may be chewing and holding their snack in their hand. Interesting!

Wednesday, November 15, 2000 2:30-3:30 (NALER Tour):
Today the children from the Why Room toured the Nutrition Assessment Lab to see where a Dietitian works. I went to the CFSC to escort the children (with the help of the teachers) to NALER for their visit. I discussed that a Dietitian is concerned with nutrition and that proper nutrition gives a strong, tall, big and healthy bodies. I reviewed height and weight with the children. I measured the height on one of the teachers to demonstrate the procedure for the children. Next, I reviewed the Cholestech and Hemoglobin machines, saying that they measure some things called Cholesterol and Iron in our bodies. I mentioned that I knew that they probably have never heard of those words before, but that a Dietitian wants to measure those things to see how our nutrition status is. Next, we discussed pizza because they were making pizza when they returned to the CFSC. I briefly went over the Food Guide Pyramid and how pizza is in different food groups and that it will help us grow big and strong. I then, walked back to the CFSC with the children and teachers.

Thursday, November 16, 2000 5:00-5:30:
Today I came later than my usual time because I wanted to observe the second afternoon snack and I wanted to be around for when the parents picked up their children. I want the parents to start to first recognize my face as a face with the CFSC and not a mean Dietitian who wants to take their child's blood. From there, I want them to recognize my name and put it with a face. One way that that is possible is by having the children know my name also. I try to say their name first and then ask them if they remember my name. More and more children do know my name off the top of their head and some will recognize it when I tell them what it is. As I was walking into the CFSC today, a little girl was walking out of the CFSC with her dad. I said good bye to her and she said it back. Then, I heard her dad say, "Who was that?" and she said back, "Brooke". So that was very nice to hear. When I entered the Why Room, the four remain children were washing their hands because they were going over to the other room, the Wonder Room for snack with the remaining children there. I washed my hands too and had English muffins with butter and cinnamon, apple juice, and water. Two different kids spilled their drinks today, which was fine and no one got upset so that was good. I then played a computer game with one of the little girls. I think about ¾ of the parents looked at me, but did not say anything.

I said "Good-bye" to all of the children leaving so that they would say good-bye back and their parents as a means of recognizing me. Overall, I found this observation very beneficial.

Monday, November 27, 2000 11:30 – 12:30:
Lunch was being served today when I observed the one and two year olds. They were eating Swiss steak, mashed potatoes, beets, peaches, and milk. The meat was a big hit with both age groups. This surprised me a bit since I was reading in Pipes book for my Maternal and Child Nutrition class that the texture of meat is not favored by one and two year olds and that a parent should keep that in mind. However, the beets were not eating by many, even the one-year-old who is a vegetable lover. That same vegetable lover is also the one-year-old who gets a hot dog everyday for lunch. This is requested by his mother and I am not quite sure why. I do know that he will drink the whole glass of milk before eating anything and then will not eat any food. So maybe this is the only food the mother can get the child to eat, but like I said, I don't know. Most of the one-year-olds ate with their hands, which was fun to watch them pick up their mashed potatoes with they fingers. I noticed that lunch was not that much longer than snack time. It was a bit longer than snack, but not as much as an adult would eat. Kids do fill up easier due to the size of their stomachs, but I think that lunch is also quicker for them because once one child gets up and is done, one by one the rest will get up and throw their plates away also. The two-year-olds appeared to be taking their time, especially three of them, were eating slower, which I have also read in the Pipes book for my Maternal and Child Nutrition class that two, three, and even four year olds eat slower. After lunch, we washed hands and played. Some parents came to pick up their kids, however, I didn't talk to any of them, but I do think they noticed me.

Tuesday, November 28, 2000 11:30-12:30:
I decided to observe lunch instead of snack today, even though observing it just yesterday, I wanted to again. Today, lunch consist of stir fry of white rice with meat, carrots, and broccoli mixture, an egg roll, green beans, red and green grapes, kiwi, milk, and M & M cookies. Certain kids liked the stir-fry and certain kids did not. Again, the one year-olds ate most everything with their hands. It was fun to watch them tackle getting every piece of rice. And again, the one-year-olds were done before the two-year-olds. We washed hands, played, and again the same parents, plus other came to pick up their children. I commented on how one child likes rice to his mother, but besides that I did not talk with any of the children's parents.

Tuesday, November 28, 2000 4:30-5:30:
I also decided today to observe the late snack with the three, four, and five year olds. There were more kids today that the last time I had observed the children later on in the day. I first visited the Wonder side and played fish with a little girl and talked with some other children. Then, I went to the Why Room and started to play a game with two little girls when it was time for clean up so that we could go to the Wonder Room for snack with those kids. When we got the Wonder Room, those children were already eating the trail mix, milk, and water. We quickly grabbed a chair and sat with the kids and enjoyed our snack. I got to meet a lot of different student teachers. After snack, I played on the computer with about 5 different girls, which was good because then when the parents would pick up their child, the child would say good-bye to me and me back and the parents would notice me. So far so good, I can't wait to be passed by Stout's IRB board.

Wednesday, November 29, 2000 2:30 – 3:30:
The Wonder Room toured the Nutrition Assessment Laboratory today. This tour went a little bit quicker than the other children's tour from the Why Room. When I came to the CFSC, most of the kids had their coats, mittens, and hats on. We walked over and headed to NALER. When we got there, I asked if anyone had heard of the word Dietitian before. One kid raised his hand, but not confidently. Then, I asked if anyone had heard of the word "Nutrition". Two children did, which they shot their hands immediately up in the air when I asked, so I think they really had. I next, showed them the anthropometric room and took the height of one of the Teachers. As we were in this room, one of the mothers a child who must work on campus came to see what was going on. That kind of made me a bit nervous, but that was o.k. I continued talking and heading into the "Biochemical" area where I tried to explain the HemoCue and Cholestech machine. Well, I didn't really explain them, I just mentioned them. We covered the blood pressure cuffs, which most of the children had seen before. We finished up our talk covering general nutrition.

Thursday, November 30, 2000 4:30 –5:30:
I went to the Why Room today to see how many children were left at the CFSC. Only four girls remained on that side so we all walked to the Wonder Room to have snack with those kids. We all ate Trail mix, water, or juice for our snack. Many kids would not eat their raisins, but wanted more of the cereal part of the mix, especially the Froot Loops. The teachers told the children that they had to eat everything in order to get seconds, which the children did while never complaining. I stayed until the last child was picked up. Again, I got to see more faces of parents today.

Tuesday, December 5, 2000 9:30 – 11:30:
I arrived for snack today, which was apples and crackers. One of the one-year olds completed eating very quickly. She is the usual late eater so that was surprising to see her get up, throw her plate out, and walked over to wash her hands. She made it clear that she was done, just done sooner than I had seen her before. The rest of the one-year-olds finished at age-appropriate times. I didn't get to spend much time with the two-year-olds due to helping out with the one-year-olds and because the two-year-olds finished eating snack very quickly. I barely got to see all of them at the table eating at one time. After snack, I played with the two-year-olds. During this time, I started putting together some of the kids personalities (well, I had done this before, but I could really confirm my thoughts today). It was arranged during this play time that the one and two-year-olds would come a visit NALER. This was such a great opportunity. We took the elevator for both ages. The two-year-old visited it first. We discussed foods, especially fruits and vegetables by the balloons hanging or the posters I had around the lab. We looked at the recumbent stadiometer and showed them how it works. We also looked at the scale and the wall stadiometer, where I measured a teacher's height. That was basically all that the two-year-olds gathered. Next, the one-year-olds visited NALER. Entering, walking around exploring, and leaving did not appear to make the one-year-olds upset. They did want to explore the place though. We had to leave soon due to one of the children smelling up the lab with a dirty diaper.

Tuesday, December 5, 2000 4:30- 5:30:
Today at the CFSC, the Wonder room was downstairs in the gym. Soon, we came upstairs to have snack with the Why Room children. We had crackers with spreadable cheese and water. Almost everyone ate snack, except for two little girls who had been playing together for a while now. Snack was very quick due to there not being a lot of it. After snack, I played at the "light table" with three girls and one little boy. I knew everyone at the table except one little girl. I asked her what her name was, told her mine, and asked her how old she was. This got the whole table telling me how old they were and such. Soon that little girl I just met was sitting on my lap and playing with the legos, so she adapted well to a new person. I got to see four children's parents I had seen before and I got to meet one parent that I had never seen before.

Wednesday, December 6, 2000 11:30 – 12:30:
As I walked down the hallway to the one and two room, I could smell the great food that was being served for lunch. The children were already sitting down, some with plates of food, when I arrived today. Meatloaf, scalloped/mashed potatoes, coleslaw, a dinner roll, and milk was on the plates of many of the children. One of the two-year-olds ate the whole meal with a palmar grasp. Most of the children liked the coleslaw to my surprise and again a lot liked the meat. Lunch was finished for the one-year-olds quicker than the two-year-olds. It is neat to see that at the young of an age, the one-year-olds know what to do when they are done eating and that is to pick up their plate, utensils, and cups and dispose of them in their proper places. After I washed the first little boys hand and face, I put him in the playroom, which he wanted me to play with him, so I joined him. Soon his mom came, so that was good that I got to see her. Next, more and more of the one-year-olds were done and being dropped off in the playroom, so I read a story to a little boy and little girl. Well, during the story, the little girls mother showed up, so that was good that I got to see her, which I have seen her face before. I stayed a bit longer, but then had to go. As I was leaving, I saw that another little boys mother (whom I have seen before) came to pick him up also.

Wednesday, December 6, 2000 4:30 – 5:30:
Popcorn and water were the snacks served at the 5:00 snack on the Why Room, however, I did play with the kids in the Wonder Room first. During snack, only one other teacher ate with the kids and me. The rest of the teachers stood there looking at us and supervising the kids. I think that all of the teachers should eat with us to display a positive role model for the children. I did notice that when there was a little popcorn left over, two of the teachers were eating some of it in the kitchen. So, they were interested in snack and/or hungry, so they should have just sat at the table with us all. Well, maybe next time. After snack, I stayed around while the kids were being picked up to familiarize myself with the parents.

Thursday, December 7, 2002 4:30 – 6:00:
This morning I was a bit hesitant if I could fit observing the late snack with the kids today or not, due to an extremely busy schedule, but some how I found time to move things around in my schedule and go. Well, I am so happy that I did because it was the CFSC "Open House" for the 3, 4, and 5 year olds. I got to see a lot of parents while I was there, some that I had seen from before, and some that I had never met before. After I had been at the CFSC for about ½ hour, the children put on a sign language song. I was sitting at a table when one of the fathers of a child asked, "Are you a Mom or are you a teacher?" I had to be honest and say that I was

neither. I am not passed by the IRB board yet, so I could not say anything about my study, so instead, I said that I was a Nutrition Student and that I have been observing the children for some time now, because I am interested in Nutrition and the Daycare system. He then asked me if I was a Dietitian. I said yes, and then he said as he was looking at his plate of potato chips and desserts, "So is this a nutritional sound snack?" Besides this parent, no others asked me who or what I was doing at the open house. Instead, a lot of parents nodded, said hi, or made some other comment to me. I felt very comfortable there.

Tuesday, December 12, 2000 9:30 –10:30:
Today I went to observe snack with the one and two-year-olds. The two-year-olds were in small group so I went to play with the one-year-olds who were in large muscle group. One of the little girls mother was in the room playing with us. I left this room after 15 minutes of playing to see if the two-year-olds had started snack, which they did. I sat on a table with the two-year-olds while they ate peaches, saltine crackers, and orange juice. There was a two-year-olds' mother with him while he finished his snack. So I got to see her. The teachers did not offer me snack this time, so I helped myself to some saltine crackers and ate them with two other girls on a different table. The kids I was originally eating with were done and washing their hands. During this process, a little one-year-old boy arrived at the CFSC with his mother. I had never seen her before, so that was good.

Tuesday, February 6, 2001 1:45-2:30:
Well, today was interesting since it was the first time I had seen the kids since I left for Christmas break. It had been close to two months, but some of the kids said they knew me, but couldn't remember my name, so that was good. When I came I went to the Wonder Room first. Most of the children were playing around the room with whatever they wanted since some were still trying to wake up. I played on the computer with some of the kids, sat in share time circle and already had two kids want to sit on my lap, which was very comforting to know they accepted and hopefully recognized me. I then, left for the Why Room, just in time for snack. We had applesauce, muffins, and water. Most of the children ate all of their applesauce. I did notice one little girl getting extremely picking about her muffin because she thought it was burnt, but really it was a chocolate chip muffin and some chocolate had melted on the bottom.

Wednesday, February 7, 2001 11:30-12:30:
Today was the first day I got to see the one and two year olds since break. I introduced myself to the teachers I remembered from last semester and to some new ones. Then, I tried saying the children's entire name and got them all right, except I switched two kids names around. So that was beneficial! Lunch was a rice casserole, bread, and salad with dressing, bananas, star fruit, and milk. I tried the star fruit for the first time ever and thought it was nice and juice, but hardly any taste. From what I could see on most of their plates, on average, about half of the meals were eaten. I helped wash hands and decided to play with the two year olds. I met a couple of new kids and I did familiarize myself with one of the parents when she came to pick her son up. I felt pretty comfortable for it being my first day back. Now I need to learn the teachers names.

Wednesday, February 7, 2001 4:30-5:30:
I returned to the CFSC for the 3, 4, and 5 year olds today to get familiar with the kids, see if there are any different ones, and most of all to get reacquainted with the parents. I got to see

about three new parents and children, and about four parents I sort of already knew. My study is passed now, which makes things a little bit easier for talking to people about my study. One little boy that I had never met before seem to like me, for he wanted to play a lot with me. When his mother came, he grabbed her by the hand and led her over to me and said, "Here, this is my mom!" So of course, we introduced ourselves and talked a little bit with the boy. I was amazed at this and thought I wish all of the kids would do this with their parents. Snack was crackers and water.

Monday, February 12, 2001 11:20-12:20:
I visited the one and two-year-olds today for lunch, which was a rice with a chicken sweet n' sour stir-fry, green beans, applesauce, and bread. Today was the first time I ate lunch with the kids in this age group because most times I would come a bit late or would have to leave early and such. This was a little bit harder than I thought due to many kids needing help, trying to get up, or touching someone next to them. Therefore, I felt I had to eat my food a bit faster so that I was done before they were done so that my food would not be cold. The little boy I was sitting next to was done eating instantly and wanted to play with the toys in the two-year-old play area, which he was two. I was not done with my cookie yet, so another teacher had to go into the room with him until I was done, but I helped wash hands with some children first. After this, I went to play with the one-year-olds since I didn't much last time, however, they were not there, so I went to the large muscle room and they were not there either. They were on a walk, so I returned to play with the two-year-olds. After a while of playing, the cots were set up for naptime. First, I took a picture for the group of children with the teachers and left.

Tuesday, February 13, 2001, 11:20-12:20:
Lunch with the 3, 4, and 5 year olds today was interesting. I again ate with the kids, I sat on a table with three other girls and ate baked chicken, mashed potatoes with gravy, peas, pears, bananas, cranberries, bread, and milk. There were four little tables with three kids at each with an adult plate. The teachers were to do most of the dishing up of the kids plates and the kids had a choice to say yes or no to any of the food items. One of the little girls at my table said no to everything except cranberries and bread, and she drank a lot of milk. I don't think she was feeling very well though. After a while, she wanted chicken, but strongly said no to mashed potatoes and peas. Once the pears were introduced all of the girls wanted a lot of the pears and they did eat a lot of them. My table was the last to finish, but I did not feel rushed. After lunch, the kids brushed their teeth and the cots were being displayed for rest time. I met a new kids in this group today.

Thursday, February 22, 2001 4:30-5:30:
Today I observed the children. When I got there, they were all downstairs, so as I started downstairs, they started heading up the stairs. As we came upstairs, we washed hands in the bathroom for snack. One little girl asked a teacher and I where own mothers were. This was sort of funny and cute. We all sat around the table and talked as we ate chocolate chip cookies and milk. After the snack, parents started to arrive to pick up their children. For some parents, I discussed my study with them to see if they had any questions.

Friday, February 23, 2001 5:00-5:30:
I arrived a bit later than usual today; however, just in time for snack. Snack was graham crackers and water. First, the teacher put one graham cracker on every child's plate. After some of the kids finished that graham cracker, they naturally wanted more. One little girl decided she wanted two full graham crackers. Therefore, there was only two full crackers for the rest of the table of 7 kids. Once the children realized that they were not enough crackers, they started getting upset that the crackers were all gone, but no child really put it together that the little girl had a lot on her plate. I thought this as interesting that the kids didn't blame or get upset that their friend had taken a lot. I also found it interesting how the little girl didn't share her plate for of crackers. After snack, a little girl asked me to read a book to her, which led to three other girls enjoying the story also. Bit by bit, the children were going home.

Appendix E

Finger Stick Procedure Used in this Study When Collecting Biochemical Data on Children

Finger Stick Procedure Used in this Study When Collecting Biochemical Data on Children

The biochemical component of a nutritional assessment is the most quantitative data on the nutritional status of a child. The detection of a single nutrient deficiency or toxicity can be discovered quicker in the biochemical results than in any other. Biochemical tests can be used for many different interpretations. A single nutrient can be tested in the blood; however, most useful is the interpretation of the test in an ongoing sequence. Interpretation of these biochemical tests can be enhanced with the use of other data. Dietary intake, clinical symptoms, 24-hour urine sample, or other testing should be combined as supportive information when assessing the nutritional status of a child; hence, the use of a single test is not recommended (DeHoog & Grant, 1999; Lee & Nieman, 1996).

The fingerstick procedure was used in this study to collect blood samples for biochemical testing. The fingerstick procedure requires less training and has adverse consequences than venous collection (Warnick, 1991). The technique in collecting the sample of blood can affect the results of the laboratory test. The following are specific recommendations to take into considerations for an accurate fingerstick.

- First, to stimulate blood flow, have the child warm their hands by rubbing, massaging, or shaking them while keeping their hand below their heart. Keeping their fingers straight will also promote blood flow.
- Choose the ring finger of the child's non-dominant hand; this is due to having less chances of calluses forming. If the child has small hands (perhaps one and two-year-olds), the middle finger is recommended.

- Using an alcohol swap or an antiseptic pad, cleanse the bottom half of the appropriate finger. After that is completed, wipe away any excess alcohol will a sterile gauze pad.
- To keep the skintight at the puncture site, pinch the end of the finger from the opposite sides of the puncture site.
- Hold the child's hand palm up with the upper side corner of the finger up away from the nail bed. Use a lancet in a spring loaded device that is equipped with sufficient force to break the surface of the skin and provide a good puncture. Place the lancet perpendicular and tightly to the skin while applying pressure during the whole puncture.
- Quickly, remove the lancet and wipe away the first drop of blood secondary to it being highly contaminated with tissue fluid or alcohol. Turn the child's palm from the upright position downward allowing drops of blood to form.
- Touch the capillary or measurement device to collect the first drop of blood. Then, tilt the device slightly upward to prevent air bubbles entering. Do not hold the device directly over the punctured site. This makes it difficult to collect the blood into the device, instead allow a blood drop to form and then touch the device to the site.
- If there are difficulties obtaining enough blood due to poor blood flow, lower the child's hand. If absolutely necessary, express blood down the hand and the finger by squeezing and releasing. Do not "milk" the finger, which can lead to dilution from tissue fluid.

- Once enough blood is collected, place a sterile pad over the puncture site while applying direct pressure to stop the site from further bleeding. After the blood has stopped, a band-aid can replace the sterile pad.
- The blood filled capillary tube needs to be analyzed within the first two to three minutes after collection. This is necessary to prevent clotting, which can occur from heparin raising to the end of the filled tube. (Warnick, 1991).

The above steps are extremely important to practice when drawing blood on children; however, it is most important to have an experienced phlebotomist or technician who is properly trained and/or certified and has drawn blood on children before. This is reinforced to reduce the errors in measurement. A technician has a better understanding in sample collection methodology and factors that can affect laboratory results (especially in cholesterol), such as proper posture, prolonged application of the tourniquet, and others (National Institute of Health, 1995).

Appendix F

United States Center for Disease Control (CDC) Age-related Growth Charts developed by the National Center for Health Statistics (NCHS) in collaboration with the National Center for Chronic Disease Prevention and Health Promotion.

Weight-for-age percentiles: Girls, birth to 36 months
Weight-for-age percentiles: Boys, birth to 36 months

Length-for-age percentiles: Girls, birth to 36 months
Length-for-age percentiles: Boys, birth to 36 months

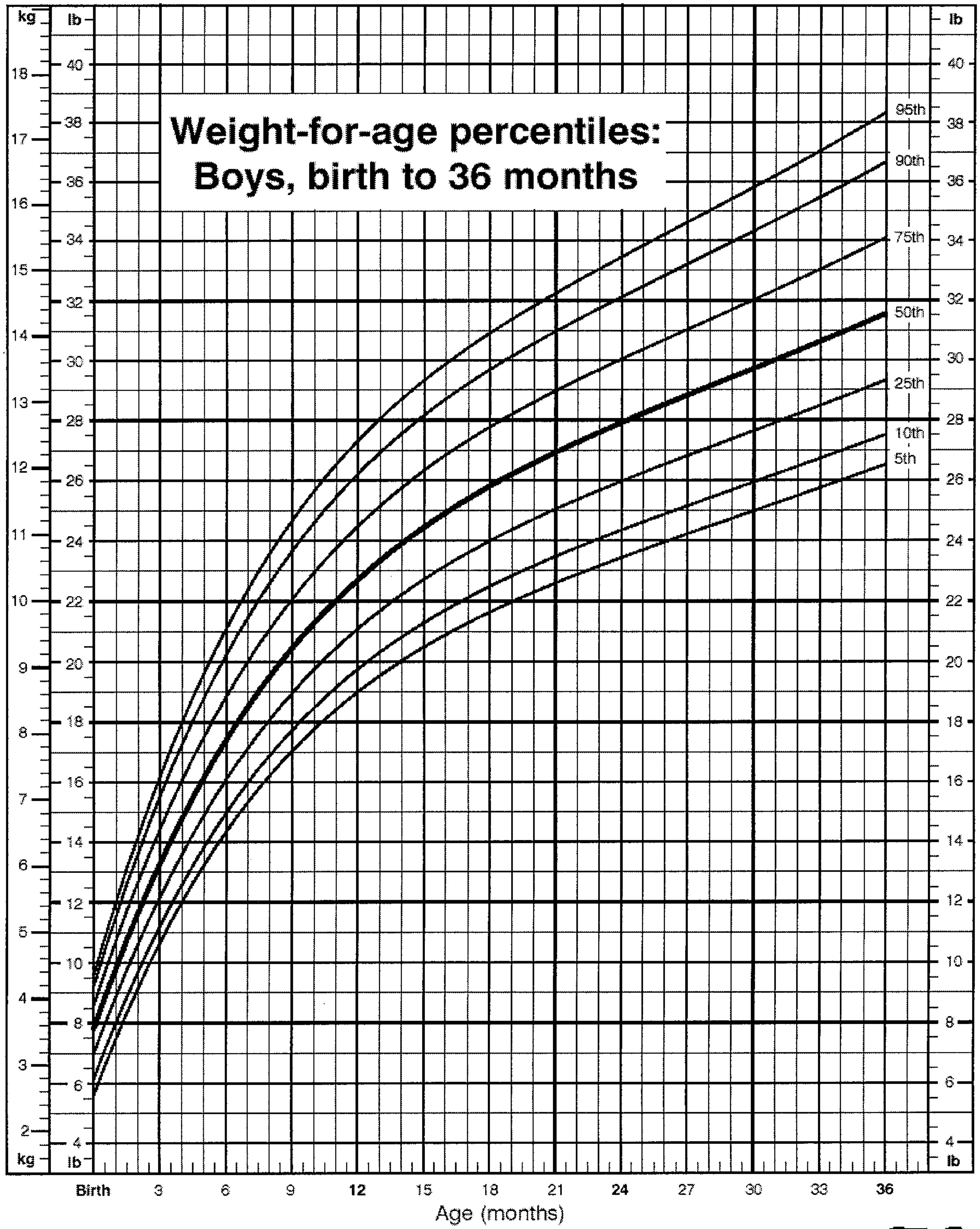
Weight-for-length percentiles: Girls, birth to 36 months
Weight-for-length percentiles: Boys, birth to 36 months

Stature-for-age percentiles: Girls, 2 to 20 years
Stature-for-age percentiles: Boys, 2 to 20 years

Weight-for-age percentiles: Girls, 2 to 20 years
Weight-for-age percentiles: Boys, 2 to 20 years

Body Mass Index-for-age percentiles: Girls, 2 to 20 years
Body Mass Index-for-age percentiles: Boys, 2 to 20 years

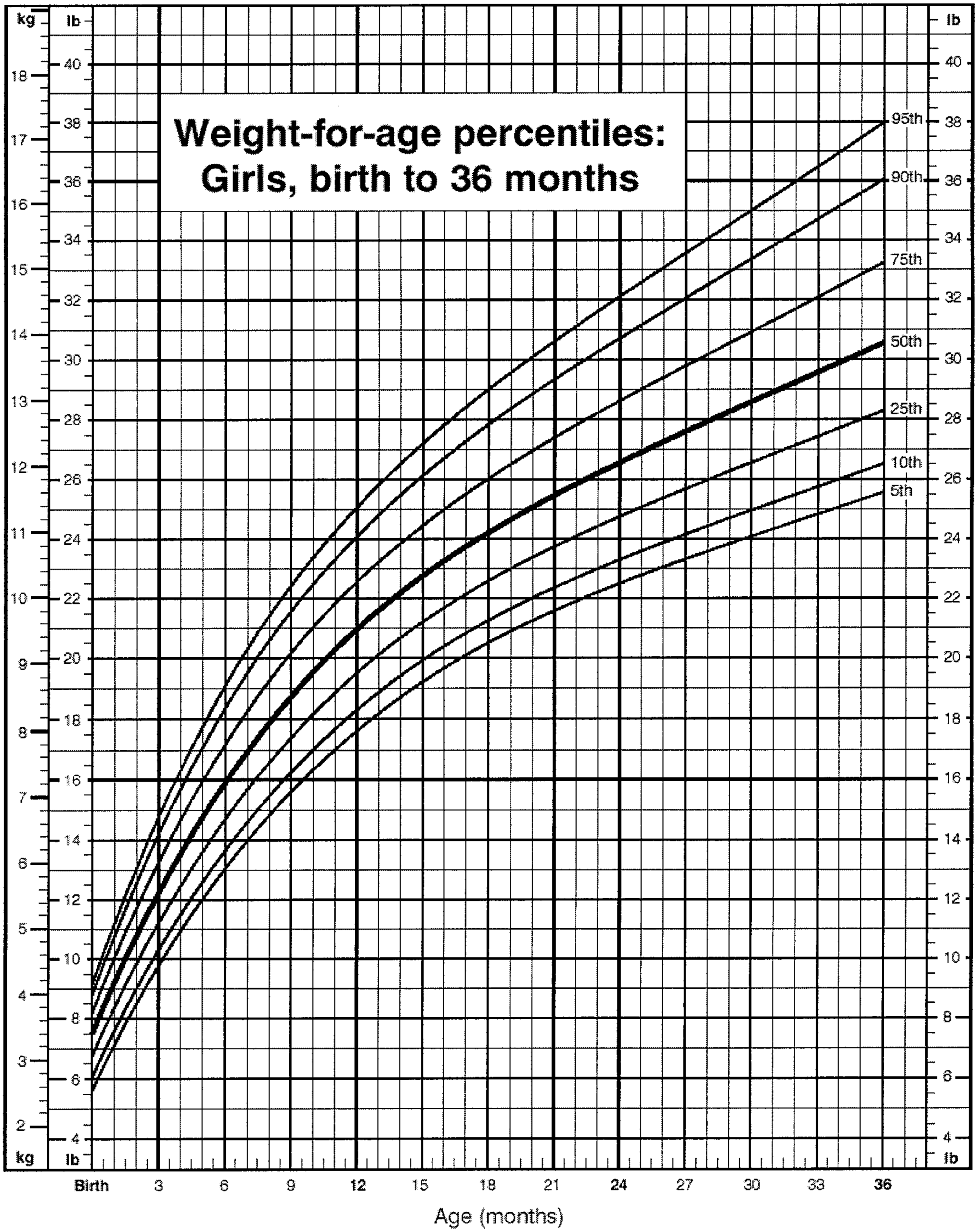
CDC Growth Charts: United States



SOURCE: Developed by the National Center for Health Statistics in collaboration with the National Center for Chronic Disease Prevention and Health Promotion (2000).

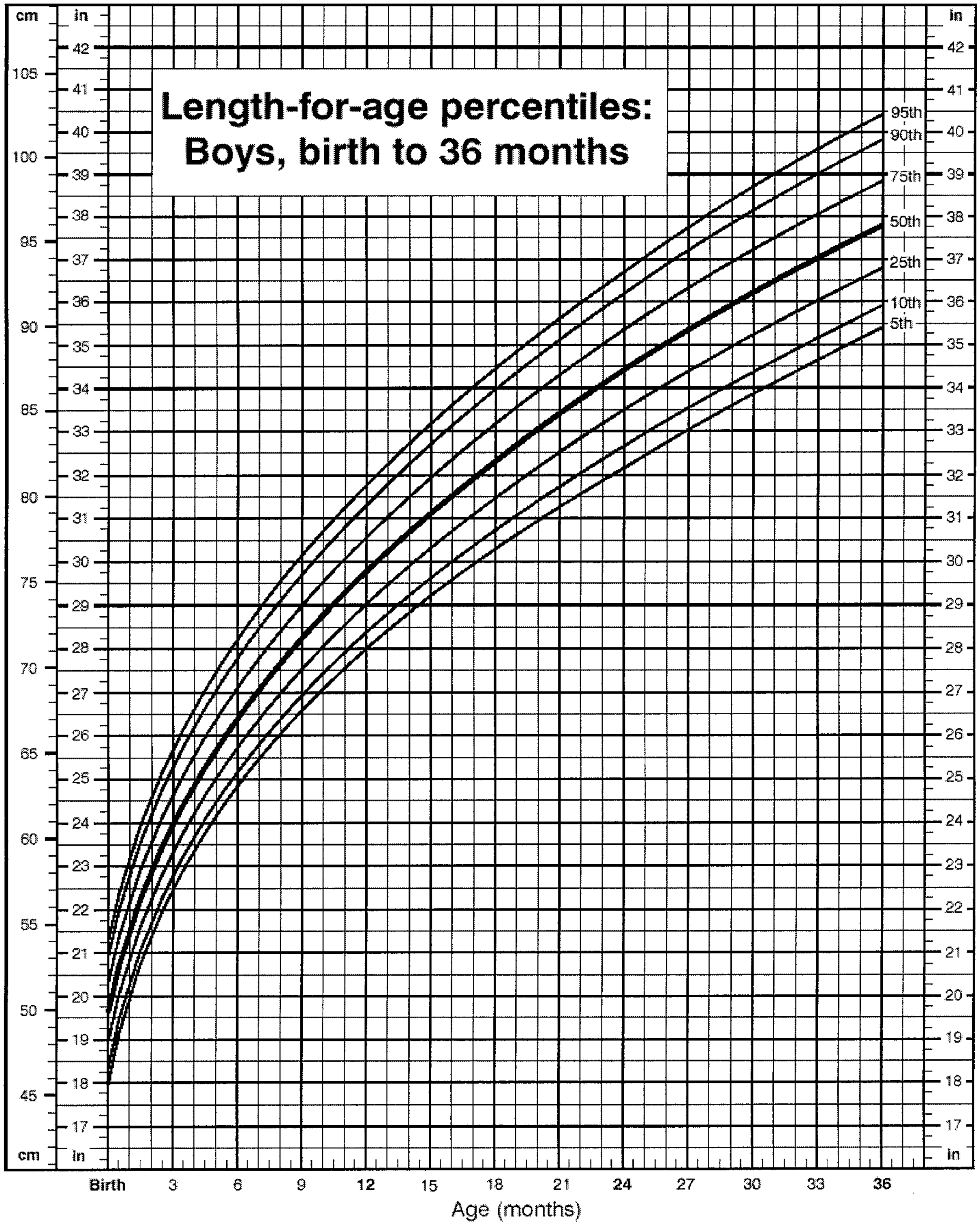
CDC

CDC Growth Charts: United States



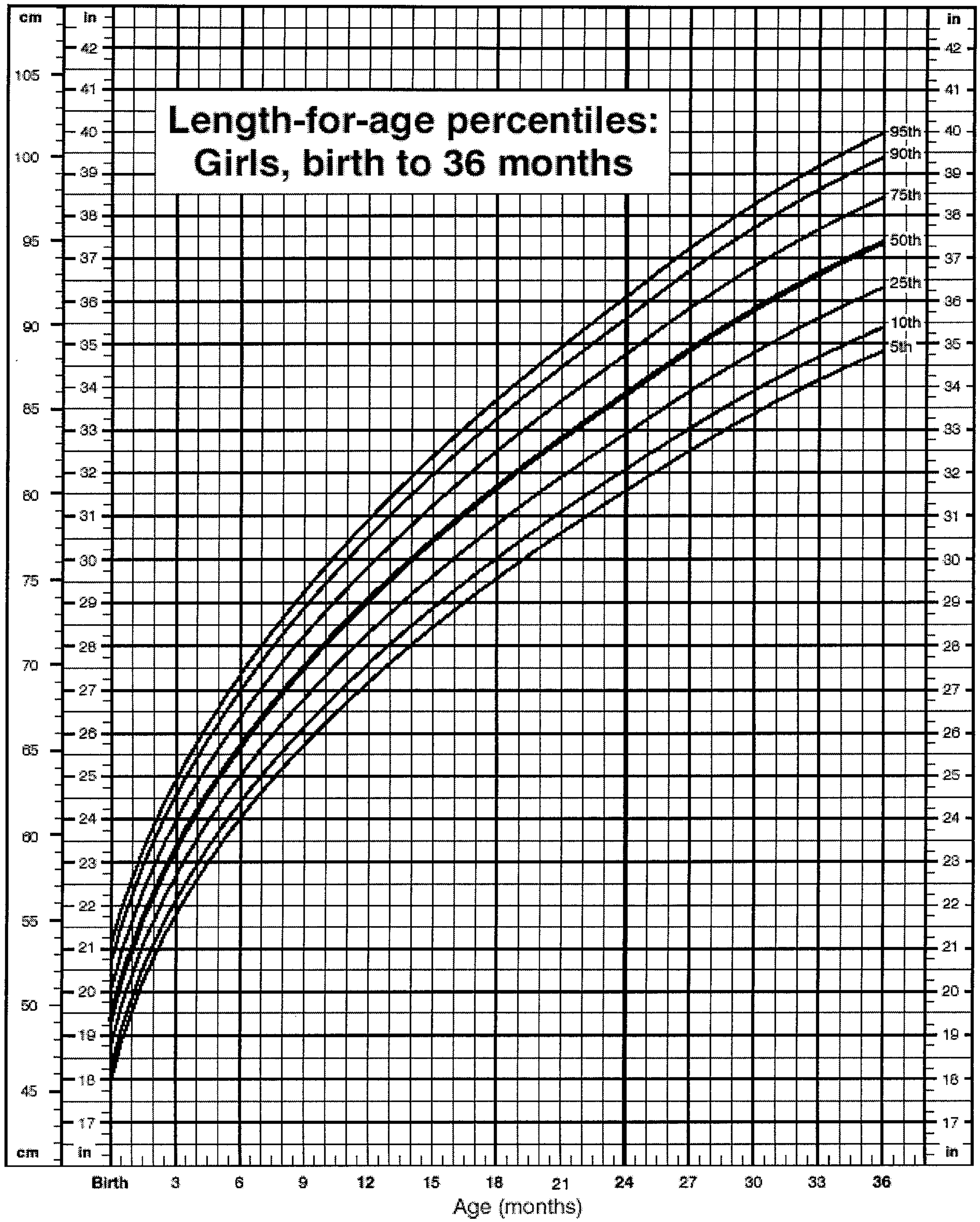
SOURCE: Developed by the National Center for Health Statistics in collaboration with the National Center for Chronic Disease Prevention and Health Promotion (2000).

CDC Growth Charts: United States



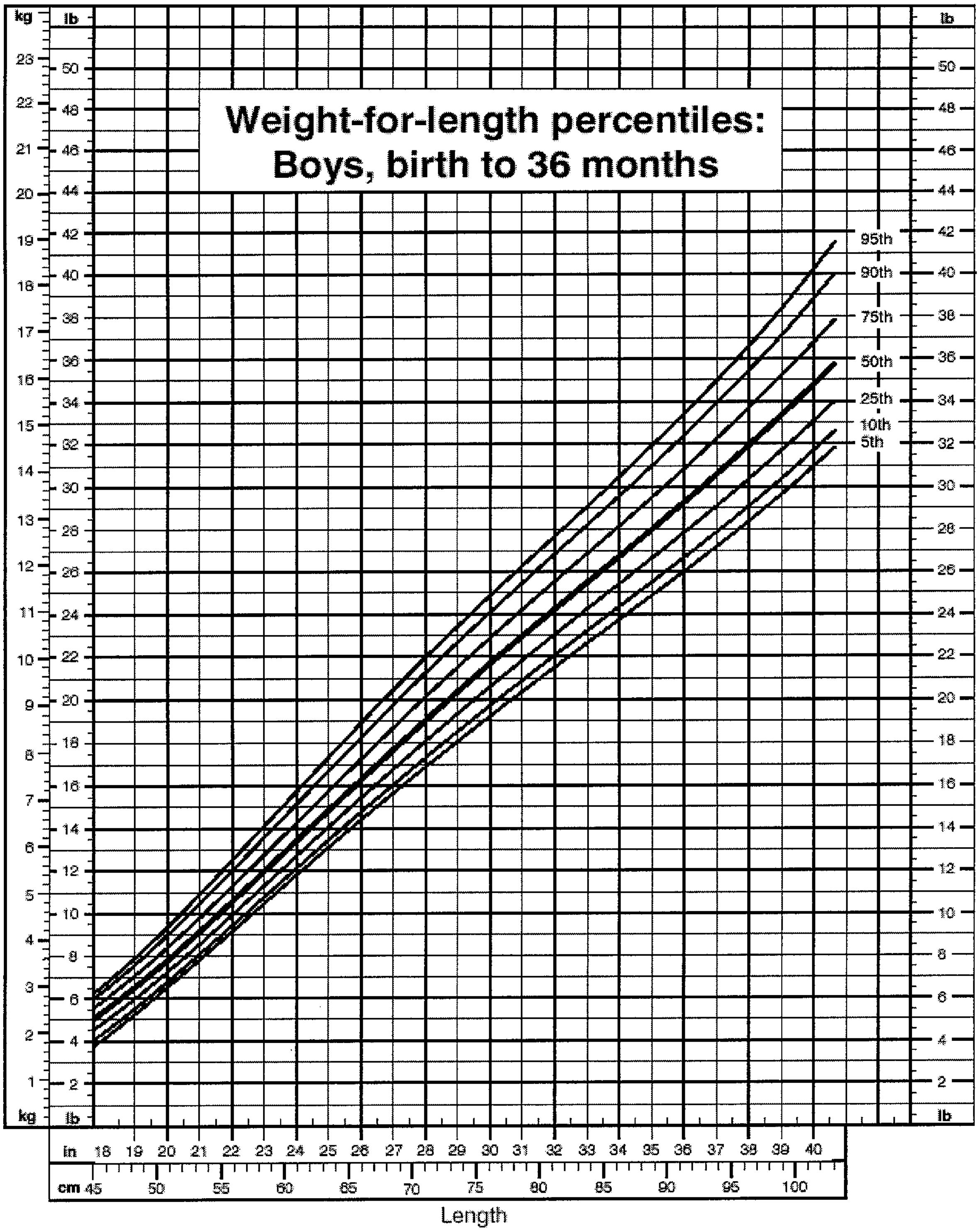
SOURCE: Developed by the National Center for Health Statistics in collaboration with the National Center for Chronic Disease Prevention and Health Promotion (2000).

CDC Growth Charts: United States



SOURCE: Developed by the National Center for Health Statistics in collaboration with the National Center for Chronic Disease Prevention and Health Promotion (2000).

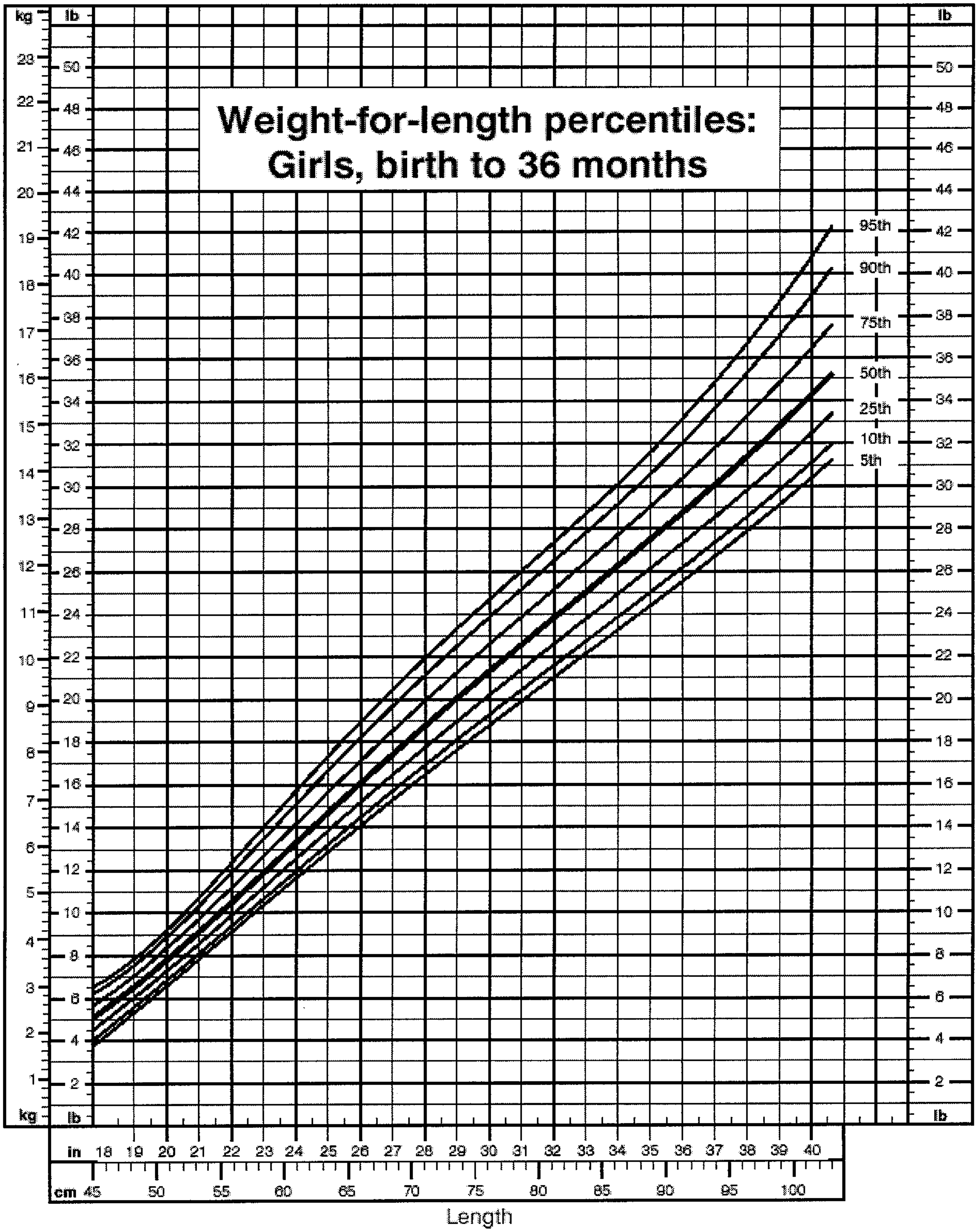
CDC Growth Charts: United States



Revised and corrected June 8, 2000.

SOURCE: Developed by the National Center for Health Statistics in collaboration with the National Center for Chronic Disease Prevention and Health Promotion (2000).

CDC Growth Charts: United States

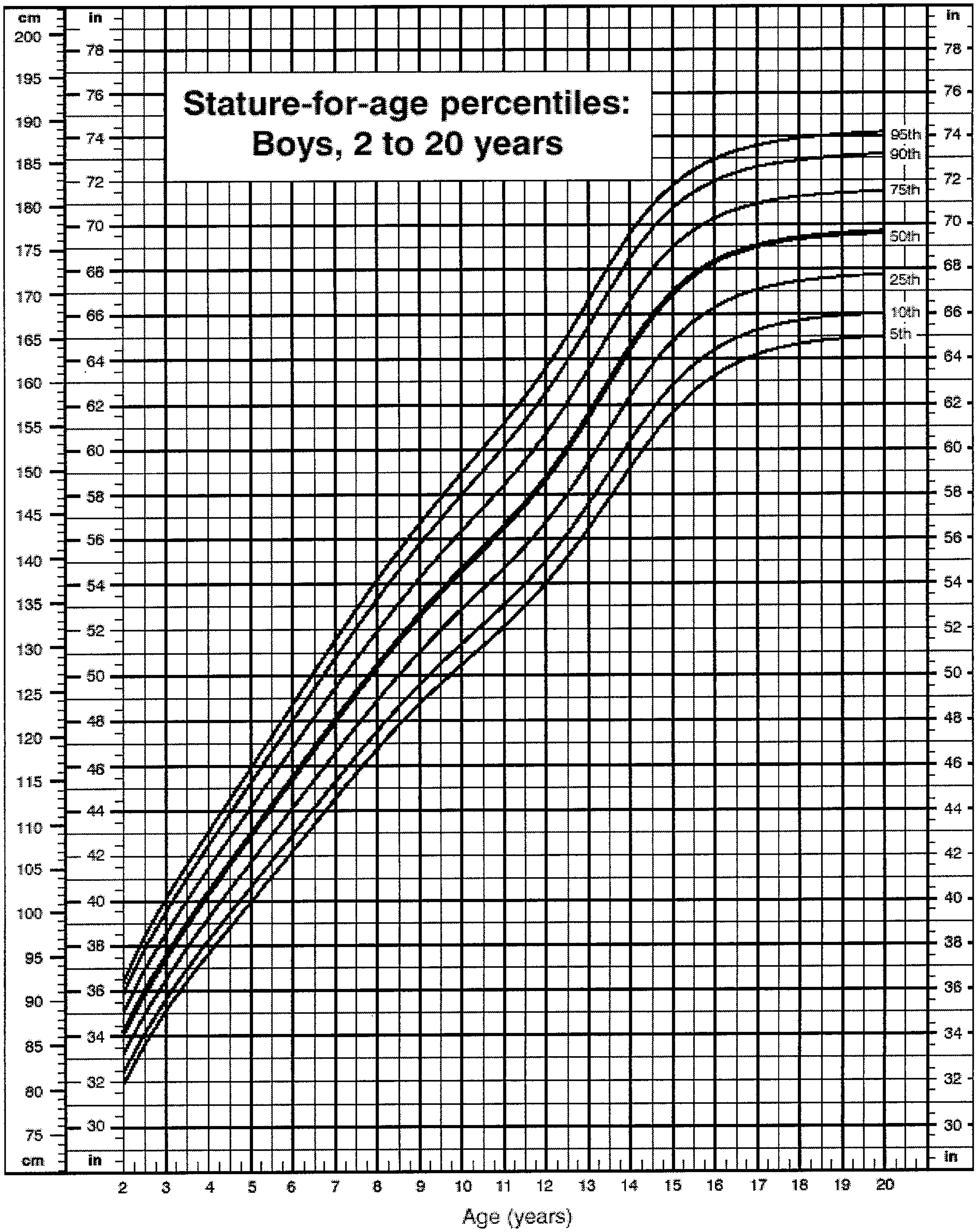


Revised and corrected June 8, 2000.

SOURCE: Developed by the National Center for Health Statistics in collaboration with the National Center for Chronic Disease Prevention and Health Promotion (2000).

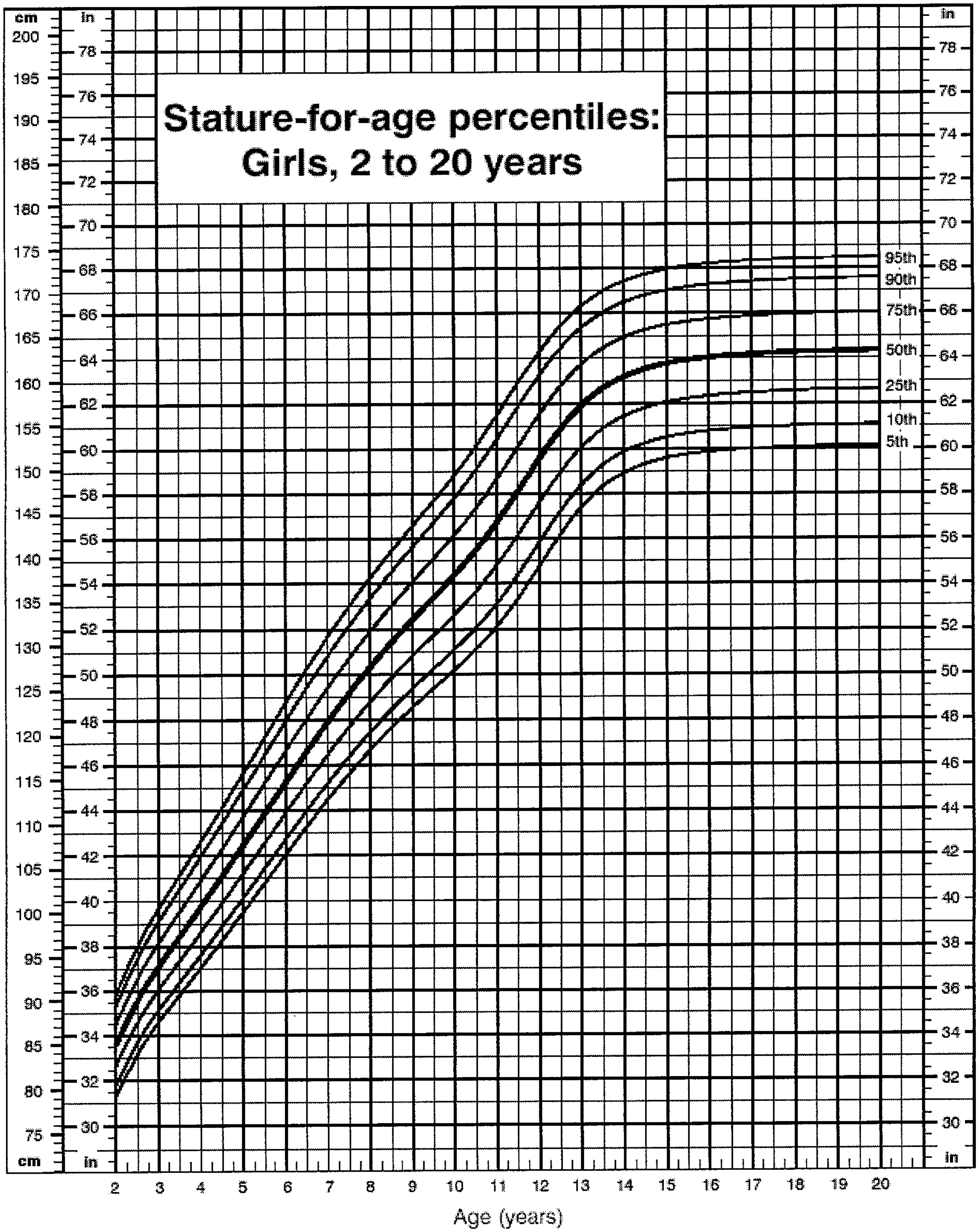
CDC

CDC Growth Charts: United States



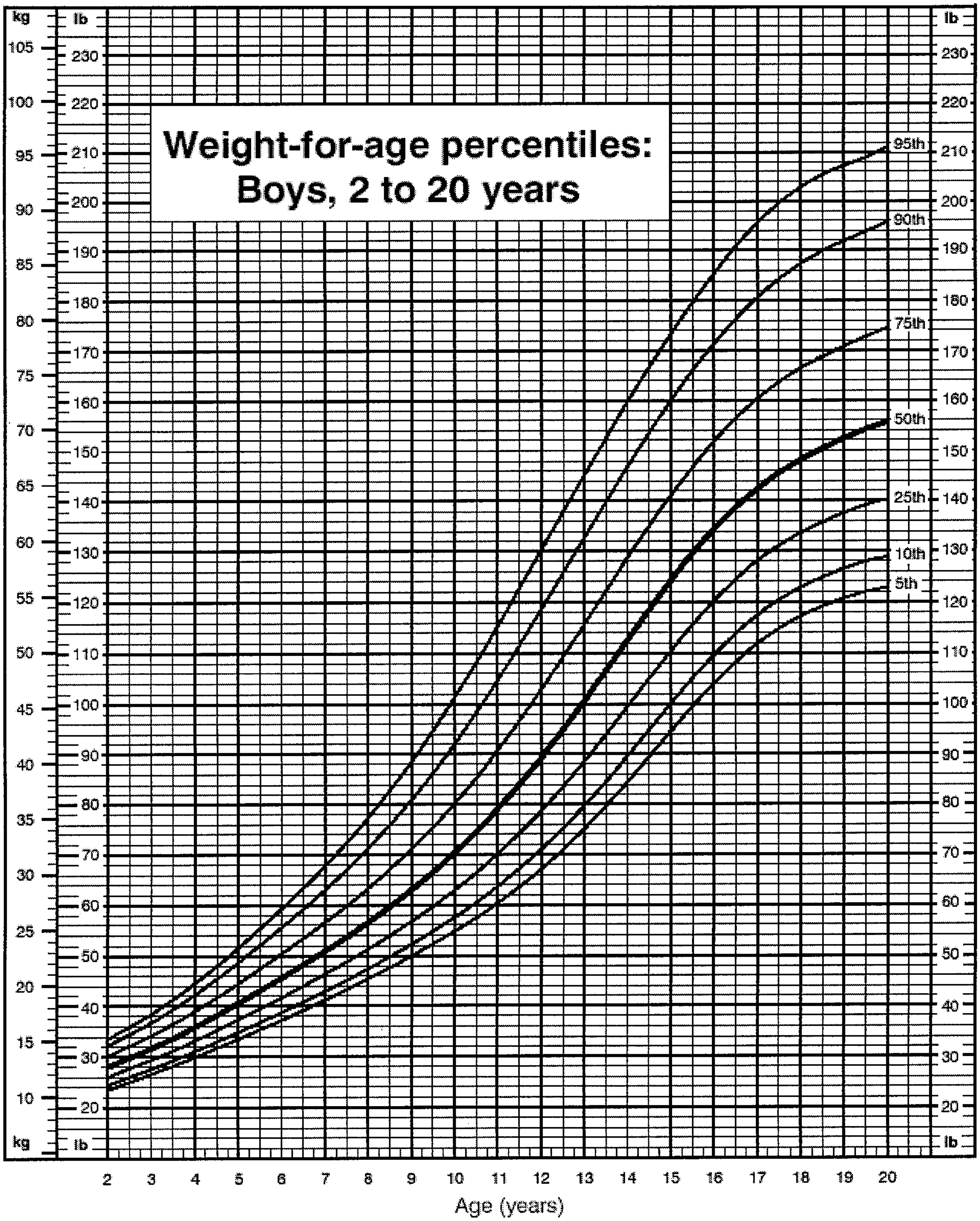
SOURCE: Developed by the National Center for Health Statistics in collaboration with the National Center for Chronic Disease Prevention and Health Promotion (2000).

CDC Growth Charts: United States



SOURCE: Developed by the National Center for Health Statistics in collaboration with the National Center for Chronic Disease Prevention and Health Promotion (2000).

CDC Growth Charts: United States



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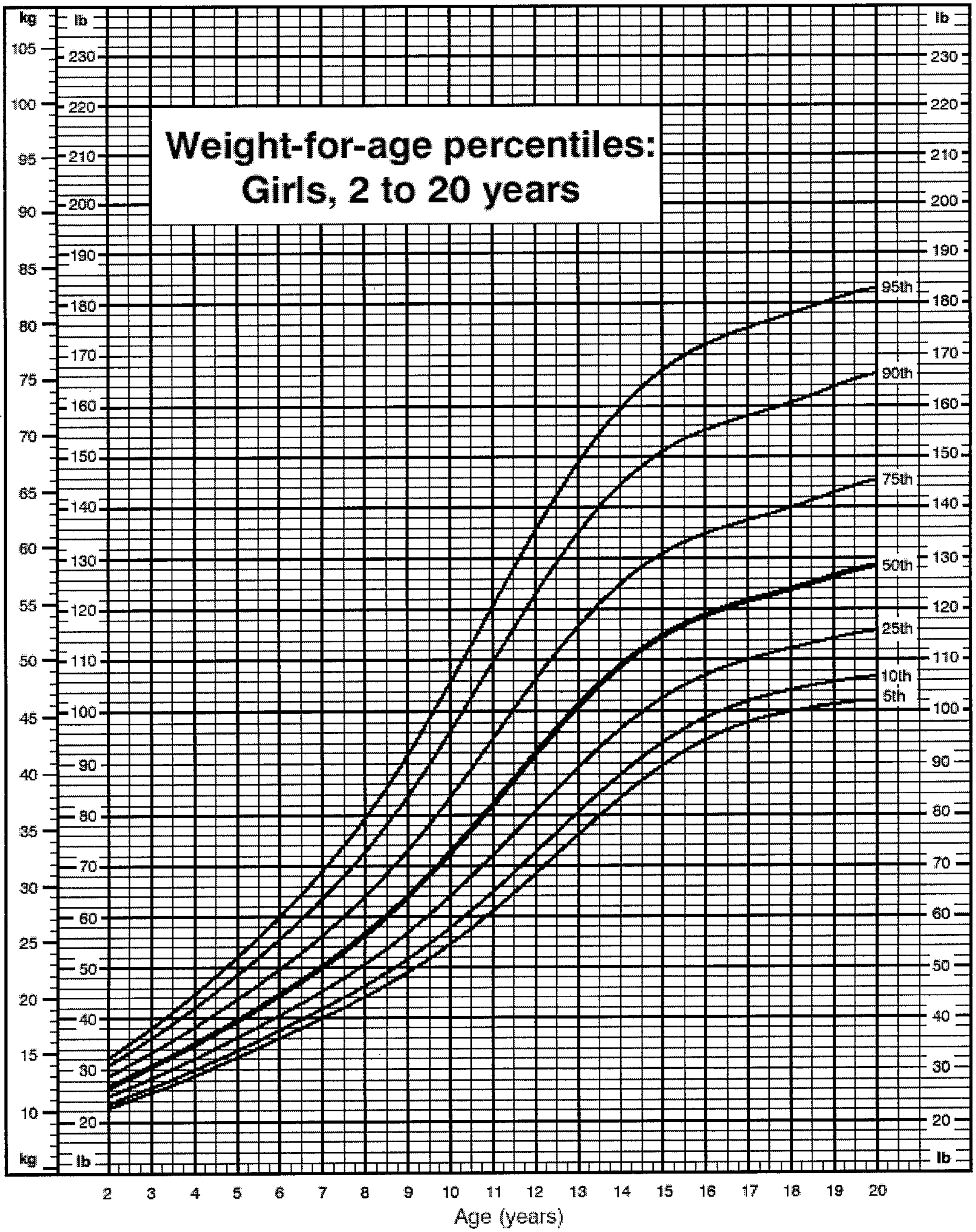
CDC

CDC Growth Charts: United States



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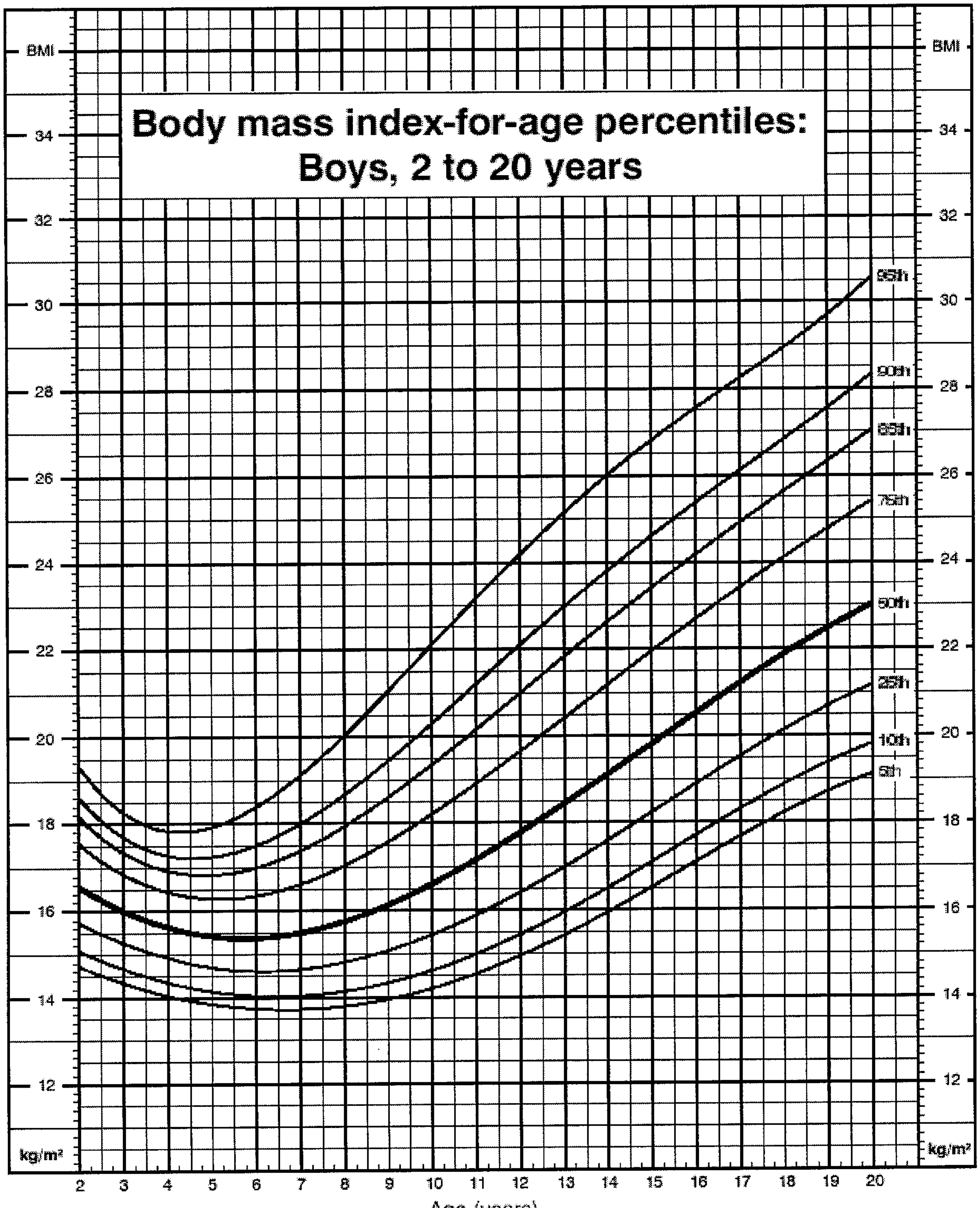
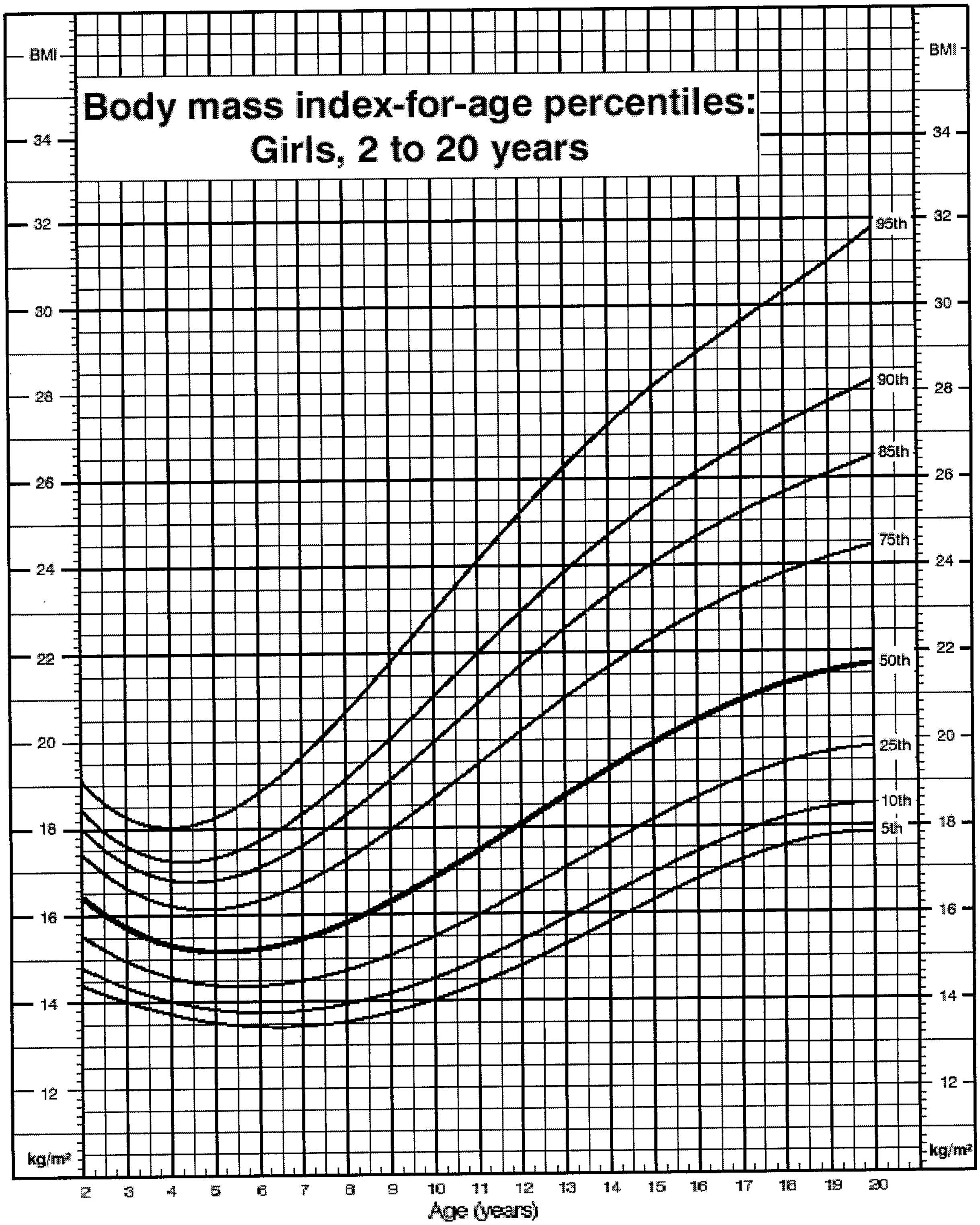
CDC Growth Charts: United States



SOURCE: Developed by the National Center for Health Statistics in collaboration with the National Center for Chronic Disease Prevention and Health Promotion (2000).

CDC Growth Charts: United States



SOURCE: Developed by the National Center for Health Statistics in collaboration with the National Center for Chronic Disease Prevention and Health Promotion (2000).

Appendix G

Measurement Procedures from Methodology

Measurement Procedures from Methodology

Anthropometrics

When height was determined in this study, a stadiometer was used. The child stood with their feet together so that their heels were touching, legs straight, arms hung to the sides, shoulders relaxed, and the head looking forward in the Frankfort position. There were four body parts that were checked for contact to the back of the stadiometer for the most accurate results; the heels, buttocks, scapulae, and the back of the head. The child wore minimal clothing, was barefoot or wore stockings, and had no ornaments in their hair as to prevent any obstruction with the measurement. Parallax was prevented when the examiner knelt down to the floor to keep eye level with the headboard measurement. This measurement was read to the nearest 0.1 cm or 1/8 in. (Lee & Nieman, 1996).

Many of the same principals were used when measuring a child on a recumbent stadiometer as a wall stadiometer. The child was in the supine position as one examiner held their head against the headboard keeping the head in the Frankfort position. The child's shoulders and buttocks were secure on the stadiometer's backboard. Also, the child's legs were held straight as the moveable footboard slid to the child's feet making a 90-degree angle. The soft tissues of the soles of the feet were firmly compressed, but not compressed too hard that it pushed the vertebral column. Measurements were recorded to the nearest 0.1cm or 1/8 in. (Lee & Nieman, 1996).

It is recommended that the calibration of the scale occur two to three times every year. The scale was placed on a hard, flat surface for security without tipping or rolling (DeHoog, 1999; Lee & Nieman, 1996). When weighing the infants and children, minimal clothing was worn. The infants wore only a newly changed diaper or nothing at all. It is recommended that a dry diaper be weighed and subtracted from the infant's weight. As when measuring height, when measuring weight, the child stood straight with his/her body weight equally distributed on both feet, holding still while not touching anything as the head was in the Frankfort position. For a more precise weight, recommendations were that the child be weighed after voiding and at the same time of the day to allow for diurnal weight variations. The measurement was recorded to the nearest 100 grams (0.1kg) or ¼ lb (Lee & Nieman, 1996).

Biochemical

When collecting the biochemical data in this study, a fingerstick was necessary to fill a capillary tube with blood for cholesterol and glucose measurements. That same fingerstick was used to collect blood to fill the microcuvette needed for hemoglobin measurements. Once the blood was in the capillary tube, the blood was plunged into the cassette by the plunger attached at the end of the capillary tube. The cassette was placed into the Cholestech® machine for the cholesterol and glucose readings. Also, the microcuvette was placed in the HemoCue® machine for the hemoglobin readings.

Blood pressure

Blood pressure was measured using a child's sphygmomanometer and a stethoscope. The child sat in a booster seat with his/her back against the chair and legs uncrossed. This was placed next to a table so that his/her arm was supported on a flat surface at mid-chest level. The child's sphygmomanometer was placed around the arm (palm up) with the center of the cuff's bladder placed over the brachial artery one inch above the brachial pulse. The child's clothing on the arm was rolled up. The stethoscope's head was place on the child 's brachial pulse in the antecubital space. The radial pulse was located with the non-dominant hand. The cuff was inflated with the dominant hand until the needle reached 120mmHg.

Dietary

The dietary data collection can be done using different instruments and methods, for example, 24-hour food recall, diet history, three to seven day food record, and food frequency questionnaire can be used. The choice of the instrument depends on the purpose of the study, the complexity of the instrument, the convenience to both the examiner and examinee, and the cooperation of the examinee (Lee & Nieman, 1996).

Food Frequency Questionnaire

There are three different forms of food frequency questionnaires: nonquantitative, semiquantitative, and quantitative. Choosing the right form of a food frequency questionnaire can be determined by what type of audience, their ability to read and follow directions and the cost (Lee & Nieman, 1996). A quantitative food frequency questionnaire was used in this study. This food frequency questionnaire consisted of a design including three serving sizes, typically small, medium, and large. The purpose of the serving sizes was for the respondent to use them as a reference when describing their child's usual portion size. Due to the necessity of knowing the exact serving sizes consumed each day of fruits and vegetables, the researcher developed a quantitative food frequency questionnaire specific to this study. These serving sizes could then be compared to the national guidelines. The specific fruits and vegetables on the food frequency questionnaire were chosen due to their popularity in society and the availability in grocery stores.

Appendix H

CLIA Laboratory Certificate of Waiver
From
The Department of Health& Human Services,
Health Care Financing Administration
For the
Nutrition Assessment Laboratory for Education and Research

DEPARTMENT OF HEALTH & HUMAN SERVICES
Health Care Financing Administration

Laboratory:	UNIVERSITY OF WISCONSIN-STOUT
Mailing Address:	HE 204 415 10TH AVENUE MENOMONIE WI 54751
Laboratory Director:	BARBARA L KNOUS
Physical Location:	HE 427 415 10TH AVENUE MENOMONIE WI 54751

CLIA ID#: 52D0968931

Effective Date: December 28, 1999

Expiration Date: December 27, 2001

CLIA LABORATORY CERTIFICATE OF WAIVER

Pursuant to Section 353 of the Public Health Service Act (42 U.S.C. 263a) as revised by the Clinical Laboratory Improvement Amendments (CLIA), the above named laboratory located at the address shown hereon (and other approved locations) may accept human specimens for the purposes of performing those laboratory examinations or procedures that have been approved as waived tests by the Department of Health and Human Services.

This certificate is subject to revocation, suspension, limitation, or other sanctions for violation of the Act or the regulations promulgated thereunder.

Judith A Yost, Director
Division of Laboratories and Acute Care Services
Survey and Certification Group
Center for Medicaid and State Operations

Appendix I

Permission to reprint Table, "Estimated Normal Mean Values and Lower Limits of Normal (5th percentile) for Hemoglobin and Hematocrit" from the American Journal of Clinical Nutrition 1984; 39:427-436.

The American Journal of
CLINICAL NUTRITION
9650 Rockville Pike, Bethesda, MD 20814-3998 • (301) 530-7038 • Fax (301) 571-8303

To: Ms Bauer Fax number: 715-847-3057

From: Elizabeth Horowitz, Managing Editor

Date: November 2, 2001

Re: Permission to reprint table from Am J Clin Nutr 1984;39:427-436

No. of pages (including this one): 3

Dear Ms Bauer:

I received your email asking for permission to reprint a table from the *American Journal of Clinical Nutrition 1984;39:427-436.*

Permission is granted to reprint this table, provided that the table contains a caption with the following line:

> Reproduced with permission by the *American Journal of Clinical Nutrition.* © Am J Clin Nutr. American Society for Clinical Nutrition.

Please be sure to include ~~the~~ original citation in the references section of ~~this table~~ your thesis.

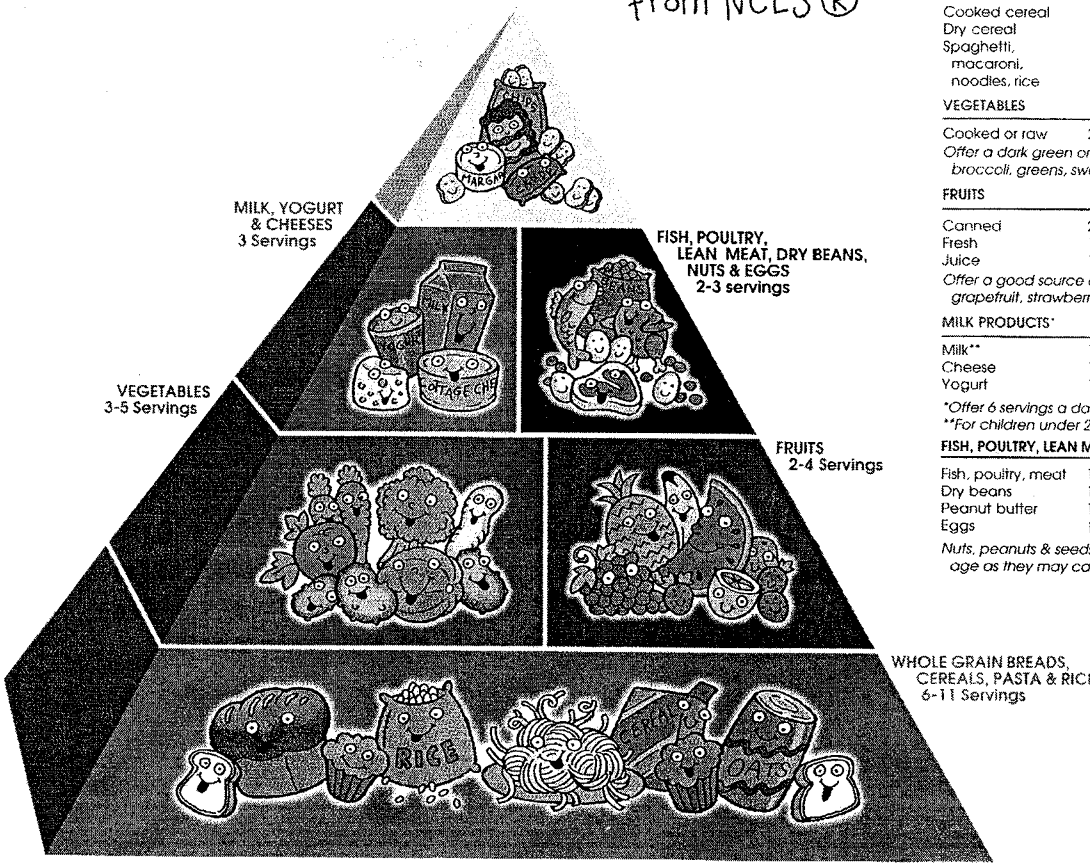
Elizabeth Horowitz
Managing Editor
American Journal of Clinical Nutrition

Appendix J

Nutrition Counseling Education Services' Pyramid handout for kids ages one to ten titled, "Hot Food Facts for Cool Kids"

HOT FOOD FACTS FOR COOL KIDS

from NCES®



SUGGESTED SERVING SIZES FOR KIDS

	1-3 YEARS	4-6 YEARS	7-10 YEARS
BREADS & GRAINS			
Bread	1/2 slice	1 slice	1 slice
Cooked cereal	1/4-1/3 cup	1/3-1/2 cup	1/2-3/4 cup
Dry cereal	1/4-1/2 cup	1/2-3/4 cup	3/4-1 cup
Spaghetti, macaroni, noodles, rice	1/4-1/3 cup	1/3-1/2 cup	1/2-3/4 cup
VEGETABLES			
Cooked or raw	2-3 tablespoons	1/3 cup	1/2 cup

Offer a dark green or yellow vegetable every day such as carrots, broccoli, greens, sweet potatoes.

	1-3 YEARS	4-6 YEARS	7-10 YEARS
FRUITS			
Canned	2-3 tablespoons	1/3 cup	1/2 cup
Fresh	1/4-1/2 small	1/2-1 small	1 medium
Juice	1/4-1/3 cup	1/2 cup	3/4 cup

Offer a good source of vitamin C every day such as an orange, grapefruit, strawberries, melon, kiwi, tomato.

	1-3 YEARS	4-6 YEARS	7-10 YEARS
MILK PRODUCTS*			
Milk**	1/2 cup	3/4 cup	1 cup
Cheese	1/2 ounce	1 ounce	1 1/2 ounce
Yogurt	1/2 cup	3/4 cup	1 cup

**Offer 6 servings a day to 1-3 year olds and 4 servings to 4-6 year olds.*
***For children under 2 years of age, offer whole milk only.*

	1-3 YEARS	4-6 YEARS	7-10 YEARS
FISH, POULTRY, LEAN MEAT, DRY BEANS, NUTS & EGGS			
Fish, poultry, meat	1/2-1 ounce	1 1/2 ounces	2-3 ounces
Dry beans	1/3 cup cooked	1/2 cup cooked	1/2-1 cup cooked
Peanut butter	1 tablespoon	1-2 tablespoons	2-3 tablespoons
Eggs	1/2-1	1	1-2

Nuts, peanuts & seeds are not suggested for children under 4 years of age as they may cause choking.

The ***Hot Food Facts for Cool Kids*** pyramid is adapted from **USDA's THE FOOD GUIDE PYRAMID.** It is an outline of what to eat each day based on the Dietary Guidelines for Americans. Every day eat at least the minimum number of servings shown for each food group.