VALIDATION OF A NUTRITION SCREENING QUESTIONNAIRE TO IDENTIFY CHILDREN AT RISK FOR NUTRITIONAL DEFICIENCIES

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To everything there is a season, a time for every purpose under heaven.

Ecclesiastes 3:1

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CHAPTER I

INTRODUCTION

Children with Special Health Care Needs

Many children with special health care needs who are at nutritional risk are overlooked or go unnoticed. Developmental disabilities in children can often cause issues related to feeding. Some problems that may occur because of a developmental disability are "gastroesophageal reflux (GER), oral motor dysfunction, pharyngoesophageal dyskinesia, and adverse feeding behavior" (1). When the nutrition problems are finally identified, the children may already have significant growth and developmental delays. These problems will be exacerbated if they are not treated properly or the child does not receive adequate nutrition to meet their needs. Nutrition services may help to prevent nutritional deficiencies and nutrition services cost less than the medical costs, which would be charged if nutrition services had not been provided (2).

The PEACH screening form, a reliable screening form, (3) found that children identified as nutritionally at risk by screening required intervention. Another study by Clark et al. (4) evaluated nutrition screening questionnaires by using focus groups and interviews and found that a nutrition screening form can identify children with nutritional concerns. Because of the importance of early identification of nutritional concerns, we

were asked to assist the Oklahoma State Health Department nutritionists in developing a screening tool for use in the SoonerStart program.

Problems with Current Tools

The PEACH survey (Parent Eating and Nutrition Assessment for Children with Special Health Care Needs) consists of questions from a review of several different pediatric screening instruments. Each of the 17 questions on the survey were weighted on a four point scale based on the importance of the question if answered yes. (The survey question only required a yes or no response.) The strengths of the survey are that each response is weighted and a score is determined for each child. When the PEACH screening form was validated (3), the form was closely matched to nutrition assessments made by dietitians. This form had been previously tried in the Oklahoma SoonerStart program and was discarded because it was considered to be too long and had a "medical" focus.

Iowa's nutrition screening form includes question concerning feeding problems, anthropometric data, diagnosis, and whether a nutritionist had been or was being seen and whether the referral to the nutritionist was recommended. The strength of the Iowa nutrition screening form was that it listed problems that, if present, could lead to nutritional deficiencies. The limitations of the form are that it was not validated and was even longer than the PEACH survey (4). In evaluation of the Iowa form, it was discovered that some nutritionally important sections were regularly skipped by the person completing the assessment, such as whether a dietitian had been seen or any

anthropometric data, these sections may have been skipped because the form was too complicated.

SoonerStart

SoonerStart is a federally funded early intervention program for children 0-3 years of age that is administered by the Oklahoma State Health and Education Departments. As of April 2002, SoonerStart provided resources to approximately 3600 children in Oklahoma (Lynne McElroy, Program Manager of SoonerStart Early Intervention July 8, 2002). The major goals of the program are early identification of children at risk for developmental delays and intervention to support growth and development. Children who participate in SoonerStart have been identified as having a 50% developmental delay in one area or a 25% developmental delay in two areas, that is if a child is six months of age but only functions in cognition (for example) at three months of age or less he then has a 50% developmental delay. Areas of development evaluated include cognitive, physical, communication, social-emotional, or adaptive. In addition, the child may have a high probability of a delay secondary to a physical or medical condition (i.e., Down's Syndrome).

If a child is determined to be at nutritional risk, appropriate nutrition services can be provided. The SonnerStart dietitians are able to provide nutritional care at no charge to the parents until the child is three years of age. After the age of three, the child is usually transferred to a school-based program and nutritional services are no longer freely available. Therefore, early identification and treatment is imperative to ensure that these

3. There are differences in degrees of nutritional risk in the children.
4. The professionals are truthful in their answers to the interview of the nutrition screening form.

LIMITATIONS

1. Results are not generalizable but may be applied to SoonerStart participants only. To participate in SoonerStart the family must be referred to the program and developmental assessments must be performed to determine eligibility. Those families eligible for services but not referred were not evaluated, nor were families who were referred but declined to be assessed for eligibility.
2. Data was collected only from those who were willing to participate.
3. Numerical values are given for the answers to the parent question. This is a limitation because it places a value on data originally not ordinal.

DEFINITIONS OF TERMS

Nutrition Screening Form: A form that is administered by the SoonerStart professionals during the initial screening evaluation of the child (Appendix A).

SoonerStart: The federally funded early intervention program administered by the Oklahoma State Health and Education Departments that provides services to children ages 0-3 and their parents. Children who participate in SoonerStart have been identified as having a 50% developmental delay in one area or a 25% developmental delay in two

areas. (Areas include cognitive, physical, communication, social-emotional, or adaptive.) In addition, the child may have a high probability of a delay secondary to a physical or medical condition (e.g. Down's Syndrome).

Special Health Care Needs: Illnesses or conditions that need additional medical attention above the primary needs of a person (5).

Nutritional Risk: The risk of developing nutritional deficiencies.

Nutritional Intervention: Intervention that prevents or overcomes nutritional deficiencies.

CHAPTER II

REVIEW OF LITERATURE

Early Intervention Programs

In 1986, P.L. 99-457 was passed mandating that states provide free education for all persons 0-21 years of age. This guaranteed that children with developmental disabilities would receive a publicly supported education (6). As a result of this legislation, states implemented early intervention programs to serve children ages zero to three years who have developmental disabilities. This public law was not only designed to help the children but to provide help to the family as well (7). Early intervention programs encourage and utilize the family unit: the focus is family centered. To accomplish this focus an Individualized Family Service Plan (IFSP) is completed before the intervention takes place. The IFSP was intended to help the family acquire the necessary resources for their child (7, 8) because the infant is totally dependant on the family (7). The IFSP encompasses the family unit and incorporates the "family strengths and needs related to enhancing the child's development" (9). The IFSP plan has seven required sections, which include: a developmental assessment of the child, an account of the needs and capabilities of the family that will help the child, the goals of the intervention, the services needed to meet these goals, the case manager contact, and the steps that will be taken for transition to the public school system.

Nutritional care was included as one of the health services provided under P.L. 99-457 and nutritionists should be included in the process of developing the (IFSP) (10). Incorporating nutritionists in early intervention programs can help to prevent nutritional deficiencies, prevent illness, and help to provide needed treatment (11, 12). In Oklahoma's Early Intervention program nutrition screening forms may be filled out by non-nutrition professionals. Children found to be at nutritional risk by the screening form are referred to a nutritionist for further assessment to receive services in a timely manner (11), thus reducing the number of children who become nutritionally deficient.

Nutrition and Early Intervention

Adequate nutrition for any child is imperative, but for a child with developmental disabilities it is crucial due to altered nutrient requirements or alteration in the way the child utilizes nutrients. The Washington State Department of Health (2) found that 70%-90% children with developmental disabilities were at nutritional risk and Ekvall et al. (12) states that two-thirds of children with special health care needs have troubles in their feeding. Common nutritional problems identified are feeding difficulties, failure to thrive, oral motor problems, unusual food habits, constipation, drug-nutrient interaction, metabolic disorders, and over- or underweight issues (10, 11, 12).

The Washington State Health Department performed a cost analysis of nutrition services provided to children with special health care needs (2). A comparison was made between the cost of the nutritionist's visits and the estimated medical costs that would have been incurred if the nutritionist had not intervened. Of the 30 children that were

reviewed, 28 were able to avoid higher cost medical interventions. For every dollar spent on nutrition intervention, there was $20 saved on medical costs. The medical costs avoided were estimated to be between $2400 to $14485. For the two children who did not avoid higher medical costs, the nutritionist was 19% and 23% more expensive. However, these two children may avoid future medical costs due to nutrition interventions and screenings. Positive outcomes of nutrition intervention were adequate growth and intake, less illness, decreased feeding problems and inappropriate behavior, and improvement in feeding skills (2).

Studies Using Screening Forms

Due to the crucial need for adequate nutrition for children with special health care needs, nutrition screenings are important parts of the early intervention program (11). Nutrition is imperative in the management of certain diseases and can thwart the development of disabilities (13). There are not enough nutritionists to screen every child in the program; therefore it is necessary that other professionals, such as resource coordinators, occupational therapists, speech therapists, or physical therapists, who see the child frequently, recognize nutrition problems.

The PEACH screening form

The PEACH survey (Parent Eating and Nutrition Assessment for Children with Special Health Needs), used in North Carolina, was designed to be a self-administered report that the parents or guardian use for nutrition screening. The PEACH form consists

of questions from a review of several different pediatric screening tools. The literacy level of the form is at a fifth-grade level. The survey questions only required a yes or a no response. Each of the 17 questions on the survey was rated on a four-point scale, based on the nutrition importance of the question. When a yes response was given the score of the question was counted. If the score totaled four or more points then a nutrition concern may be present. The range of the score could be 1-33 depending on which questions were answered yes (3).

The PEACH survey validation study involved 79 children, less than six years of age, and their parent(s) or guardian. The parent(s) or guardian completed the PEACH form, which was followed by a full nutritional assessment on each child by two dietitians who had no knowledge of the PEACH screening form results. The full nutrition assessment included "chart review, anthropometric measures, health and medical history, dietary intake, feeding and oral-motor function, and behavioral or environmental problems affecting nutrition." Each question was assigned a point value and then the points were totaled. Nutrition assessments by dietitians and the screening form were compared to determine the accuracy of the nutrition screening form, the sensitivity being 88.6% and the specificity being 90.9%. The overall predictive value was 88.6% (3).

The Iowa screening form

The screening form used by the Iowa early intervention program consists of the following categories: feeding problems, anthropometric data, diagnosis, whether a nutritionist had been or was being seen and whether the referral to the nutritionist was recommended. The feeding problem question asked whether the behavior was apparent

three times in the last month. These behaviors include gagging, choking, tube feedings, poor suck, and problems with mealtime behavior. The anthropometric data included questions on weight above the 95th percentile or below the 5th percentile, appearing over or underweight, and weight loss. Diagnosis suggestions included, but were not limited to, AIDS (acquired immunodeficiency syndrome), cystic fibrosis, cerebral palsy, metabolic disorder, and food allergy (4).

To evaluate Iowa's statewide nutrition screening, the screening results were reviewed and those involved in nutrition screening were interviewed (4). Four hundred twenty-five forms were completed and returned. For the feeding concerns, 26% of the forms returned reported that the intake of formula/milk was less than 16 ounces per day or more than 32 oz./day. This was the most common feeding concern response. Gagging and choking, as well as constipation, were reported in 16% of the children. Fourteen percent of the children had weight loss or the lack of weight gain. The second most common reported anthropometric problem was weight and/or height below the 5th percentile. Results from the analysis showed that 62% of the children screened had seen a nutritionist (4).

The professionals interviewed regarding the Iowa nutrition screening form and the nutrition referral did not screen all the children for nutrition risk. In fact, less than half of the professionals returned the nutrition screening forms. The professionals working for the early intervention program felt that WIC (Women, Infants, and Children) was "the primary source" for nutrition services. When WIC nutritionists were asked about their nutrition assessment and care procedures, they said that they felt that there was not

enough time to adequately assess and to care for the child with special health care needs (4).

Review of Literature by Screening Tool Question

The nutritionists at SoonerStart did not want a lengthy form, but they did want a form that brought to light nutrition related issues and identified children at nutritional risk. In the following pages each question is discussed with a short review of the literature supporting its inclusion in the screening form.

Birth weight of less than 3 pounds, 5 ounces

The risk of death is increased in the premature and low birth weight babies (14). A significant number of deaths of neonates in the USA are due to low birth weight. These deaths are attributed to infection, respiratory distress syndrome or bronchopulmonary dysplasia, and congenital defects (15). Low birth weight has also been cited to be "the most important risk factor" leading to developmental disabilities in infants (13). These developmental delays can be neurological problems, feeding difficulties, and motor delays. Premature infants have high energy needs and low energy stores. The effects of a higher metabolic rate, a higher body surface area with an increase in water loss, an immature digestive tract, higher energy and protein needs, as well as increased stress in a premature infant can impair neurodevelopment (16).
Growth delays continue into school age and one researcher found that there are side effects from low birth weight still evident in adolescence (17) and adulthood (18).

A British study (19) examined the effects of birth weight on cognitive function. The study consisted of 3900 subjects born in the year 1946 that were followed at ages 8, 11, 15, 26, and 43. At each age the subjects were tested on their cognitive function as compared to their birthweight. Birthweight was divided into these five categories: <2.51 kg, 2.51-3.00 kg, 3.01-3.50 kg, 3.51-4.00 kg, and 4.01-5.00 kg. Adjustments were made for father's social class, mother's age, mother's education, birth order, and sex. Researchers found an increase in cognition associated with an increase in birthweight in the first four birthweight catergories. At the highest birthweight, which was 4.01-5.00 kg, there was a decrease in cognition at the ages of 8, 11, 15, and 26. There was a significantly higher ($p<0.01$) cognitive function of the "normal birthweight categories" for the ages 8, 11, and 15 compared to those with a low birthweight. But there was no significant difference in cognitive function by the age of 43 no matter what their birthweight was. The authors suggested that cognitive function at this age was not significantly different due to educational and occupational achievement.

Another study (16) looked at growth and development in 197 children who had an extremely low birth weight at birth. At the two year adjusted age mark, children with a weight of less than the 10^{th} percentile had lower general intelligence scores (IQ). These children were also more likely to have IQ scores minus one standard deviations below the mean and also more likely to have "motor difficulties." It was also found feeding problems ($p= 0.002$) occurred in the children that fell in the lower weight percentile categories.

Feeding Tubes

Children are placed on feeding tubes for a variety of reasons such as inability to swallow safely or inadequate growth. Placement of a percutaneous endoscopic gastrostomy (PEG) tube would be necessary if a child is on nutrition support for a prolonged length of time (20).

To ensure that weight gain is appropriate, and to monitor for other complications, nutritional assessment should be performed in the following manner: infants every month, children less than five years of age every six months, and children over the age of five should be assessed every year (21).

Benoit (22) found that most children with failure to thrive at the time the tube was placed were also at failure to thrive at the time of tube removal, which shows that there was no change in nutritional status even though the feeding tube was placed to improve nutritional status. Without adequate nutrition, the removal of the tube feeding can worsen the nutritional status of the child, which increases the strain on the family. The process of weaning and removing the tube is also a complex process that can be taxing to the families.

Respiratory problems

Malnutrition can affect pulmonary status in children with pulmonary diseases by reducing growth, which may lead to developmental delays. (23). The primary treatment for pulmonary insufficiency is drugs but nutrition also plays a key role in determining the health outcome of these children. Children with pulmonary insufficiency have increased energy needs due to their increasing work to breathe. Nutrition therapy can assist with

the increased energy needs so that growth can be normalized and feeding problems are avoided (24). Infants with feeding difficulties from their disability or from prematurity may experience problems with the suck-swallow-breathe mechanism. This inability to coordinate causes decreased intake, which may lead to decrease in growth. "Gagging, choking, spitting, apnea, severe brachycardia, and cyanosis are indications that the infant is not yet ready for nipple feeding" (25).

Asthma

"Asthma is the most common chronic illness in childhood" (23). The most common drugs supplied to these children are steroids; which decrease the side effects of asthma. Abrams (26) stated that children who use steroids have a statistically significant lower adult height than those that did not receive steroids.

One study looked at the differences in stature (27) between 120 children and their sibling(s), one sibling had asthma and the other did not. Short stature is defined in this study as stature less than the 2.5 percentile. Short stature was identified in 12.5% of the asthmatic children and in only 4.2% of their siblings ($p=0.0166$).

Inhaled corticosteroids have been shown to stunt growth in children. Corticosteroids inhibit growth hormone secretion, reduce insulin-like growth factor, and impede the synthesis of new collagen. A longitudinal study by Allen (28) found a change in bone mineral density in children with asthma. When compared to children who did not use corticosteroids, children who received 300 to 400 micrograms/day of beclomethasone had a smaller growth increase in bone density. Bone metabolism may be influenced by

glucocorticoids hindering the absorption of calcium (28). More studies comparing the use of nutrition support and inhaled corticosteroids needs to be implemented.

Bronchopulmonary Dysplasia (BPD)

BPD is the third leading cause of lung disease in infants (26). "Children with BPD have a high probability of growth failure into at least their second year" (29). These energy requirements may be 10%-20% greater than nutrition needs for normal infants (30). Feeding problems that often occur are poor sucking, oral aversion, aspiration, gastroesophageal reflux, fatigue, and resistance to feeding. With these problems in mind, feeding time is increased, and the level of intake for the infant may be decreased which may cause problems with growth (29, 30).

Johnson et al. (30) studied the risk factors associated with BPD. In 40 infants diagnosed with BPD, 73% had a weight-for-age z-score decline, 20% had decreases in length-for-age z-scores, and 65% had decreases in z-score in weight-for-length. This study also found in the first weeks after discharge from the hospital 29 parents were concerned about feeding problems and at the three month visit 35 parents had concerns about feeding problems. Thirty percent of the children were determined to have serious feeding problems which included feeding tube potential, aversive feeding behavior, and gastroesophageal reflux.

Abrams (26) reported that children affected by BPD have poor development, smaller head circumference, and neuromuscular difficulties. Also, BPD is "shown to be an independent predictor of poorer motor outcome at 3 years of age." There is good

evidence that after discharge from the hospital, infants with BPD will still be at risk for growth failure.

Pridham (29) studied parental behavior in parents with children diagnosed with BPD. Seven of the 11 subjects expressed that they felt that feeding their child was difficult and all of the parents stated that they had at least one concern about feeding. These concerns encompassed tolerance to food, dietary intake, parental adequacy, feeding responsibility, normality of feeding, and enjoying the feeding by the parent or child.

Cystic Fibrosis

Children with cystic fibrosis (CF) are at nutritional risk due to impaired absorption and increased energy needs. Farrell et al. (31) cites that almost half of the children experience "severe malnutrition" at their time of initial diagnosis. Children with CF who have poor nutritional status have been shown to also have poor lung function and shorter survival time (32). One three year longitudinal study looked at the growth of preadolescent children with CF and compared it to the growth of preadolescent children without CF (33). Measurements taken were weight, height, mid arm circumference, skinfold thickness (tricep, subscapular, biceps, and suprailiac), and total body water. The study was inclusive of all children above the 3rd percentile for growth. At the end of the three years, rate of the height growth of the boys with CF was "slower" than the control group ($p=0.004$). Skinfold thickness was different by $p=0.008$ and total body water was significantly lower by $p=0.02$ in the boys with CF.

Another study by Farrell et al. (31) found that children who were diagnosed early with CF, that is by 13 weeks of age compared to 107 weeks at initial diagnosis, had better growth than children diagnosed later ($p<0.001$). Length ($p<0.001$), weight ($p=0.027$), and head circumference ($p=0.003$) were significantly higher in the early diagnosed group compared to the later diagnosed group. Even though the albumin levels were lower in the children who were diagnosed early, the study suggested that this may be due to their younger average age than the age of the later diagnosed children. The researchers also noticed that a positive effect of early diagnosis of CF was that the children were able to receive nutrition services earlier and thus had better nutrition outcomes.

Food allergy

Food allergies and intolerances affect 15%-30% of persons in developed countries. In the United States of America, half of the sensitizations in children under two years of age are caused by cow's milk, eggs, and peanuts (34). In addition wheat, citrus, soy, peas, fish, chocolate, corn, and chicken are very common allergens (35). Signs of food allergies are anaphylactic shock, asthma, rhinitis, ecxema, urticaria, angioedema, nausea, vomiting, diarrhea, and gastrointestinal pain. Constant diarrhea can lead to weight loss, which leads to malnutrition (36).

A study by Arvola et al. (37) looked at 81 children with diseases like eczema and pruritus. They studied the parents' concerns over their child's disease, especially as relates to a food allergy. At the beginning of the study 88% of the parents felt that it was harder to take care of a child with atopic disease. The intervention focused on elimination diets for the children. The child saw a dermatologist, pediatric nurse, a

dietitian, and pediatrician each time they went in for follow-up. The parents were given advice on the diets and on skin treatments. Due to the elimination diets there were significant decreases in diarrhea ($p<0.0001$), vomiting ($p<0.0001$), abdominal pain ($p<0.0001$), restlessness ($p=0.0008$), pruritus ($p<0.0001$), sleep loss ($p<0.0001$), and parents' fatigue ($p<0.0001$). Even after the intervention, 92% of the parents felt that caring for a child with atpoic diseases was harder caring for a child without the problem.

In a study that looked at children with an allergy to cow's milk (38), researchers found that the children were slower in their growth. These children experienced a –0.6 SD in height-for-age compared to "healthy" children who had a +0.2 SD. Children with cow's milk allergy also had a lower energy intake. In a 6-month follow-up the children with cow's milk allergy were still experiencing slower growth rates than the healthy children in spite of increased energy intake. Their protein intake was lower than the healthy children, along with lower serum prealbumin, zinc, and iron.

It is important for the child with food allergies, especially at the beginning of life, to receive adequate nutrition to maintain growth and optimal health (39). The treatment of food allergies is elimination. With elimination of foods, entire food groups, or even certain nutrients substituting alternatives to provide appropriate energy and other nutrients requires assistance from a registered dietitian (RD).

Too small or thin for age

Failure to thrive is a term used to portray children with low weight-for-age and/or a low or no weight gain. Failure to thrive (FTT) can be classified as nonorganic, organic, or both. Nonorganic failure to thrive is caused by factors such as poverty or neglect

while organic failure to thrive is caused by genetics or a disability (40). "Children with malnutrition are more likely to be unresponsive, irritable, lethargic, and of lower intelligence than are children who are well fed" (41). The malnourished child is less active and is therefore less likely to engage in active behaviors that allow the child to investigate their surroundings and learn (41, 42).

To study the effects of a home-based intervention (41), families were provided with biweekly visits for four weeks. These visits focused on the weight gain of the child, but also allowed for time social interaction with the mother and time for questions. The focus of the intervention was nutrition and the mother was taught skills such as how to boost calories in the child's diet. These mothers who received 8 home visits, compared to the mothers who received only two visits had less stress, had children who gained more weight, and had increased their child's calorie and protein intake. The article does not state whether the increase in weight and increases in calorie and protein intake were significant.

Dykman et al. (40) studied the behavior and cognitive function of school age children who were diagnosed as failure to thrive (FTT) earlier in childhood. The study included 27 children who had nonorganic failure to thrive and 17 control children. The researchers examined the children when they were between 8-12 years. The FTT group, as compared to the control group, had lower height percentiles ($p<0.05$), lower weight percentiles ($p<0.01$), and lower weight Z-scores ($p<0.05$). There was also a significant difference between cognitive function for the two groups. Scores on the Wechsler Intelligence Scale for Children (WISC-III) and the Visual-Motor Integration (VMI) were significantly lower for the FTT group with significance of $p<0.01$ and $p<0.05$,

respectively. For behavioral differences, the Child Behavior Checklist was given and children who were FTT were more likely ($p<0.001$) to exhibit behavior problems than the control children.

A study by Colombo et al. (43) looked at the growth and intelligence in children from 6 to 12 years. They all had received treatment from the Nutritional Recovery Center (NRC) in Chile for protein-energy malnutrition. After treatment, the children, were either returned home (their biological family), adopted by other families, or sent to an institution to live; which provided three different environments to compare the children who had previously similar nutrition deficiencies. There were 16 children in the adopted group, 8 in the institutional group, and 11 in the biological family group. The outcomes measured were weight, height, head circumference, and intelligence. Intelligence was measured by the WISC. At their initial admission, the children in all groups were delayed in growth. At the end of the study, the adopted children had a significantly higher weight-for-age ($p<0.01$) than the institutional or the biological groups. Also, the institutional group had a significantly lower ($p<0.05$) height-for-age than the adopted or biological groups. The intelligence quotient (IQ) for the adopted children was 15 points higher than the institutional group and 13 points higher than the biological group ($p<0.05$). The verbal IQ's of the adopted group was significantly higher than the biological and the institutional group ($p<0.05$), but there were no significant differences for the performance IQ section among the groups.

Too heavy for age

A study by Stettler et al. (44) looked how weight gain in children during the first four months of life was correlated with weight at seven years of age in a cohort study. The 27,899 subjects were born between 1959 and 1965, 19,397 had complete data. The subjects were excluded if they were born before the 37th week of gestation or after the 42nd week of gestation. The study found that there was a 17% increased risk of overweight at the age of seven years with each 100g extra weight the child gained each month during the first four months of life. This result was not related to birth weight or weight of the infant at one year of age.

A study by Tanaka et al. (45) examined the relationship between weight at three years and weight at birth. The subjects were recruited from October 1987 through June 1999 from pediatricians and obstetricians who performed "well baby check-ups." Five hundred fifty-eight children were available to compare birth weight and weight at age three. There was a positive correlation ($p<0.0001$) between birth weight and weight at age three was compared as well as well the comparison with weight gain in the first month ($p=0.0012$) and BMI (Body Mass Index) at one month ($p<0.0001$). The children who were overweight were significantly correlated with their birth weight. Therefore, excessive weight gain in the zero to three year age group is of increasing concern. Another study by Charney et al. (46) that compared early childhood weight gain with adult obesity status found that the weight gained in the first six months of life was positively correlated with being overweight in adulthood.

The Bogalusa Heart Study (47) looked at 3599 children aged 5-10 years and 5568 children aged 11-17 years and compared their BMI to blood lipids (total cholesterol,

triglycerides, LDLC, and HDLC), insulin, and blood pressure values (risk factors). Those children who were classified above the 95th percentile in the BMI, in both age ranges, had higher values of blood lipids and a greater percentage of blood insulin levels. As the children gained in percentile ranks they also gained in risk factors. The overweight children were 9.7 times more likely to have 2 of these risk factors and 43.5 more likely to have 3 of these risk factors. The overweight children were 2.4 times as likely to have total cholesterol level above 200 mg/dL, and 7.1 times likely to have a triglyceride level above 130 mg/dL. Obesity in childhood often leads to obesity in adulthood. One study found that children who had reached a large portion of their adult height by the age of seven years were heavier at birth and thus "had an increased risk of obesity at age 33" (51).

Childhood obesity leads to adverse effects on the health of the child. Thirty percent of the newly diagnosed Type 2 diabetes is in children and adolescents. Sixty percent of children who are overweight have risk factors for cardiovascular disease (48). Complications with child obesity are often seen as being only long-term, but there are conditions that can affect the health of an obese child while they are still young. These health risks include: "pickwickian syndrome, cardiomyopathy, and pancreatitis" as well as "orthopedic disorders... and respiratory disorders" (49). Also included in short term health risks are gallstones, sleep apnea, increased cranial pressure, and hepatitis (50). Along with these physical ailments, there are psychological issues for the child with peers and even adults (49, 50).

Food Groups

As with the issue of food allergies, the elimination of certain foods and food groups can lead to a deficiency. If the child is refusing or cannot eat certain foods then they are at risk of or may already be developing nutritional deficiencies. These deficiencies can affect the growth and development of the child. With elimination of foods or food groups nutrients are removed, and substituting alternatives or giving suggestions to how to incorporate certain foods that are refused by the child to provide appropriate energy and other nutrients require assistance from an RD.

Parental Concern

Children with special health care needs often have feeding difficulties, which raises parental questions on whether the child is getting enough, what is needed to best feed the child, and what affects the disability may have on feeding skills. Parents of children who are developmentally typical often have these concerns, but they can be increased in parents with children who demonstrate developmental disabilities.

A study by Adams (52) tested maternal stress in mothers who had children with feeding problems. They chose mothers for this study because other literature cited showed that in 90% of families with children with feeding disabilities, the mother was in charge of the child's intake (52). The study included 30 subjects who were given the Questionnaire on Resources and Stress (QRS-F). This test consists of four components: "parent and family problems, pessimism, child characteristics, and physical incapacitation." When comparing stress levels of mothers of children on tube feedings, there was a significant difference in the parent and family problem component ($p=0.026$).

Another study looked at the maternal stress of mothers who had low-birth weight infants (53). The study included an intervention and a control group. Both of the groups completed the Parenting Stress Index (PSI) at the beginning and the end of the intervention. The PSI contains three sections, they are: "personal distress", "parent-child interaction", and "difficult child section." The intervention and control groups both received nutrition instruction when their children were discharged from the hospital and then follow-up medical and developmental evaluations at 4, 9, and 12 months of age. The intervention group also received a phone call each month to talk about any concerns with feeding and growth. Health information was also shared with the parent (mother) during this time. Results of the PSI at the end of the child's first year of life showed that the intervention group had a stress index at the 50^{th} percentile in all three categories. On the other hand, the control group showed a personal distress index at the 55^{th} percentile, parent-child interaction was at the 90^{th} percentile, and difficult child was at the 65^{th} percentile. The study suggests "that parents were more comfortable with their expectations of their child in the intervention groups than in the control group" (53).

Conclusion

Children with special health care needs are at risk for many nutritional problems. If these problems are undetected or are diagnosed late then nutritional deficiencies can worsen the feeding problems the child has already, create new problems, and/or not provide enough nutrition to sustain the child's growth and development. Intervention can

effectively ameliorate many conditions, however children need to be appropriately identified in order for service to be delivered.

CHAPTER III

METHODS AND PROCEDURES

PURPOSE

The purpose of this research is to design and validate a nutrition screening instrument to be used during the initial assessment or follow-up evaluation of a child referred to and/or participating in SoonerStart.

RESEARCH DESIGN

The design used for this study is descriptive, using quantitative methods to determine validity and qualitative methods to determine ease of use.

INTRODUCTION

The pilot nutrition screening questionnaire (form A) was developed by the nutritionists from SoonerStart as well as Dr. Tay Kennedy from Oklahoma State University Department of Nutritional Sciences (Appendix A). After testing, revising when necessary, and validating, the final nutrition screening questionnaire (Appendix B) will be used statewide to regularly assess children referred to and participating in the program.

The research was divided into two major phases. Phase I consists of pilot testing and determining the ease of use of the initial nutrition screening questionnaire (form A). Form A was revised based on the results of phase I. The revision of form A lead to the development of form B, which was used in phase II. Phase II consists of the validation section of the study. This research was reviewed and approved by the Oklahoma State University Institutional Review Board (IRB) (Appendix C) and the Oklahoma State Department of Health Institutional Review Board (Appendix D).

PHASE I- form A

Nutrition screening form

The pilot nutrition screening form (form A) was developed by the SoonerStart nutritionists and Dr. Kennedy, from the Oklahoma State University Nutritional Sciences Department, after reviewing the PEACH (3) and the Clark article (4). They developed a list of questions designed to identify children in SoonerStart who were at risk for developing nutritional deficiencies. The form consisted of 7 questions with a yes or no response. If any response was marked yes, the child was classified as at nutritional risk. The SoonerStart supervising nutritionist recruited several regional offices to test form A. SoonerStart professionals completed 181 nutrition screening questionnaires, from November 2000 through February 2001. These were mailed to Oklahoma State University to identify problems in completing the screening form.

Each person who completed the pilot nutrition screening questionnaire was assigned a number to determine who had filled out the most questionnaires. They were

also grouped into one of four categories: parent/guardian, resource coordinator, professional/therapist (occupational therapists, speech therapists, physical therapists, etc), and unknown. The pilot screening form was not designed to be completed by parents or guardians, but the few that did complete the pilot form were left in the final totals. The children were also grouped by calculated age to provide more descriptive groups. These groups are: 0-5 months (n= 52), 6-11 months (n= 27), 12-17 months (n= 12), 18-23 months (n= 21), 24-29 months (n= 24), 30-36 months (n= 28), and unknown (n= 17).

The yes responses were given the numerical value of 1 and the no responses were given the value of 0. Any missing values were labeled as missing. Frequencies of the yes and no responses were calculated to determine number of children at risk. There was an area on the pilot screening form for comments if there was a problem or a need for explanation of a specific item. The comments were reviewed to identify problems with questions. The statistical analysis software used was SPSS for Windows 10.0 (Standard Version, LEAD Technologies, Inc.)

Ease of Use

The population sample for identifying ease of use were professionals who work for the State Health Department and who had contact with form A. Purposeful sampling procedures of the seven professionals from the 40 professionals and parents who completed the pilot form were used. The seven professionals chosen had completed the most screening forms. Parents were not included in the interviews because the pilot screening form was designed to be given by professionals from SoonerStart. The professionals were interviewed on their experience with form A, whether they felt the

pilot form was easy to use, whether they felt the form identified children at nutritional risk, and if there were any changes they thought would be appropriate for the form. The phone numbers of the professionals were obtained from SoonerStart. The professionals were interviewed over the telephone at their work place at a convenient time. At the start of the interview, verbal consent was obtained for taping (Appendix E). The script for the professionals who came in contact with the pilot nutrition screening questionnaire is available in Appendix F.

Transcripts of the interviews were prepared by KL. Three reviewers read the transcripts and identified comments related to the research questions by color-coding the responses. Red was used to identify responses indicating ease of use. Blue was used to identify changes the professionals felt should be made to the pilot form. Finally, green was used to identify responses indicating whether or not the professionals felt the form identified children at nutritional risk. One reviewer (KL) grouped the comments by the color-coded responses to determine consensus. This consensus was reviewed by TK and the SoonerStart supervising nutritionist.

Form A was then revised (Appendix B). As explained in greater detail in Chapter IV, the too thin question was removed (question 5A) and the question pertaining to food refusal (question 6) was asked to children who were over one year of age.

PHASE II- form B

Validation

SoonerStart supervisors in the Stillwater and Tulsa regions assisted in recruiting children for the criterion validation phase. The first 20 at risk and the first 20 not at risk

children identified were evaluated. Due to miscalculation, the final total number of children in each group was 21 determined to be at risk and 19 determined to be not at risk.

The families gave initial consent to the SoonerStart personnel. The parents of the 40 children selected for the assessment were contacted through a phone number provided by SoonerStart. Verbal consent for the visit was obtained over the phone before a visit to the home was scheduled (Appendix G). At the start of the home visit, the purpose and the procedures were explained again to the family and written consent was obtained (Appendix H). The parent(s) were interviewed regarding their child's eating behaviors and the child was weighed and measured (Appendix I). The survey was a verbal paraphrase of form B. The infants were weighed in a dry diaper using a Seca battery-operated scale (model 727) that averages the multiple measurements of weight of the child. Using a portable length board, measurement of length was taken in triplicate and averaged. Both assessments were less than four weeks apart. The weights and lengths were converted to z-scores according to the directions provided by Centers for Disease Control (CDC) growth charts (54). Then the z-scores of the children not at nutritional risk were compared to the z-scores of children at nutritional risk using independent t-tests. The criterion used to determine validity of the final nutrition screening form was weight, length, or weight-for-length z-score and was expected to be lower in the at risk group. An abnormal z-score is less than -1.5. Significance for the t-tests was determined as $p<0.05$. SPSS software was used.

To determine the reliability of the final questionnaire, the parent's answers to the survey was compared to the nutrition screening questionnaire (form B) obtained by

SoonerStart. The percentage of identical answers on the forms was expected to be greater than 95%.

CHAPTER IV

RESULTS AND DISCUSION

Introduction

Developmental disabilities in children can often cause problems related to feeding (1). Adequate nutrition for any child is imperative, but for a child with developmental disabilities it is crucial due to altered nutrient requirements or alteration in the way the child utilizes nutrients. One survey found that two-thirds of children with special health care needs had feeding problems (12). Nutrition screening is an important initial component of nutrition services, which are important in the treatment and/or supportive care of children with chronic diseases or disabilities (13).

Two screening forms for children with special needs have been reviewed in the literature. The Parent Eating and Nutrition Assessment for Children with Special Health Needs (PEACH) survey (3) consists of 17 questions from a review of several different pediatric "screening instruments." The strengths of the survey are that it weights the different questions and a score is determined for each child. When the PEACH form was validated (3) the screening form was closely matched to assessments made by dietitians. The form was validated for children ages 0-6 years of age. This form had been used in Oklahoma and was discarded because of its length and "medical" focus.

Iowa's nutrition screening form includes questions concerning feeding problems, anthropometric data, diagnosis, and whether a nutritionist had been or was being seen and whether the referral to the nutritionist was recommended. The strength of the Iowa

nutrition screening form was that listed medical, social, and behavioral nutrition problems that, if present, could lead to nutritional deficiencies. The limitations of the form are that it was not validated and was even longer than the PEACH survey (4). In evaluation of the form, it was discovered that many nutritionally important sections were regularly skipped by the person completing the assessment.

The Early Intervention program in Oklahoma wanted a screening form that was short and simple to use but also accurately identified children at nutritional risk. Content validity was determined by pilot testing the screening form and by interviewing SoonerStart professionals who used the form during the pilot testing. Criterion validity was determined by assessing 40 infants (19 infants determined to be at risk by the nutrition screening form and 21 infants identified as not at risk by the nutrition screening form). After testing and validating, the questionnaire will be used statewide to regularly assess children referred to and participating in the program. If a child is determined to be at nutritional risk, appropriate nutrition services can be provided. The SoonerStart dietitians are able to provide nutritional care at no charge until the child is 3 years of age. After the age of the 3, the child is transferred to another program and nutritional services are no longer freely available. Therefore, early identification and treatment is imperative to ensure that these high-risk children are able to grow and develop in an appropriate manner.

Methods

The research was divided into two major phases. Phase I consists of designing the form, pilot testing, and determining the ease of use of the nutrition screening questionnaire. After the pilot nutrition screening form was analyzed and ease of use was determined a final nutrition screening form was developed and that form was tested for validity and reliability, this was phase II of the research. This research was reviewed and approved by the Oklahoma State University Institutional Review Board (IRB) (Appendix C) and the Oklahoma State Department of Health Institutional Review Board (Appendix D).

Content Validity

Three registered dietitians from the State Health Department who were experienced in working with SoonerStart children, along with TK from the Oklahoma State University Nutritional Sciences Department, reviewed the PEACH (3) and the Clark article (4) and developed a list of questions designed to identify children in SoonerStart who were at risk for developing nutritional deficiencies (Appendix A). The screening form contained seven yes or no questions. It was decided a child would be at risk if there was at least one yes response on the nutrition screening form. After the form was completed, it would be given to the dietitians so that the child may be further evaluated.

Pilot Testing of the nutrition screening questionnaire

The SoonerStart supervising nutritionist (SN) recruited regional offices to test the pilot screening form. The SN sent written instructions on completing the pilot forms to the regional professionals participating in the pilot test. SoonerStart professionals completed 181 pilot nutrition screening questionnaires, from November 2000 through February 2001. The screening questionnaire was completed in the children's home during routine assessment at referral to the program and at reevaluation. These questionnaires were then copied and the copies were mailed to KL and TK to identify problems in completing the screening form.

Ease of use sampling procedures

Seven professionals out of 40 professionals and parents who completed the form were chosen to determine ease of use of the nutrition screening form. This purposeful sampling from the 181 pilot nutrition screening forms were done to include different disciplines, such as resource coordinators and dietitians, and to include those professionals who had completed the most forms. Parents were not included in the interview process since the screening form was designed to be administered by SoonerStart professionals. The phone numbers of the selected professionals were obtained from SoonerStart. The professionals were interviewed over the telephone at their work place at a convenient time. At the start of the interview, verbal consent was obtained for taping (Appendix E). The professionals were interviewed on their experience, whether they felt the pilot form was easy to use, whether they felt the form identified children at nutritional risk, and if there were any changes they thought would

be appropriate for the form (Appendix F). Transcripts of the interviews of SoonerStart employees were used for analysis. Three reviewers read the transcripts and identified comments related to the research questions by color-coding the responses. Red was used to identify responses concerning ease of use. Blue was used to identify changes the professionals felt should be made to the pilot form. And green was used to identify responses of whether the professionals felt the form identified children at nutritional risk. KL summarized the results which were reviewed by TK and SN. Based on the results of the pilot test, the screening form was revised before further testing.

Criterion Validity

SoonerStart supervisors, one from the Stillwater region and one from the Tulsa region assisted in sampling procedures, by using nutrition screening questionnaires with families currently involved in the early intervention program. The SoonerStart personnel in the Stillwater and Tulsa regions administered the final nutrition screening form and families gave initial consent to be evaluated for the research project. The parents of the children who consent to the assessment were contacted by KL through a phone number provided by SoonerStart. Verbal consent for a home visit was obtained over the phone (Appendix G). The children were consecutively sampled; the first 20 children in each group, at risk and not at risk. The final total number of children identified in each group was 21 at risk and 19 not at risk. The time between the screening and the weight and height measurements was less than four weeks.

At the start of the home visit, the purpose and the procedures were explained again to the family and written consent was obtained (Appendix H). Then the parent(s) were

interviewed (parent survey) regarding their child's eating behaviors (Appendix I). The parent survey consisted of questions similar to the pilot screening form with the questions worded slightly different. Such as, question two on the pilot form says, "Does your child use a feeding tube or other special feeding method?" while the parent survey asks, "How do you feed your child?" After completing the survey, the infants were weighed in a dry diaper by a trained researcher (KL) using a Seca battery-operated scale (model 727) that averages multiple measurements of weight to increase accuracy with an active infant. Measurement of length was taken using Shorr Productions (Olney, Maryland) portable length board. Whenever possible, the lengths were taken in triplicate and averaged for analysis. All measurements were taken by KL.

Weights and lengths were converted to z-scores according to the directions provided by Centers for Disease Control and Prevention (CDC) (54). The growth charts were used as a standardized tool to validate the screening form. Then the z-scores of the children not at nutritional risk were compared to the z-scores of children at nutritional risk using independent t-tests and SPSS software (version 11.0). An abnormal z-score is less than -1.5. Significance for the t-tests was determined at the $p<0.05$ level.

To determine the reliability of the final questionnaire, the parent's answers to the survey were compared to the final nutrition screening questionnaire obtained by SoonerStart. The percentage of identical answers to the questions on the forms were expected to be greater than 95%.

Results

Summary of Pilot Test

Oklahoma State University received 181 completed screening questionnaires for analysis. The mean age of the children was 15.15 months. The questionnaire identified 51 children (28.2%) not at risk and 130 (71.8%) at risk. Most children at nutritional risk were those in the 0-5 month age range, which was 30.8% of the total. The age range that had the fewest number of children determined at nutritional risk was the 12-17 month age range (7.7%).

The screening form included an area for the name and occupation of the person who completed the screening form. The completers were placed into one of four categories. They are parent (7.2%, n= 13), resource coordinator (42.5%, n= 77), professional/therapist (11.0%, n= 20), or missing, that is the area was left blank (39.2%, n= 71). Professionals/therapists include physical therapists, speech therapists, occupational therapists, or nurses. The total number of people that completed the forms was 110. A single professional completed from 1-37 forms with the average forms completed being 4.2.

Results

The frequencies of yes and no responses for each item in the pilot questionnaire were determined (Table 1). The most frequent yes response came from the question of parental concern. Fifty-three (29.3%) of the responses to that question were yes. The fewest positive responses came from the question concerning Bronchopulmonary

TABLE 1

FREQUENCY OF YES AND NO RESPONSES FOR EACH QUESTION

Question	Yes response		No response		Missing		Total
	N	%	N	%	N	%	
Was your child's weight 3 pounds, 5 ounces or less?	32	17.7%	146	80.7%	3	1.7%	181
Does your child use a feeding tube or other special equipment?	13	7.25%	166	91.7%	2	1.1%	181
Does your child have asthma?	20	11.0%	151	83.4%	10	5.6%	181
Does your child have BPD?	4	2.2%	166	91.7%	11	6.1%	181
Does your child have any other respiratory problem?	20	11.0%	135	74.6%	26	14.4%	181
Does your child have any food allergies?	22	12.2%	141	77.9%	18	9.9%	181
Is your child small for age?	45	24.9%	129	71.3%	7	3.9%	181
Is your child too thin?	23	12.7%	146	80.7%	12	6.65%	181
Is your child too heavy?	7	3.9%	161	89.0%	13	7.2%	181
Does your child not drink milk?	19	10.5%	141	77.9%	21	10.5%	181
Does your child not eat meat?	12	6.6%	124	68.5%	45	24.8%	181
Does your child not eat vegetables?	19	10.5%	123	68.0%	39	21.6%	181
Does your child not eat fruits?	15	8.3%	125	69.1%	41	22.6%	181
Are you concerned about your child's eating behavior?	53	29.3%	122	67.4%	6	3.3%	181

dysplasia (BPD); only four children (2.2%) were reported to have BPD. The questions that were the most frequently unanswered or were not applicable to all the children were the food habit questions (question 6) and the other respiratory problem question. The food habit questions seem to be the least answered either because of vagueness or it was found to be confusing when asked for children less than 1 year of age. Also, the "Too thin" question was never checked by itself. That is the question was always checked along with another question on the screening form.

Figure 1 shows the percentage of children at nutritional risk compared to age range. The 0-5 month age range had the most frequent amount of parental concern at 9% (Figure 2). The groups that had the least frequently expressed parental concern were the 6-11 (3.4%), 12-17 (3.4%), and 24-29 (3.4%) month age ranges.

Analysis of Ease of use

The seven professionals who had the most experience with the nutrition screening questionnaire were interviewed (Appendix F) on A) how easy the questionnaire was to use, B) their opinion of the effectiveness of form in identifying children at nutritional risk, and C) what possible changes that could be made to the questionnaire. The professionals interviewed were dietitians (n= 2), resource coordinators (n= 4), and a physical therapist (n= 1).

The consensus of the responses to the ease of use question was that it was very simple, easy to use, and simpler than previous forms. Responses for suggestions on improving the form were to add a place for gestational age, current weight, birth weight, diagnosis, and a gagging and choking question. When the professionals were asked if the

Figure 1
Percent of Children at Nutritional Risk Compared to Age

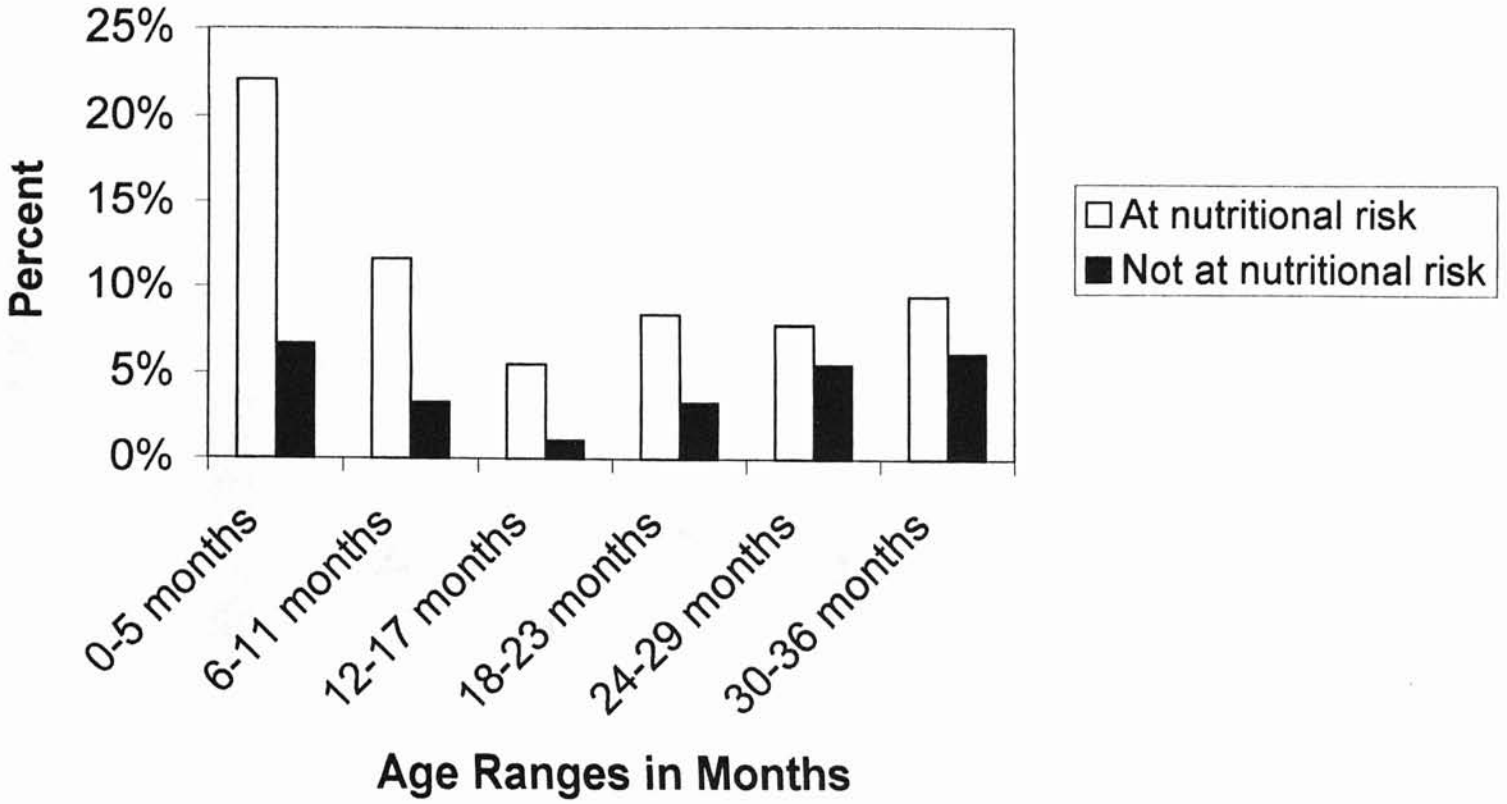
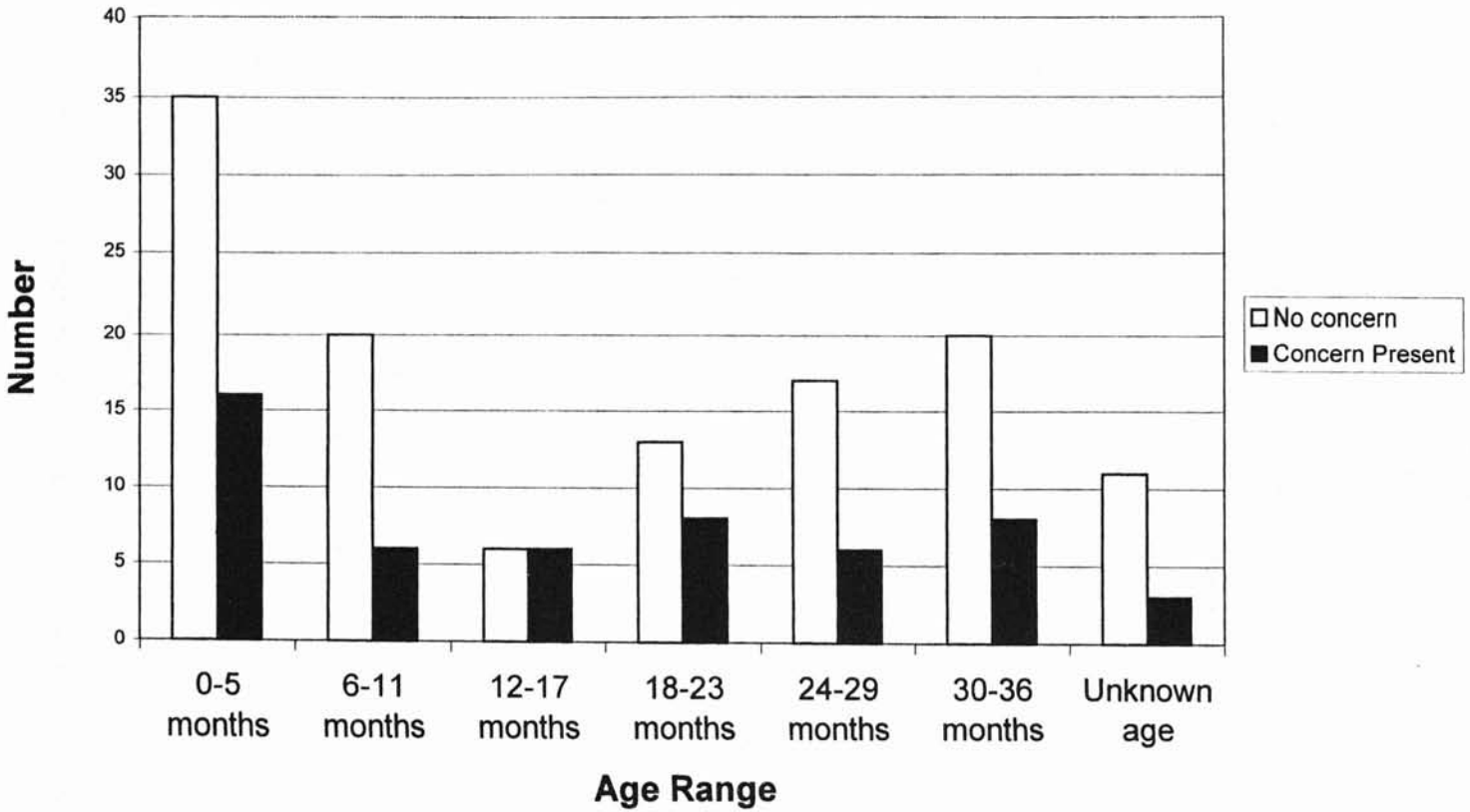


Figure 2
Number of Children whose Parent Had Concern With Eating Behavior Compared to Age Range



form was effective in identifying children at risk, one of the professionals felt the form was 50% effective and the rest of the professionals felt the form was effective or very effective. At this point the form was revised. The "too thin" item (5b) was removed because it was never marked by itself during the pilot testing. Question six was revised to be asked only to children over the age of one year. Since one of the purposes of the screening form was that it be easy, removing an unnecessary item aided in reaching that goal.

Criterion Validation Results

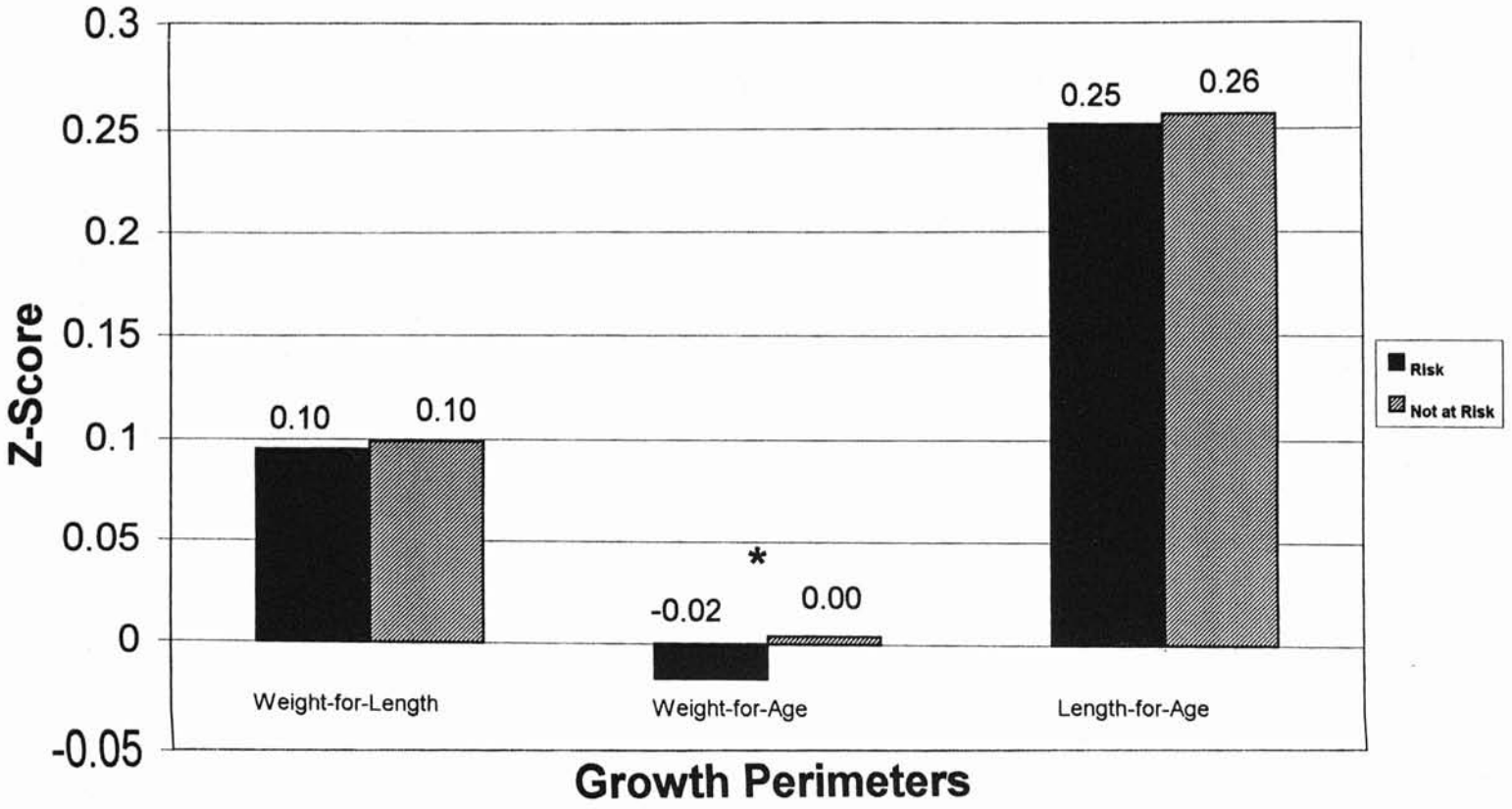
Forty children, 21 determined by the final screening form (Appendix B) to be at risk and 19 determined to be not at risk, were weighed and measured. The parent(s) or guardian(s) were asked questions (parent survey) about the child's eating behavior similar to the revised screening form questions (Appendix I). Table 2 shows the z-scores of the weight-for-age, length-for-age, and weight-for-length for the children at nutritional risk and those not at nutritional risk. Z-scores were used in the criterion validation because of the age variation of the children would make an average weight meaningless. The range for the weight-for-age z-scores in the at risk group were –0.09 to 0.03 with the mean z-score being –0.02, the not at risk group had a range from –0.02 to 0.04 with a mean of 0.00. The range for the length-for-age in the at risk group were 0.10 to 1.07 with a mean of 0.25, in the not at risk group the z-score range was 0.11 to 0.80 with a mean of 0.26. The range for the weight-for-length z-score in the at risk group were 0.06 to 0.28 with a mean of 0.10, in the not at risk group the range was 0.08 to 0.70 with a mean of

0.10. There was a significant difference between the two groups of children in weight-for-age ($p=0.0048$). There was no significant difference between the two groups for length-for-age ($p=0.244$) and weight-for-length ($p=0.92$). The final screening form accurately identifies children at nutritional risk (Figure 3). The average adjusted age of this group of children was 16.78 months.

Reliability

The percentage of identical answers on the nutrition screening form filled out by the SoonerStart professionals compared to the parent survey was calculated for the birth weight, special feeding equipment, respiratory problems, food allergy, the food avoidance or refusal, and the parental concern questions. Of the 40 forms, there was a 97.5% agreement in birthweight, only one parent survey did not agree with the screening form. Instead, the question on the screening form asked if birthweight was less than 3 pounds, 5 ounces and the parent survey selected for only those whose birthweight was less than 3 pounds. The feeding equipment question had an agreement of 100%. The respiratory problems and the food allergy questions had an agreement of 92.5%, that is 3 of the 40 subjects did not agree between the final screening form and the parent survey. For the questions pertaining to food refusal or avoidance, there was a 90% agreement. This may be lower due to the fact that the food questions do not pertain to children less than one year of age. The parent concern question had a 60% agreement, which may be due to the differences in the two questions. The question on the screening form read: "Do you have any concerns about your child's eating behavior?" but on the parent survey it read "What

Figure 3
Z-Score Averages for At Risk and Not At Risk Children



concerns do you have about your child's eating behavior?" This may have elicited responses from parents that may not have otherwise been raised.

Discussion

This screening form was developed to help reduce the technical aspects of nutrition screening while still providing an accurate and reliable tool that many people can use, which is a strength of the form. Revisions were not done on the screening form to take into account comments concerning current weight, birthweight, and diagnosis due to the fact that the previous forms used in the state were considered "technical" and the screening forms had failed because of this reason. In the validation, this nutrition screening form utilizes a more appropriate age range for Early Intervention Programs as compared to the PEACH form (3). Even though this screening form is shorter than the PEACH screening form, based on the results it is felt that the form is still valid, reliable, and easy to use in determining nutritional risk in children with developmental delays. This screening form was validated using standardized growth charts, while the PEACH form was validated using assessments made by dietitians (3). The strength of the PEACH survey is that it gives weights to the different questions and a score is determined for each child.

The number of children determined to be at nutritional risk by this screening instrument agrees with other survey results of children with developmental disabilities (12). The form asks questions about birthweight (13, 15-19), tube feeding (20-22), respiratory problems (23-24, 26-27, 29-30, 31-33), food allergies (36-39), being either small for age (41-43) or heavy for age (44-45, 47), food refusal, and parental concerns on

eating behavior (52, 53) all of which are accepted as important risk factors in this population. While none of the children were seriously growth retarded; there was a significant difference in weight-for-age between the two groups as weight-for-age is the most sensitive indicator of growth and nutritional status (55), we feel that the purpose of the screening form: to identify early the potential to have growth failure, is met.

Due to the large number of children identified as being at nutritional risk, not all of the children can be adequately seen by the dietitians in the Early Intervention program. Cross training other professionals in the program to deal with certain nutrition issues, can reduce the number of children who need to be seen by the dietitian. Picky eating behavior, for example, can be addressed by early childhood educators, speech therapists, and even occupational therapists because of their knowledge of either normal development and/or oral motor functions. Addressing this will be reassuring to parents in that they can realize that picky eating is a behavior that is commonly displayed in children, especially toddlers, and give the parent the assurance that their children are exhibiting normal developmental behavior. Picky eating may or may not be an indication for nutritional risk, however SoonerStart and Early Intervention programs focus on family concerns and helping the family solve this problem can support normal development. Training other professionals to address this problem will free the dietitian to focus on other nutrition issues.

The revised form is currently being distributed and used across Oklahoma. It is being utilized to help develop the initial plan of care and to reevaluate the children in the program.

Implications for Practice

A simple, easy form can be used to identify children at nutritional risk. The form identifies nutritional concerns that may be appropriately addressed by non-nutrition personnel with appropriate cross training. Non-nutrition professionals can then address issues, such as picky eating. The serious nutrition issues raised by the screening form, such as cystic fibrosis, prematurity, and tube feedings can be addressed by the dietitians.

This screening form correctly identified many children at nutritional risk. The state currently serves 3600 children and their families with only three dietitians to provide nutrition services. A representative sample of screening forms from children at nutritional risk can be collected and the services that were needed for these children can be designed into protocols for the dietitians and non-nutrition professionals to use. These protocols can be used to provide services to these children. For example, if the state had a high number of premature children then there can be training of all professionals on the general developmental needs of premature children.

Possibilities of future research include piloting and validating the nutrition screening form in Early Head Start programs and even in WIC (Women Infants and Children) programs. The form is already being requested by other states, which could lead to more research on the form in their areas. Dietitians in hospitals could also use this form as a screening tool to determine nutritional risk in a child under the age of three.

CHAPTER V

CONCLUSION

Summary

The purpose of this study was to validate and determine the ease of use of a pilot nutrition screening form for children participating in Oklahoma's Early Intervention program, SoonerStart.

The objectives for the study were:

1. To determine the validity of the final nutrition screening form.
2. To determine the ease of use of the pilot nutrition screening form.

There were two phases of the study. In the first phase experts in nutrition developed the form by reviewing literature and the form was pilot tested to assure content validity. The second phase began after the pilot screening form was revised. After the revision a new group of children were recruited and the growth of the children in the at risk and not at risk groups were compared to establish criterion validity. The sample included 40 children, 21 determined to be at risk and 19 determined to be not at risk, participating SoonerStart whose parent(s) agreed to participate in the study. Each subject was weighed, measured, and the parents were asked eating behavior questions (parent survey) of their child.

Results of Hypotheses Testing

The following hypotheses were developed for this study:

H1: There will be an agreement between those identified as at risk by the nutrition screening form and those identified as at risk by individual assessment.

This hypothesis was accepted. There was a significant difference between the two groups of children in weight-for-age ($p=0.0048$). There was no significant difference between the two groups for length-for-age ($p=0.244$) and weight-for-length ($p=0.92$). Because weight gain is the most sensitive factor in nutritional status (55) and significance was only found in weight-for-age, the children who are at nutritional risk were found before length was affected and growth was significantly impaired. The weakness of the validation of the screening form was that it did not include seriously growth retarded children. Most of the children in the at risk and the not at risk groups had normal growth patterns. The significance came in the fact that the at risk group did have more children with growth that was slightly lower than normal.

H2: Professionals administering the nutrition screening form will find it easy to use in identifying children at risk.

This hypothesis was accepted. The consensus of the responses to the interpretation of the ease of use was that it was very simple, easy to use, and simpler than the previous screening forms. Responses for suggestions on improving the form were to add a place for gestational age, current weight, birth weight, diagnosis, and a gagging and choking question. The professionals interpreted the form to be effective in identifying children at risk.

Implications

1. This simple screening form can be used to identify children at nutritional risk.
2. The form identifies nutritional concerns that may be appropriately addressed by non-nutrition personnel with appropriate cross training.

Recommendations

Non-nutrition professionals need to be trained to deal with questions on picky eating. It was noticed that many parents who are concerned about their child being a picky eater have a child that is about 2 years old. This is a common behavioral characteristic among toddlers and can be addressed by developing a parent handout on normal toddler eating behavior and training staff to answer questions related to "picky eating." This approach will show parents that their child is exhibiting typical growth behavior and will allow the nutritionists in the Early Intervention program to deal with other children.

Applications

A simple, easy form can be used to identify children at nutritional risk. The form identifies nutritional concerns that may be appropriately addressed by non-nutrition personnel with appropriate cross training. Non-nutrition professionals can then address issues, such as picky eating. The serious nutrition issues raised by the screening form, such as cystic fibrosis, prematurity, and tube feedings can be addressed by the dietitians.

This screening form correctly identified many children at nutritional risk. The state currently serves 3600 children and their families with only three dietitians to provide nutrition services. A representative sample of screening forms from children at nutritional risk can be collected and the services that were needed for these children can be designed into protocols for the dietitians and non-nutrition professionals to use. These protocols can be used to provide services to these children. For example, if the state had a high number of premature children then there can be training of all professionals on the general developmental needs of premature children.

Implications for Further Research

Possibilities of future research include piloting and validating the nutrition screening form in Early Head Start programs and even in WIC (Women Infants and Children) programs. The form is already being requested by other states, which could lead to more validation research on the form in their areas. Dietitians in hospitals could also use this form as a screening tool to determine nutritional risk in a child under the age of three.

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APPENDICES

APPENDIX A

PILOT
NUTRITION SCREENING QUESTIONNAIRE

Child's Name:	**Date:**
Address:	
City **State**	**Zip**
Phone: ( )	**Child's Date of Birth:**
Initial Screening?	**Yes** **☐ No**
Name of Person completing this form	

An answer of YES to any of the following questions should generate a referral for a complete nutritional assessment.

		Yes	No
1. Was your child's birth weight 3 pounds, 5 ounces or less (≤ 1500 grams)?			
2. Does your child use a feeding tube or other special feeding method?			
If yes, explain			
3. Does your child have respiratory problems like	Asthma		
	Bronchopulmonary dysplasia (BPD)		
	Other *←(please specify)*		
4. Does your child have food allergies?			
If yes, what foods?			
5. Is your child:			
	Small for age?		
	Too Thin?		
	Too Heavy?		
6. Which of the following foods does your child **NOT** eat?			
	Milk		
	Meats		
	Vegetables		
	Fruits		
7. Are you concerned about your child's eating behavior?			
If yes, explain:			

Questions developed by Tay Kennedy, Ph.D.
Oklahoma State University
Stillwater, Oklahoma
8/2000

NUTRITION SCREENING QUESTIONNAIRE

Child's Name:	**Date:**
Address:	
City State	**Zip**
Phone: ( )	**Child's Date of Birth:**
Initial Screening?	**Yes No**
Name of Person Completing this form	

An answer of YES to any of the following questions should generate a referral for a complete nutritional assessment.

		Yes	No
1. Was your child's birth weight 3 pounds, 5 ounces or less (≤1500 grams)?			
2. Does your child use a feeding tube or other special feeding method?			
If yes, explain			
3. Does your child have respiratory problems like	Asthma		
	Bronchopulmonary dysplasia (BPD)		
	Other *(please specify)*		
4. Does your child have food allergies?			
If yes, what foods?			
5. *Is* your child:			
	Small for age?		
	Too Heavy?		
6. Does your child <u>not</u> eat any of the following foods?			
	Milk		
	Meats		
	Vegetables		
	Fruits		
7. Are you concerned about your child's eating behavior?			
If yes, explain:			

Questions developed by Tay Kennedy, Ph.D. and Kelsey Leach Oklahoma State University Stillwater, Oklahoma 8/2000

APPENDIX C

Oklahoma State University
Institutional Review Board

Protocol Expires: 5/14/02

Date: Tuesday, May 15, 2001 IRB Application No HE0160

Proposal Title: VALIDATION OF A NUTRITION ASESSMENT SCREENING QUESTIONNAIRE TO IDENTIFY CHILDREN AT RISK FOR NUTRITIONAL DEFICIENCIES

Principal Investigator(s):

Kelsley Leach
422 HES
Stillwater, OK 74078

Tay Kennedy
422 HES
Stillwater, OK 74078

NOTE: The IRB chair notes the following: The consent form should NOT state the data are completely anonymous. Please revise and use the term "confidential.

Reviewed and Processed as: Expedited (Spec Pop)

Approval Status Recommended by Reviewer(s): Approved

Dear PI :

Your IRB application referenced above has been approved for one calendar year. Please make note of the expiration date indicated above. It is the judgment of the reviewers that the rights and welfare of individuals who may be asked to participate in this study will be respected, and that the research will be conducted in a manner consistent with the IRB requirements as outlined in section 45 CFR 46.

As Principal Investigator, it is your responsibility to do the following:

1. Conduct this study exactly as it has been approved. Any modifications to the research protocol must be submitted with the appropriate signatures for IRB approval.
2. Submit a request for continuation if the study extends beyond the approval period of one calendar year. This continuation must receive IRB review and approval before the research can continue.
3. Report any adverse events to the IRB Chair promptly. Adverse events are those which are unanticipated and impact the subjects during the course of this research; and
4. Notify the IRB office in writing when your research project is complete.

Please note that approved projects are subject to monitoring by the IRB. If you have questions about the IRB procedures or need any assistance from the Board, please contact Sharon Bacher, the Executive Secretary to the IRB, in 203 Whitehurst (phone: 405-744-5700, sbacher@okstate.edu).

Sincerely,

Carol Olson, Chair
Institutional Review Board

APPENDIX D

MEMORANDUM

July 5, 2001

TO: Tay Kennedy, Ph.D.
Assistant Professor
Nutritional Science
Oklahoma State University
422 HES
Stillwater, OK 74075

FROM: Laura Beebe, Ph.D.
OSDH IRB Chair

IRB # 908 Oklahoma State Dept Hlth IRB #1
FWA00000183

RE: 01-08 Validation of a nutrition screening questionnaire to identify children at risk for nutritional deficiencies

The OSDH Institutional Review Board has conducted a full review of *Validation of a nutrition screening questionnaire to identify children at risk for nutritional deficiencies.* The informed consent document and research proposal is hereby approved and you may begin subject enrollment. It is the Board's judgement that the rights and welfare of the individuals who may be asked to participate in this study will be respected; that the proposed research, including the process of obtaining informed consent will be conducted in a manner consistent with the requirements of 45 CFR 46, as amended; and that the potential benefits to subjects and to others warrant the risks subjects may choose to incur.

As principal investigator of this project, it is your responsibility to insure that this study is conducted as approved by the Board. Any modifications to the protocol or consent form will require prior approval, which you may request in an amendment letter or memorandum to me.

This approval is granted for a period of one year. A periodic progress report is required by June 20, 2002 summarizing study results to date, or a summary of the completed study.

If you have questions or need additional information, please contact Shari Kinney, IRB Administrator at (405) 271-9444 ext. 56738 or by E-mail at sharik@health.state.ok.us.

Thank you.

APPENDIX E

Professional Phone Consent

Hi. My name is Kelsey Leach. I am a graduate student in Nutrition at Oklahoma State University. I am working with SoonerStart on a nutrition screening *questionnaire that you administered/that the employees of SonnerStart administered* during the initial evaluation of the child for the program. I am determining the effectiveness of the form in identifying children that need nutritional help. I would like to ask you a few questions about your experience with the nutrition screening questionnaire. This includes your opinion on the strengths and weaknesses of the form and, also, your opinion on the ease of use of the form. In order to accurately evaluate all responses, the interview will be taped. All data will be kept confidential.

Do you have any questions?

May I have your permission to interview you if this is a convenient time for you? If not, may I schedule another time for the interview?

APPENDIX F

APPENDIX G

Parent Phone Consent

Hi. My name is Kelsey Leach. I am a graduate student in Nutrition at Oklahoma State University. I am working with SoonerStart to assess a nutrition screening questionnaire administered during your child's initial evaluation for the program. I would like to determine if the form is effective in identifying children that need nutritional help. In order to make sure the form works, we need to evaluate a few children more thoroughly by assessing their growth. I would like to come visit you at your home and ask a few questions about how your child eats. I would also like to weigh your child and measure your child's height. The results will help us determine if the form appropriately identifies children who need nutritional help. All data will be kept confidential. If you do not wish to participate, this will not affect you or your child's role in SoonerStart.

Do you have any questions?

May I have your permission to visit you at a convenient time for you and your child?

What is a convenient time that I may come?

May I have directions to your home?

INFORMED CONSENT FORM

I _____, hereby give permission for myself and my son or
(print name)
daughter, _____, to participate in the following research study conducted
(print name)
by **Kelsey Leach** and **Dr. Tay Kennedy** and I understand that my participation and my son/daughter's participation in this project will involve the evaluation of nutrition and development and the results of this research will improve the delivery of nutritional services in SoonerStart. My individual interview and the assessment of my child will take approximately 1 hour for the visit. I understand that there will be only 1 visit.

Upon meeting with each participant, an oral assessment will proceed in order to familiarize the parent with the researcher and the agenda of that visit. The researcher will explain the he/she will be asking questions about the child's nutritional intake, and weighing and measuring the child. The parent will then be asked if he/she would like to participate.

Participation is completely voluntary and each parent is free to not respond to any item and to withdraw from the study at any time.

ASSURANCE OF CONFIDENTIALITY

I understand the answers will be completely anonymous. My name and my son/daughter's name will not be identified with any data collected in the study and responses will be considered confidential and for research use only. I understand this Consent form will be kept within a locked file cabinet in a secured office and will also be kept separate from the recorded responses. The collected data will be viewed only by members of the current or future research teams who are authorized by the project director and who have signed an agreement to assure the confidentiality of information about the participants. I understand that test results for individual children will not be available. I understand that refusal to participate in the research will not affect my family's participation in SoonerStart. I understand that my participation in this research is voluntary, that we are free to not respond to any item, that there is no penalty for refusal to participate, and that I am free to withdraw my consent and participation in this project at any time without penalty after notifying the project director.

If I have any questions, I may contact **Tay Kennedy, Ph.D., RD, LD or Kelsey Leach** at **(405) 744-5965**. I have read and fully understand this form. I sign it freely and voluntarily. A copy has been given to me.

Date: _____ Time: _____(a.m./p.m.)

Signed: _____
(Signature of parent authorizing permission for myself and son or daughter to participate)

Signed: _____
(Signature of project director/witness)

APPENDIX I

Parent Questions

Child's Data of Birth_____ Date of Questionnaire_____

Child's Weight_____ Expected Due Date_____

Child's Length_____

1. How much did you baby weigh when they were born?

   >3.0 lbs. 2.5-3 lbs. 1.5-2.5lbs. <1.5 lbs.

2. How do you feed your child?

   Breast/bottle NG tube Special equipment

3. What, if any, continuing medical problems does your child have?

   None Asthma BPD Cystic Fibrosis Metabolic Disorder Other

4. Does your child have food allergies?

   Milk Bread Legumes Fruit Vegetables None Formula Other

5. Are there any foods that your child does not eat?

   Milk Bread Vegetables Fruit Meat Sweets None Other

6. What concerns you when you feed your child?

7. Does your child take any medications regularly?
   Yes No

VITA 2

Kelsey L. Leach

Candidate for the Degree of

Master of Science

Thesis: VALIDATION OF A NUTRITION SCREENING QUESTIONNAIRE TO IDENTIFY CHILDREN AT RISK FOR NUTRITIONAL DEFICIENCIES

Major Field: Nutrition

Biographical:

Personal Data: Born in Oklahoma City, Oklahoma, on November 19, 1977, the daughter of Robert and Renee Chase.

Education: Graduated from Westmoore High School, Oklahoma City, Oklahoma in May 1996; received Bachelor of Science degree in Nutritional Sciences from Oklahoma State University, Stillwater, Oklahoma in December 2000. Completed Dietetic Internship August, 2002. Completed the requirements for the Master of Science degree with a major in Nutrition at Oklahoma State University in December 2002.

Experience: Employed as a diet clerk for Mercy Health Center June through August 2000; employed as a trayline worker at Mercy Health Center from August through December 2000; employed as a grader for introductory nutrition class January through May 2001; employed as a research assistant from January 2001 through December 2001 and from August 2002 through December 2002 for Dr. Tay Kennedy.

Professional Membership: American Dietetic Association, Pediatric Nutrition Practice Group, and Oklahoma Dietetic Association.