FOOD INSECURITY AND CHILDREN WITH SPECIAL HEALTH

CARE NEEDS

By

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CERTIFICATE OF APPROVAL

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Abstract

Food Insecurity and Children with Special Health Care Needs

by

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Background: Food insecurity (FI) is the "limited or uncertain availability of nutritionally adequate and safe foods or limited ability to acquire acceptable foods in socially acceptable ways." In 2006, 15.6% of households with children in the United States were classified as being food insecure, including 12.6 million children. Many adverse effects are seen in food insecure children; spanning physical, developmental, cognitive, and social realms. Screening for childhood food insecurity is crucial to identify and provide aid for those in need but is not often done in primary care settings.

Children with Special Health Care Needs (CSHCN) are "those who have a chronic physical, developmental, behavioral, or emotional condition and who also require health and related services of a type or amount beyond that required by children generally." Having CSHCN puts an additional financial burden on the household, increasing the likelihood for food insecurity. CSHCN are already at a higher risk for nutrition related problems, and coupled with food insecurity, the risk for adverse effects may be much greater for this group.

Research Questions: 1. Is a single question from the USDA 6-Item Subset (Short Form) of the 12-month Food Security Scale adequate for use as a screening tool for food insecurity? and, 2. What are the household and family characteristics that predict household food insecurity in the study population?

Methodology: A survey was administered to parents of pre-school children attending the annual Multi-Modular Pre-School Health Screening in Tillamook, OR, with questions pertaining to food security, CSHCN, and household/family characteristics. Statistical analysis was performed using receiver operating characteristic (ROC) plots, chi square analysis and multivariate logistic regression. SPSS 15.0 software was used.

Results: Question 1 from the USDA 6-Item Subset (Short Form) of the 12-month Food Security Scale resulted in the highest area under the ROC curve, the highest sensitivity, and an acceptable measure of specificity. Question 1 would be a valid single question screening tool for identifying food insecure individuals. The predictors of household food insecurity adjusted for covariates were having a CSHCN in the family, having a family income below $25,000, and using no-cost food (such as from a food bank).

Significance: The results will be shared with Tillamook County to help with identification of the predictors of household FI and with planning strategies to address the prevalence of food insecurity. Determining a valid screening tool is the first step towards implementing screening in primary care, in order to identify and provide support to food insecure families at a community level.

Chapter I

Introduction

Problem and Significance. Childhood is a critical time for growth and development,

and nutritional demands for a healthy child are high. Food insecurity, or not having

enough safe, nutritious food, is a persistent problem that affects children as well as adults

in the United States (US) every year. Lack of food or lack of variety of food poses a risk

for children in their physical, mental and psychological growth.[1-11] The US has long been

aware of the pervasiveness of food insecurity in this country, and the goal of Healthy

People 2010 Objective 19-18 is to reduce the incidence of food insecurity to six percent

of the population.[12] Household food insecurity currently affects 10.9% of households in

the US and 11.9% of households in Oregon, indicating that there is much progress to be

made.[13] Additionally, as households face economic challenges such as rising costs or

unemployment, the prevalence of food insecurity is likely to rise.

Assessment of household and child food insecurity is carried out regularly in large

national surveys at the population level to determine the prevalence of food insecurity,

but is rarely done in primary practice settings.[14,15] Reasons for not asking about food

insecurity in primary care settings are numerous, including time constraints and lack of

knowledge of food insecurity.[16,17] However, identifying children in primary care settings

who are living in food insecure households may be an optimal avenue for follow up with

the family to obtain appropriate services and programs to combat the food

insecurity.[5,15,16] Identifying food insecurity in households with children in this setting

may also lead to a more in-depth assessment by the physician or other health care provider of food insecurity-related issues, such as iron-deficiency anemia.[7] Developing a reliable one-question screening tool is the first step toward reducing the prevalence of childhood food insecurity in the primary care setting.

Children with special health care needs are those with any physical, developmental, behavioral, or emotional condition and are already at an increased nutritional risk.[18,19] The families of these children may be at greater risk for food insecurity due to high out-of-pocket costs for treatment and management of the condition(s) of the children.[20-23] Children with special health care needs may be especially susceptible to the adverse effects of food insecurity. More information about this specific population and their experiences with food insecurity is needed to make a crucial step towards resolving food insecurity in the US.

Food Insecurity.

Food Insecurity Definitions. Food insecurity (FI) is defined as the "limited or uncertain availability of nutritionally adequate and safe foods or limited or uncertain ability to acquire acceptable foods in socially acceptable ways."[13] In short, it describes people and families who do not have enough food from month to month, or at times throughout a given year. Conversely, food security (FS) is "access by all people at all times to enough food for an active, healthy life."[13] Beginning in 2006, the United States Department of Agriculture (USDA) introduced new labels to define varying levels of food insecurity.[13]

The old terms "food insecurity without hunger" and "food insecurity with hunger" are now referred to as "low food security" and "very low food security," respectively. The classifications are the same, such that previous and future reports are comparable. Low food security designates those who experience decreases in diet quality and variety rather than quantity, while very low food security delineates those who experience "disrupted eating patterns" and decreases in food quantity.[13] For the purposes of this paper, the term food insecurity will encompass both "low food security" and "very low food security" unless otherwise stated. Child food insecurity is a term used throughout this thesis. It is assessed by the USDA 18 question Household Food Security Survey Module (HFSS).[13] The last seven questions in the HFSS refer to the children of the household specifically, and by assessing responses to these questions, national percentages of child food insecurity can be determined.

Trends in Food Insecurity. Since 1998, the national prevalence of household FI has ranged between 10.5% and 11.9%; currently it is 10.9% and very low food security, the more severe form, is at 4.0%.[24] The percentage of *children* who are food insecure nationally is much higher, ranging from 17.2% to 19.7% from 1998 to 2006.[24] Currently the percentage of children who are food insecure is 17.2%, the lowest since 1998.[24] Food insecurity in Oregon has for many years been above the national average though recently the prevalence has decreased to near the national percentage (see Table 1). The reasons for this are not well understood, as strictly income or poverty level information does not

Table 1

Trends in Food Insecurity in the United States and Oregon, 1998-2006[24,25]

| Year | Household Food Insecurity | | Child Food Insecurity |
	US Rate (%)	OR Rate (%)	US Rate (%)
1998	11.8	12.3	19.7
2000	10.5	13.7	18.0
2002	11.1	12.9	18.1
2004	11.9	11.9	19.0
2006	10.9	11.9	17.2

explain the discrepancy, although action by anti-hunger advocacy groups may have helped to reduce FI.[25] Though the level of food insecurity in Oregon has neared the national level, the state of Oregon still has the need for better services and programs to continue to decrease the prevalence to be equal to or below the national average.

Predictors of Food Insecurity. Characteristics that predict household food insecurity have been described in analyses of data from national surveys including the Current Population Survey, the National Health and Nutritional Examination Surveys (NHANES) and various others. Food insecurity disproportionately affects single mother-headed households (30.8%), African American households (22.4%), Hispanic households (17.9%), and those living below the poverty line (36%).[13] Additional household

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demographic and socioeconomic predictors of FI include: presence of children,[13,26-28] adults with less than 12th grade education,[26-28] having a disabled person in the household,[28] renting rather than owning a home[25] and living in principal cities of metropolitan areas or living in rural areas.[13] Understanding the predictors associated with FI is important in being able to identify and assist families likely experiencing food insecurity, gaps in public services, and may suggest methods of preventing long and short term food shortages in families.

The problem of food insecurity affects adults and children alike, and is not necessarily restricted to the homeless or to those below the poverty line.[13] In 2006, 11% of households and 15.6% of households with children were classified as having low to very low food security,[13] which means a substantial number of children are exposed to household food insecurity, or are food insecure themselves. As the severity of poverty increases, the presence and severity of low food security increases as well, but there is also a small percentage of households living above the poverty line that report the presence of food insecurity, and not all impoverished households experience low food security.[13] Thus food security or lack of security cannot be predicted solely by income; multiple factors are associated with food insecurity.

Adverse Effects of Food Insecurity on Child Health and Development. In 2006, 12.6 million children were classified as having low food security, and of those, 3.4 million had very low food security.[13] A variety of adverse effects of food insecurity have been described among children, including physical, developmental, cognitive, and social effects. Through mainly cross sectional studies with a sample size of several thousand,

the main categories of adverse health effects described in food insecure children are: chronic health conditions,[3-7] ratings of fair/poor health by their parents or caregivers,[4-6,8,34] poor diet,[29-33] psychosocial functioning,[1,2,5,9,10] behavior problems[2,5,9-11,35] and academic issues.[1,2,5]

Poor Health

Adverse health effects experienced by food insecure children are often illustrated by using health ratings by a caregiver, by number of hospitalizations, and by frequency of ailments. Alaimo and colleagues have done extensive research on food insecurity and its effects on children, using data from the third National Health and Nutritional Examination Survey (NHANES III). Common to large surveys is the health rating question, where a caregiver is asked to rate the child's health as "excellent," "very good," "good," "fair," and "poor." Ratings of fair and poor are often grouped together to show a low level of health. Among children who live in food insecure households, this study and others[4,6] found that preschool aged and school-aged children were rated by their parents to be in fair or poor health more often than their food secure peers.[3] Furthermore, the greater the severity of poverty combined with FI, the poorer the children were rated in overall health by their caregiver. The food insecure children were found to have more stomachaches, more headaches, and more colds, after adjusting for sociodemographic and family characteristics and health risks. Cook and colleagues supported the higher incidence of ailments in food insecure children in their research, and showed the trend was also the same for lifetime hospitalizations, though to a lesser degree.[4] Food insecure and hungry children have been found to be absent from school more often,[34] which may

contribute to the link between FI and poor school performance. These findings depict just a few of the many adverse health effects that FI has on children.

Behavior and Psychological Effects

Behavior problems and lower psychosocial functioning are adverse effects found to be associated with food insecurity in children. The common method for determining these outcomes is by survey either of the caregivers or of the teacher. Surveys such as the Pediatric Quality of Life Initiative, Child Behavior Checklist (CBCL), and Social Skills Rating System are examples of tools that might be used to assess behavior or psychosocial functioning. Studies using these and other surveys found that food insecure children were more likely to have at least one of the following behavior problems: aggressiveness, feeling anxious/depressed, or displaying attention deficit,[11] and they had impaired social skills[1] and lower psychosocial function.[35] Food insecure children were also more likely to have externalizing and internalizing behavior problems,[9] and be classified as dysfunctional.[10] Lower scores on the CBCL and the Children's Global Assessment Scale (measures overall functioning) were also found to be more likely in this population when compared to their food secure peers.[34]

Alaimo, et al, (2001) analyzed NHANES III data, with sample sizes of 3286 children aged 6-11 and 2063 adolescents aged 12-16, looking at cognitive, academic, and psychosocial performances of the surveyed children. They found that food insecure children aged 6-11 were more likely to have seen a psychologist (Odds Ratio [OR] 1.89, $P \le 0.05$), food insecure children aged 12-16 were also more likely to have seen a

psychologist (OR 1.82, P ≤ 0.05), ever have been suspended (OR 1.95, P ≤ 0.05) and had difficulty getting along with others (OR 1.74, P ≤ 0.05).[2] The same researchers analyzed the NHANES III data for associations between depression and food insecurity, and found that adolescents who were food insecure were four times more likely to have had dysthymia, two times more likely to have had thoughts of death, three and a half times more likely to have had the desire to die, and five times more likely to have attempted suicide compared to their food secure peers when adjusted for various household characteristics; though these odds ratios were not significant at the 0.05 level.[36] It is clear, however, from the studies noted here, that food insecurity has varied and broad negative effects on the psychosocial, psychological and behavioral aspect of children's health.

Academic Performance

Food insecurity and its association with school performance is a key query of many studies involving children and FI. A study by Jyoti et al, (2005) assessed children in kindergarten and then again when they reached the third grade. The researchers found that children who were food insecure throughout had smaller gains in math and reading scores than their food secure peers, and those transitioning from food secure to food insecure had much smaller gains in reading scores.[1] Other studies reported lower math scores in food insecure children,[2] and increased math scores when breakfast was given to at risk children.[37] Studies often do not reveal a significant relationship between FI and school performance. This may be due, in part, to inadequate sample size and multiple

confounding factors, but evidence suggests a trend of decreased school performance with increased food insecurity, and improvements in performance with adequate nutrition.

Diet Quality

Analysis of the diets of children is a helpful, yet complicated method for showing the potential diet inadequacies of children experiencing food insecurity. Deficiencies in nutrients over extended periods of time can have adverse effects on a child's health and development. Furthermore, excesses in nutrients like saturated fat and cholesterol from cheaper foods may adversely affect a food insecure child into adulthood by causing conditions such as high cholesterol and atherosclerosis. Most studies investigating FI use data from large-sample surveys that have limited data on actual or reported dietary intakes. Using the Continuing Survey of Food Intakes by Individuals (CSFII), Casey, et al, (2001) were able to obtain a sample size over five thousand children, as well as two 24-hour diet recalls for each, reported by the children six years and older, with parental help, and by the parents of children five years and younger.[8] With this data, nutrient intakes were available for analysis in addition to health and development factors. The children were categorized according to household income level as well as food security status. The low income, food insecure children had significantly lower total energy and carbohydrate intakes, and higher cholesterol intakes than their higher income, food secure peers. In addition, food insecure children across all age groups reportedly ate fewer dark green vegetables, nuts, fruits, and yogurt, and ate more eggs, dry beans, and peas than the food secure group.[8]

A study of adult diets in lower income counties in Mississippi, Louisiana, and Arkansas found similar results. Prior to Hurricane Katrina, one 24 hour food recall was taken over the phone, as well as the 18-Item HFSS, and results demonstrated that food insecure adults scored lower on the Healthy Eating Index (HEI) (P<0.0001) and consistently achieved intakes that fell further below the Dietary Reference Intakes than food secure individuals.[38] Particularly low were intakes of vitamin A, copper, and zinc with significant differences between FI and FS adults (P< 0.01). The findings of poorer diets when looking at food insecure individuals may be a partial explanation for the array of symptoms that are related to food insecurity found in children, such as poor health and behavior.

Food Insecurity and Obesity. There has been much debate recently on the topic of weight and its associations with childhood FI. Results from large studies range from showing evidence that food insecure children are less likely to be overweight or obese[31,39] to evidence that the children are more likely to be overweight.[30,40,41] Other studies show no significant associations at all, or significant associations within some categories of age, gender or race/ethnicity but not others.[1,3,7,33] The analysis of weight associations with FI is complicated by many variables, including income, age, race/ethnicity, the presence or absence of hunger, and comparisons between mild to severe FI, all of which can contribute to confounding and decreased statistical significance.

Casey, et al, (2006), analyzed body mass index (BMI) data from NHANES surveys, with a sample size of 6995 children aged 3-17. The 18 question HFSS was used to identify FI, and the researchers evaluated both overweight status (BMI ≥ 95%) and at

risk for overweight (BMI $\geq$ 85%).[30] The researchers found that children in food insecure

households and children that were child food insecure were more likely to be both

overweight and at risk for overweight at P< 0.01. Broken down into groups by gender

and age, the analyses again exhibited that children in food insecure households and those

that were child-food insecure were more likely to be overweight and at risk for

overweight, or in some cases, trends in the data displayed findings in these directions

despite not reaching statistical significance. In multivariate regression, however,

household FI was not statistically significantly associated with overweight or at risk for

overweight, although child FI was significantly associated with at risk for overweight.[30]

A separate study of 1514 preschoolers found that children in the study population were

3.4 times more likely to be overweight (P < 0.05) if they lived in food insecure houses,

even after adjusting for variables such as birth weight, parents' weight status, income and

education.[41] This study used one question to assess FI, and followed the children from

birth to age 4.5 years, allowing for plentiful data collection.

Rose and Bodor (2006) found nearly the opposite associations between food

insecurity and child overweight status. The odds ratio (OR) for overweight in food

insecure children was 0.80, indicating that "after controlling for other possible

confounders, children from food-insecure households were 20% less likely to be

overweight."[39] The total sample size was 12890 children assessed twice, once in

kindergarten and again in first grade in the Early Childhood Longitudinal Study,

Kindergarten Cohort. This survey used the 18 question HFSS to assess FI status.

Interestingly, in addition to the above result, the researchers found a significant inverse

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relationship between income and overweight status.[39] Though there was no mention in the article of the effect of the age of the children, since all the subjects were aged five to six at their second assessment, it may be that this cohort was simply too young to be displaying the BMI/weight consequences of FI.

Other studies have found a mix of results. For example, Alaimo, et al, (2001) used the NHANES III data and found no associations in the two through seven year age group between food insecurity and overweight. Results suggested higher levels of overweight in non-Hispanic white girls aged 8-16 years, although the P value was not significant.[42] Jyoti, et al, (2005) used data from the Early Childhood Longitudinal Study, Kindergarten Cohort and found significant associations between FI and increased BMI in females only.[1] The trend in research suggests a positive association between food insecurity and childhood overweight, but currently, no definitive statement can be made due to the multitude of non-significant findings.

BMI Z Score. Measurements of anthropometrics for children, such as height and weight, change in meaning with age and gender, in that one measurement will be interpreted differently depending on whether the child is a nine year old female or a four year old male. Anthropometric data are most meaningful when compared to national standards such as the National Center for Health Statistics (NCHS). Use of anthropometric Z-scores for age and sex allows the comparison across age and sex categories. Z scores also have a normal distribution, which is better for statistical analysis. Z scores of -2.0 to 2.0 encompass 95% of the population in the normal distribution, and are the cuff-off points for the range of "normal."[43] In regards to child BMI, above a Z score of 2.0

indicates overweight and a score below -2.0 indicates underweight. Z scores are a method for accurately analyzing and reporting pediatric BMI data, and are therefore often used in studies.

Identifying Food Insecurity.

Assessment of Household Food Security. Since the 1980's the American public has been aware of and concerned about hunger in the US; the concept of food insecurity has been defined since 1990.[13] The awareness of hunger led to the development of numerous methods for identifying hunger and FI in the general population. To assess FI the most recognized instrument is the 18 question Household Food Security Survey (HFSS). This has been developed and utilized by the USDA and has been contained in the Current Population Survey (CPS) since 1995.[13] Testing of the HFSS began with a cognitive assessment and field test by the US Census Bureau. It has also been tested extensively since its conception by the US Census Bureau, Mathematica Policy Research, Inc, IQ Solutions and numerous other independent agencies to assess its validity, reliability and applicability across various household types.[13] The questions range from asking about the uncertainty of having enough food for the members of the household, to the children of the household missing meals because the parents are unable to provide food. This questionnaire can be used to assess the severity of food insecurity from fully food secure to the most severe food insecure level, low food security among the children.

NHANES is another USDA survey and includes a variety of questions pertaining to health and nutrition. Since 1999, NHANES has contained the 18 question HFSS. Numerous food security studies have used NHANES data for analysis.[1,4,6,11,29,30] The HFSS is used in a variety of surveys, for both national and smaller populations. Other surveys that use the HFSS include the Continuing Survey of Food Intakes by Individuals (CSFII), which is a USDA survey that includes 24 hour recalls of food intake;[13] and the Food Research and Action Center's Community Childhood Hunger Identification Project (CCHIP), which was the first survey designed to provide data on food insecure families with children.[44]

USDA 6-Item Subset. The USDA also utilizes a 6-Item Subset (Short Form) of the 18 question HFSS, which is a shorter version of the form used in the Current Population Survey (See Appendix B). The short form was evaluated for effectiveness, and was found to be accurate and reliable for classification of food security status.[45,46] The six questions come directly from the full 18-question model, and include questions such as, "the food we bought just didn't last and we didn't have money to get more, was that often, sometimes or never true?" and "in the last 12 months, did you ever eat less than you felt you should because there wasn't enough money to buy food?" with the responses being yes, no, or I don't know.[47] The severity of the questions increases as they are read, in that an affirmative answer to the last question would indicate a more dire food insecure situation than an affirmative answer to the first. There are three main advantages of this shortened form: (1), a shorter time response burden for families can be useful for inclusion in longer surveys or for screening criteria, (2), it is able to provide prevalence

estimates of low and very low food security with minimal bias relative to those on the 18-item module, and (3), because it was developed from the full version, the six-item subset is standard and can be compared and related to the longer survey.[13]

Due to its condensed form, there are some disadvantages to use of this form over the 18-item questionnaire. This survey is less precise and somewhat less reliable than the full module. It cannot measure the most severe levels of food insecurity, and does not contain questions pertaining to child food insecurity and hunger, rather all questions ask about the entire household.[13] Despite these drawbacks, this survey instrument has been employed by numerous studies and has been well tested.[13,45,46,48]

Clinical Screening Tests. Clinical screening may be used to identify food insecurity on an individual level. At this level, assessment of FI is not for descriptive or census purposes. Instead it is used to identify individuals and families experiencing FI in order to provide information about programs providing income and food assistance. A second purpose of clinical screening for FI is to address problems related to FI. Use of a one question screening tool has been assessed to detect the prevalence of hunger in households by Kleinman et al.[49] Hunger is different from low or very low food insecurity; it is "an individual-level physiological condition that may result from food insecurity."[13] A one question written screening form was given to all parents in primary care pediatric clinic, and responses were compared to the 18 question HFSS that a sub group of participants completed during in-depth interviews. The one question to detect hunger had an 83% sensitivity and an 80% specificity, which the authors said represents an accurate and reliable screening tool.[49] Though the focus of this study was on hunger,

the results demonstrated that it is possible to implement a one question screening tool in a primary care setting. This study showed that it is also possible to ask briefly about food insecurity as part of the routine for health clinics serving low-income populations.

Screening at Primary Care Level. It is unclear how much screening for FI occurs at the level of hospitals and clinics for general pediatric care, although anecdotal reports indicate that access to food or food insecurity is rarely addressed in primary care.[14,15] Screening for FI at this level may be crucial to reducing the prevalence of FI, in that clinicians can make resources and services known to those experiencing FI. Granger and Holben (2004) state, "Physicians are well positioned to be aware of food insecurity among their patients before health and nutritional deterioration occurs and play a critical role in improving food security in the United States," but also concede that this is rarely done.[15] Not all food insecure families make use of governmental and nongovernmental food assistance programs,[49] and screening at the primary care level may serve to increase use of the programs and decrease prevalence of FI. Many articles investigating FI concluded with phrases such as, "this study supports the need to educate [clinicians] about food insecurity and incorporation of food security practices into the healthcare process."[16] Another study concluded with saying, "healthcare providers, along with their office staff, have an opportunity to reach eligible families."[5] However no research was found addressing the actual implementation of food insecurity screening practices in clinical settings.

A study assessing the knowledge and practices of nurse practitioners regarding food insecurity found that 47% of nurses surveyed were "not knowledgeable enough to

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identify a source [of their knowledge]" about FI, and only 33% strongly agreed or agreed

that they were familiar with the topic of FI.[16] The authors reported that the survey was

optional (sent by mail), and only those concerned with FI may have responded;

consequently an overestimation of knowledge of FI may have been obtained.[16] A similar

study assessing physicians' knowledge and practices towards FI found that practices and

referrals related to FI were not regularly performed, and that the majority were not

familiar with the concept of FI.[15] These authors also noted only those concerned with FI

may have responded. The development of a standardized, validated question to address

the concept of food insecurity may be a key to increasing both the knowledge and

practices of clinicians regarding FI. The hunger screening study by Kleinman et al,

(2007) discussed above documents the feasibility of applying a written screening

question in a primary care setting. Follow-up of any personal patient-clinician interaction

and discussion of available services was not assessed.

The Oregon Childhood Hunger Initiative (CHI) recently reported on a survey

mailed to randomly selected healthcare providers in the Portland, Oregon area that

addressed hunger and the primary care setting.[17] The goal of the CHI project was to

determine what providers surveyed know about FI and its health implications, as well as

to find out the tools needed to ask about FI and if providers would take action if given the

tools. When asked what factors prevent providers from asking about hunger during

clinical appointments, 81% marked "time constraints."[17] In addition, "I don't know

enough about the issue" was marked by 45.5% and "I don't know how to ask this type of

question" was cited by 22.3% of healthcare providers.[17] Despite these barriers, 89%

reported that they would be willing to use a standardized screening question to identify

FI. Assessing FI in national surveys and in various other populations is necessary to

determine the population prevalence of FI and impact or need for government food

assistance programs; interventions incorporating screening for FI in clinics and hospitals

may be an additional avenue for reduction of the incidence of FI, particularly in children.

Receiver Operating Characteristic Curves for Assessment of Screening Tools.
Analysis of Receiver Operating Characteristic (ROC) curves provides a method to select

optimal screening tools of desired sensitivity and specificity and discard others, and can

be applied to a screening tool for food insecurity.[50] In essence, the ROC curve is a plot of

the sensitivity versus 1-specificity of a classifier system. Sensitivity is defined as the

conditional probability that the indicator (for instance, one screening question) will

correctly give a food insecure result, provided that the person screened is food insecure.

Specificity is defined as the conditional probability that the indicator will correctly give a

negative result, such as food secure, provided that the person screened *is* food secure (or

NOT food insecure). When looking at the results in ROC analyses, the closer to 1.0 the

measure of sensitivity, the better the performance of the question, and the closer to 1.0

the measure of specificity (meaning the value of 1-specificity closer to zero, as results are

given in this format), the better the performance of the question as well. A properly

discerning screening tool will have both a high sensitivity and a low 1-specificity, in

order to identify those who are food insecure as such (or "True Positives"), but not also

falsely identify those who are not food insecure as food insecure (known as a "False

Positive"). However, it is not possible for a tool to have both perfect sensitivity and perfect specificity; there is a trade-off or balance in the two measures.

In the ROC curve, the data are plotted as sensitivity versus 1-specificity. A diagonal line runs through the ROC plot from bottom left to top right, and is the line of indifference.[51] A result falling on this line represents an indicator (screening question) that does not discriminate between food security and food insecurity better than chance alone. The closer a point is to the upper left corner of the graph, the better the sensitivity and 1-specificity are for the question being tested.[51] Refer to Figure 1 in the Results section for an illustration of a ROC plot. The area under the curve (AUC) is an additional calculation used to assess ROC plots. The AUC specifies the probability that, when you pick one positive and one negative example at random (for instance, a food insecure person and a food secure person), the decision function assigns a higher value to the positive than to the negative example.[50] In other words, AUC is the best balance between sensitivity and specificity for a certain screening question. Indicators that discriminate perfectly between food secure and food insecure have an AUC of 1.0, whereas a question that discriminates no better than chance has an AUC of 0.5.

Children with Special Health Care Needs.

Definition and Description. Children with Special Health Care Needs (CSHCN) are "those who have or are at increased risk for a chronic physical, developmental,

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behavioral, or emotional condition and who also require health and related services of a type or amount beyond that required by children generally."[52] As examples, this definition includes children with type 1 diabetes, cerebral palsy, autism, and cancer. In 2006, 13.9% of children nationwide and 13.6% of Oregon children had one or more special health care need,[52] and 20% of households nationwide had CSHCN.[53,54] Services needed by CSHCN beyond those utilized by children without chronic conditions are varied, and include case management, special therapies, special equipment and supplies, home health, respite care, and special nutrition.

Financial Impact of Children with Special Health Care Needs. The prevalence of having a child with special health care needs (SHCN) increases as poverty status increases, and creates an additional financial burden on the family.[20,21] One study from 1998 found that children in families with income levels at or below the federal poverty line are one third more likely than those in families above the poverty line to have a child with SHCN.[21] A nation-wide analysis found that over 40% of families with CSHCN experience finance-related family problems.[22] Employment problems, either reduced hours worked or the need to stop work altogether, affect 30% of this population nationally,[52,53] and a smaller percentage of parents of CSHCN work full time than those of children without chronic conditions.[55] Working less than full time not only reduces income; this may also prohibit eligibility for insurance through the employer, compounding the financial load. A study by Chung, et al, (2007) found that 41% of parents were not able to miss work on days they believed they needed to in order to care for their ill child.[56] The reasons were mainly because the income was needed or they

feared being fired.[56] This statistic illustrates that parents may have to choose between providing for their family financially and caring for their child. The entire household or the child with SHCN may suffer the consequences of either decision. Beyond simply the financial burden, but perhaps intrinsically linked to it, numerous studies have found adverse effects of having a child with SHCN on the family, including reduced parental employment, [22,53] increased stress,[57] and poor mental health.

Insurance does play a protective financial role in the costs associated with caring for a child with SHCN, and there are expanded insurance opportunities for parents with SHCN children, such as Medicaid, and assistance programs like the Supplemental Security Income (SSI). Despite these resources, mean out-of-pocket expenses for a SHCN child are almost double that of a child without chronic health conditions. [22,23] Viner-Brown (2005) reported that only half the families of CSHCN that are impacted financially have adequate insurance to cover needed services,[53] and families of CSHCN face greater burdens even finding coverage to meet the child's needs.[55] In a focus group of parents with CSHCN, parents frequently reported that insurance companies would deny coverage of the child for an extended time, or would impose lengthy waiting periods for needed services, both resulting in large out of pocket expenses.[58] It is clear that insurance does not fully compensate for the abundant needs of CSHCN, and the resulting gap may contribute to an increased risk of FI or a greater severity of FI for the family.

Impact on the Child. Due to the higher costs to the families, children with special

health care needs are more likely to go without various types of care, posing a real threat

to their well-being.[55,59] Porterfield, et al, (2007) found that children from poor families

were less likely to use specialized physician services and prescription medications than

children of families with incomes above 200% of the federal poverty level due to cost

and health plan problems.[59] Despite that, CSHCN average about four times as many

hospital stays[23] and three times the medical encounters and absences from school when

compared with other children.[21] Because the definition of children with special health

care needs is so broad, and because each child's condition or conditions are so

personalized, it is difficult to assess or describe the health ramifications of a SHCN on a

child beyond showing issues such as increased medical needs, mental health care needs,

missed school days due to hospitalizations, unmet prescription needs, etc. However,

CSHCN from poorer families may not receive the spectrum of care that is consistent with

recommended practices.

Identifying Children with Special Health Care Needs.

The definition of children with special health care needs is broad and varied. The

one nationally accepted tool to identify CSHCN is the Children with Special Health Care

Needs Screener© developed by The Child and Adolescent Health Measurement Initiative

in accordance with the definition specifications of the Federal Maternal and Child Health

Bureau (MCHB).[60] The survey is a five item, parent-completed module that takes only a

minute to fill out, yet provides identification of children across the range of conditions denoted in the definition of CSHCN.[60] The five items included in the survey are: 1. the need or use of prescription medications, 2. an above-routine use of services, 3. the need or use of specialized services or therapies, 4. the need or use of mental health services, and 5. a functional limitation. The full survey can be found in Appendix C. The screener is applied by the NCHS in the National Survey of Children with Special Health Care Needs (NS-CSHCN) and in numerous other comprehensive surveys.[60]

Relationship between Food Insecurity and Children with Special Health Care Needs. It has been shown above that FI negatively impacts the general health, school performance, behavior and physical growth of children. It was also stated above that the prevalence of households with CSHCN increases as poverty increases, a factor intrinsically tied to FI. Regardless of food security status, CSHCN are at an increased nutritional risk[18,19] and with food security factored in, the nutritional risk of CSHCN is likely to increase. A position paper from the American Dietetic Association states that, "persons with . . . special health care needs frequently have nutrition problems including growth alterations (such as failure to thrive, obesity, and growth retardation) metabolic disorders, poor feeding skills, medication-nutrient interactions, and partial or total dependence on enteral or parenteral nutrition."[18] In families that are struggling to pay bills and potentially facing problems obtaining adequate health insurance coverage to meet the needs of CSHCN, feeding the child *anything* may be the main priority, making an appropriate diet for the specific needs of the child a lower priority. CSHCN in food insecure households may be at increased risk for one or more of the adverse physical,

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developmental, or psychological health issues associated with food insecurity in addition to the already present issues brought on by the SHCN. For the health of the nation's children, food insecurity among families with CSHCN is a problem that demands further attention in the form of services and support that will help families address their needs.

Tillamook County Preschool Screening Description and Demographics.

The data used for this study was obtained from a free health screening for preschool children called the Tillamook Multi Modular Preschool Screening. This screening has taken place in the city of Tillamook, Oregon for the past 20 years. The Northwest Regional Education Service District (NWRESD) and the Child Development and Rehabilitation Center (CDRC) of the Oregon Health and Science University sponsor this event, which provides free health screening to children in Tillamook County prior to entering kindergarten. The children are assessed for medical, developmental, physical or educational problems. Results are used to identify children in need of health-related services and make appropriate referrals prior to school entry. The screening is well known and well advertised, and served as the ideal medium through which to obtain the data used for this analysis.

Tillamook County, Oregon is found in the North West coastal region of Oregon, and encompasses 1,333 square miles.[61] The city of Tillamook had 4,300 residents in

2000. Tillamook County had 24,000 residents, as reported by the most recent Current Population Survey.[61] The distribution of county residents by race /ethnicity is as follows: the majority (91%) are non-Hispanic White, 5.1% are Hispanic or Latino and 0.2% are Black. Female headed households make up 4.8% of the households in the county. Eighty four percent of people over the age of 25 are high school graduates or higher. A full 21.5% of children are in poverty in the county compared to 18.8% in the state.[62]

Research Questions and Specific Aims.

This thesis utilized data obtained from the Tillamook Multi-Modular Preschool Screening using the Survey of Household Food Needs to address two main questions. (See Appendix A for survey) The questions are as follows:

1. Is a single question from the USDA 6-Item Subset (Short Form) of the 12-month Food Security Survey Module valid for use as a screening tool for food insecurity?

2. What are the household and family characteristics that predict household food insecurity in the study population?

The objectives of this study are:

1. To test the hypothesis that a single question from the 6-Item Subset (Short Form) of the 12-Month Food Security Scale has appropriate sensitivity and specificity to be an accurate screening tool in primary care.

2. To test the hypothesis that having a child with special health care needs in the family predicts household food insecurity.

Testing these hypotheses will be achieved by using data obtained from the Tillamook Multi-Modular Preschool Screening using the Survey of Household Food Needs to accomplish the following specific aims:

1. Determine the prevalence of low food security (food insecurity) and very low food security in the study population.

2. Determine the prevalence of children with special health care needs in the study population.

3. Identify the most appropriate single question for use as a screening tool from the 6-Item Subset (Short Form) of the 12-Month Food Security Survey Scale using Receiver Operating Characteristic curve analysis to describe the sensitivity, specificity and area under the curve of each question of the 6-Item Subset.

4. Identify associations between household food insecurity status and status of households with children with special health care needs using chi square and logistic regression analysis.

5. Identify the household characteristics that predict food insecurity in the study population using the variables obtained from the Tillamook Multi-Modular Preschool Screening: Survey of Household Food Needs.

Chapter II

Methods

Study Design. This retrospective analysis of existing data was determined to be exempt from need for review from the Oregon Health and Science University Institutional Review Board. Data for this cross-sectional descriptive study were obtained in 2006 from Tillamook, Oregon by the Northwest Regional Education Services District (NWRESD). Data were collected from parents of children who participated in the Annual Tillamook Multi-Modular Preschool Screening (TMMS) in 2006. The instrument used for data collection was the Multi-Modular Preschool Screening: Survey of Household Food Needs (See Appendix A). The annual screening is optional, and available to all families in the area who wish to have their pre-kindergarten child screened. The Survey of Household Food Needs was mailed to parents signed up for the screening, along with other screening paperwork. The parents who had not completed the survey before arriving at the screening event were invited to complete the survey on site as well as ask questions of staff.

The survey is a 17 question tool. It contains the USDA 6-Item Subset (Short Form) of the HFSS (See Appendix B), as well as three questions modified from questions on the Children with Special Health Care Needs Screener© (See Appendix C). The remaining questions ask about demographic characteristics and other household characteristics and behaviors. Questionnaires were available in Spanish and English versions.

Study Population. The participants in the study were families with at least one child

aged three to six years who attended the TMMS. Families living in Tillamook, Oregon,

and Tillamook County, Oregon, were recruited for the screening, although participation

was not restricted to those living within the area. Addresses were not recorded, and

children living outside of Tillamook County may have been included. A total of 221

families representing 228 children completed the survey, out of 239 children attending

the screening.

Inclusion/Exclusion Criteria. The main inclusion criterion was having a child of pre-

kindergarten age, although the age range in the study sample was three to six years. All

families who wanted to participate could do so. The survey was available in English and

Spanish. If the family did not have a mailing address (for example, had moved recently

or were homeless) they were not excluded from the survey; families were able to fill out

paperwork and surveys during the screening. Families bringing in more than one child

for the screening filled out one survey of demographic and household characteristics, and

then answered child-specific health and nutrition questions for each child screened.

Respondents not providing answers to the food security questions or who provided partial

responses only were excluded from analysis.

Data Management and Definition of Dependent Variable. Data from the surveys

were entered into Microsoft Access, and transferred to an SPSS data file. All analyses

were performed using SPSS Version 15.0.[63] Missing data were excluded from all

analyses. Households were classified as either food secure or food insecure, depending

on the answers to the 6-Item Subset of the HFSS. Families responding affirmatively to

two or more food security survey questions were categorized as food insecure according to the scoring protocol.[47] The 6-Item Subset asks questions only of the household, not of the children, so assumptions cannot be made about the food security status of the children. Food insecurity in this sample refers to household FI only. Respondents answering affirmatively to five or more questions were categorized to have "very low food security" in the household.[47] Ten families, or 4.3% of the study population, had very low food security, which was too small a number to analyze with reportable results. Therefore, low FS and very low FS were collapsed into two categories, either food secure or food insecure; household food insecurity was used as the dependent variable of interest.

Recoding of Variables. Classifying a child as one with a special health care need was based on responses to three questions in the survey (questions 16, 17 and 18). All three questions needed to be answered in the affirmative to identify the child as one with a SHCN. To increase cell size of the CSHCN variable for analysis, affirmative answers for the first two questions were used to represent the CSHCN variable, and the requirement of the condition lasting 12 months or longer (the content of the third question) was not included. Though this resulted in an alteration of the standard definition of CSHCN, this allowed analysis of having a child with SHCN in this population, regardless of the duration, as this question was of particular interest to the study.

Measured heights and weights were recorded for each child and used to calculate the body mass index (BMI), which is weight in kilograms divided by height in meters, squared. The BMIs were converted to Z scores using Epi Info[64] by applying the NCHS

growth chart data. The BMI Z score was tested in models as both a continuous variable and as a trichotomous categorical variable of low BMI ($<$ -2.0 Z score), normal BMI (-2.0 – 2.0 Z score) and high BMI ($>$ 2.0 Z score).

All variables except child age were analyzed as categorical variables reflecting how questions were asked, and required recoding to provide adequate cell sizes. When necessary and where feasible, categories were collapsed to provide adequate cell sizes for analysis. Need for recoding was determined by assessing frequency tables and histograms. For example, question number 7 asked about family type and provided seven answer choices including "other." The frequency table for this variable showed that the option "single father living with children" had only 1 respondent, and therefore this category was collapsed with "single mother living with children." Similarly, "grandparents living with children" had only 2 respondents, and was grouped with "couple living with children."

Health status of the child was addressed as, "In general, would you say this child's health status is A. Excellent, B. Very good, C. Good, D. Fair or E. Poor." There were zero responses for the option of "poor" and four responses of "fair." Because of this, the responses were collapsed and recoded into a dichotomous variable with excellent and very good as one category and good and fair as the second. The latter represented the lower end of health reported in this survey. Collapsing the health status variable is common practice in other analyses.[3,4,6]

Descriptive Characteristics. Demographic characteristics of the study sample were obtained with descriptive statistics such as mean and frequency and are reported in detail in the Results section. Prevalence of household FI and families with CSHCN were described using descriptive statistics.

Receiver Operating Characteristic. Receiver operating characteristic (ROC) curve analysis and corresponding areas under the ROC curve were carried out to address Aim 3: identify the most appropriate single question for use as a screening tool from the 6-Item Subset (Short Form) of the 12-Month Food Security Survey Scale using Receiver Operating Characteristic curve analysis to describe the sensitivity, specificity and area under the curve of each question of the 6-Item Subset. Each question in the 6-Item Subset was compared to the entirety of the 6-Item Subset. Analyses included measures of sensitivity, specificity and area under the curve (AUC).

Chi Square and Multivariate Logistic Regression. Chi square and univariate and multivariate logistic regression analyses were used to test Aims 1, 2, 4 and 5. For all results, P values < 0.05 were considered statistically significant. Frequency tables and chi square were used to determine the prevalence of FI and CSHCN, while univariate and multivariate logistic regression were utilized to identify predictors of FI. Correlation between pairs of variables were evaluated, and those correlated above a 0.35 cut-off point were run in simple logistic regression to evaluate the strength of their relationship with food insecurity; the variable with the larger P value was left out of subsequent model building. A 0.35 correlation was chosen as this is a common rule-of-thumb cut-off for this type of analysis. For instance, having a home garden and child gardening correlated

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highly at 0.818 (P = 0.01), and so child gardening was not included in the model building, as having a home garden explained so much of the variable and child gardening was less significant in simple logistic regression. Correlations were also checked between the dependent variable, household FI, and the independent variables to observe the relationships between variables.

Simple logistic regression was run first for each variable and variables with a P value of > 0.2 were excluded from the model building. All remaining variables were put into a model together for backwards elimination, unless they had been eliminated because of a high correlation with another variable. Variables were eliminated one-by-one according to largest P value, unless the variable was of interest to the end interpretation, in which case it was left in regardless of P value.

Confounding was assessed by calculating changes in P values and betas (β) after each variable was eliminated in the multiple logistic regression model. If the change was 10% or more, the variable was considered to be a confounder and left into the model to control for the effect.

Chapter III

Results

Study Demographics. Characteristics of the study sample are presented in Table 2 and Table 3. The 221 families that participated in the survey represented 228 children. The majority of the children were preschool age, and the mean age was 53.5 months, or 4.5 years. A majority of participants were non-Hispanic White (n = 165, 77.1%) and almost one fifth were Hispanic (n = 39, 18.2%). Ten participants were of another race or ethnicity (4.7%). Almost three fourths of families were parent or grandparent couples with children (n = 156, 72.6%), one fifth were single parent families (n = 42, 19.5%), and the remaining family types made up 7.2% (n = 17). The mean family size in this sample was 4.36, and the average number of children per household participating was 1.25. The majority of families brought one child to the screening; seven families brought two children and zero families brought three or more children.

Income and Education. Over a third of the families participating reported an income of $35,000 or above (35.1%, n = 72), whereas the second largest income category was $0-14,999 reported by 26.3% (n = 54). Fewer reported incomes of $15,000-$24,999 at 21.0% (n = 43) and $25,000-$34,000 at 17.6% (n = 36). Almost half (42.7%, n = 90) of the sample population had finished high school or the General Educational Development tests (GED), while 31.8% (n = 67) had completed some college, 11.8% (n = 25) were college graduates, and 13.7% (n = 29) had finished some high school or less. A full 56.4% of persons completing the study had a high school diploma or less.

Table 2

Demographic Profile of Study Sample

Characteristic	Study Population Response	
	Percent %	n
Number of Families in Survey		n = 221
Number of Children in Survey		n = 228
Age of Child, Mean in Months (SD)[1]	53.5	(10.69)
Weight of Child in Pounds, Mean (SD)[1]	42.41 lb	(8.512)
Race/Ethnicity: White	77.10%	n = 165
Hispanic	18.20%	n = 39
All Other	4.70%	n = 10
Family Type: Single Parent	19.50%	n = 42
Grandparent/Parent Couple w/ Children	72.60%	n = 156
Other	7.20%	n = 17
Number of Children Participating Per Family, Mean (SD)[1]	1.25	(0.496)
Family Size, Mean (SD)[1]	4.36	(1.39)
Income Category: $0-14,999	26.30%	n = 54
$15,000-$24,999	21.00%	n = 43
$25,000-$34,999	17.60%	n = 36
$35,000 or Above	35.10%	n = 72

Table 2 continued next page . . .

Table 2 continued:

Characteristic	Study Population Response	
	Percent %	n
Parents Education: Some High School or Less	13.70%	n = 29
High School or GED	42.70%	n = 90
Some College	31.80%	n = 67
College Graduate	11.80%	n = 25

[1] Results reported as mean in the first column and standard deviation (SD) in the second

GED = General Educational Development tests

Table 3 represents questions on the survey pertaining to food and income behaviors in the household, and also shows the prevalence of food insecure families and families who have CSHCN. About a quarter of families have gardens, and children typically aid in gardening (family has home garden, 24.9%, n = 54, and child gardens 27.2%, n = 58). In general, there was substantial use of many assistance programs: over a third (38.30%) reported food stamp usage, just under a third (31.90%) make use of the National School Lunch Program (which provides low- or no-cost lunch in schools to eligible children), and nearly half use the Special Supplemental Nutrition Program for Women, Infants and Children (WIC) (46.50%). A lesser number of families reported

using Head Start or Early Head Start and obtained food at no cost from churches or food pantries, but these percentages were considerable as well (17.3%, n = 35 and 18.2%, n = 38 respectively).

"Program use" was a variable made to describe families that used *at least one* of the programs, to show the proportion of families who used programs versus those who did not. Almost three quarters (73.6%, n = 173) of the survey population used at least one of the programs listed in the questionnaire, showing that a large number of the families make use of federal and public food assistance.

It is not common that a child will skip breakfast for any reason in the study population, just 15% (n = 32) skip breakfast a few days a week or more. The question about skipping breakfast was followed by a query of why the child would skip breakfast, but since the majority of respondents did not answer this question (71.5%, n = 168) or marked "none of the above" (21.3%, n = 50), this question was not reported or analyzed. No other information was obtained about mealtime habits.

Food Insecurity and Children with Special Health Care Needs. Household food insecurity in this sample is 23.2% (n = 53). Food insecurity with hunger, or very low food security, occurred in 4.3% (n = 10) of the households. The proportion of affirmative responses to the food security questions are shown in Table 4. Children with a special health care need made up 10.8% (n = 25) of the study population. Children in this sample who were both from food insecure households and have a special health care need represent 3.4% (n = 8) of the total children included in this study.

Table 3

Food and Income Behaviors, Food Security and Children with Special Health Care Needs Status

Behavior or Characteristic	Survey Response	
	Percent (%)	N
Family has Home Garden[1]	24.90%	n = 54
Child Gardens[1]	27.20%	n = 58
Food Stamp Use[1]	38.30%	n = 80
School Lunch Program Use[1]	31.90%	n = 66
School Breakfast Program Use[1]	25.40%	n = 52
Summer Food Program Use[1]	3.40%	n = 7
Head Start or Early Head Start Use[1]	17.30%	n = 35
WIC Use[1,2]	46.50%	n = 100
Obtain No-Cost Food[1]	18.20%	n = 38
Families who use at least one program	73.60%	n = 173
Child Skips Breakfast: Almost Daily	5.60%	n = 12
Few Days a Week	9.40%	n = 20
Almost Never	85.00%	n = 181

Table 3 continued next page . . .

Table 3 continued:

Behavior or Characteristic	Survey Response	
	Percent (%)	N
Household Food Insecurity (Low Food Security)	23.20%	n = 53
Very Low Food Security	4.30%	n = 10
Child has Special Health Care Need	10.80%	n = 25
Children who are both in FI[3] households and have a SHCN[4]	3.40%	n = 8

[1] Indicates a yes or no answer

[2] WIC = The Special Supplemental Nutrition Program for Women, Infants and Children

[3] FI = Food Insecure

[4] SHCN = Special Health Care Need

Table 4

Frequency of Responses to Food Security Questions

Question from 6 Item Subset[1]	Frequency	Percent (%)
Question 1	65	27.7
Question 2	53	22.6
Question 3	20	8.5
Question 4	18	7.7
Question 5	18	7.7
Question 6	15	6.4

[1] See 6-Item Subset in Appendix B for list of questions.

Table 5

Receiver Operating Characteristic Results

Test Question[1]	Area Under the Curve	Standard Error	Sensitivity	1-Specificity	95 % CI for Sensitivity
Question 1	0.958	0.015	0.981	0.066	0.928, 0.987
Question 2	0.919	0.028	0.870	0.033	0.864, 0.973
Question 3	0.661	0.048	0.333	0.011	0.568, 0.754
Question 4	0.667	0.048	0.333	0.000	0.573, 0.760
Question 5	0.655	0.048	0.315	0.006	0.561, 0.748
Question 6	0.639	0.048	0.278	0.000	0.545, 0.733

[1] See 6-Item Subset in Appendix B for list of questions.

Receiver Operating Characteristic Analysis. An overall question of this thesis was to determine whether a single question from the USDA 6-Item Subset of the Food Security Survey would be valid and appropriate as a screening tool for delineating food insecurity in the survey population. ROC analysis was performed to test this aim, and the results are depicted in Table 5. Question 1 performed at the highest level of area under the curve (AUC) and sensitivity. AUC for question 1 was 0.958, where 1.00 represents a prefect

test. The sensitivity of question 1 was 0.981 and 1-specificity was 0.066. This question

corresponds to, "The food we bought just didn't last, and we didn't have money to get

more," with possible responses being "Often true," "Sometimes true," or "Never true."

Question 2 had a slightly lower AUC of 0.919 with a substantial decrease in the

sensitivity at 0.870. 1-specificity was 0.033 which indicates better specificity than

question 1 (0.066). AUC was lower for questions 3-6 than for questions 1 and 2; the

AUC for these three questions were all in the range of 0.636 – 0.661. Figure 1 shows the

ROC plot for identification of FI using question 1 of the 6-Item Subset.

Chi Square Analysis. Results of chi square analyses testing statistically significant

differences between food secure families and food insecure families and statistically

significant differences between families with and without CSHCN are presented in

Tables 6 and 7. The majority of the household demographic characteristics and program

use were significantly associated with food insecurity ($P \leq 0.05$). In contrast, family type

($P = 0.258$), age of child ($P = 0.178$) and gender ($P = 0.875$) of child were not

significantly related to FI. The association between food insecurity and having CSHCN

was significant in chi square at $P = 0.051$. Chi square was also used to test associations

between household demographic characteristics and program use and families with

CSHCN (See Table 7). There were three significant associations. The relationship

between food insecurity and having a child with SHCN was significant at $P = 0.051$. The

two additional significant associations with having a child with SHCN were

excellent/very good health status versus good/fair health status ($P = 0.009$) and Head

Start use ($P = 0.023$).

Figure 1

Receiver Operating Characteristic Plot for Identification of Food Insecurity using

Question 1 of the 6-Item Subset of the 12-Month Food Security Scale

1 - Specificity
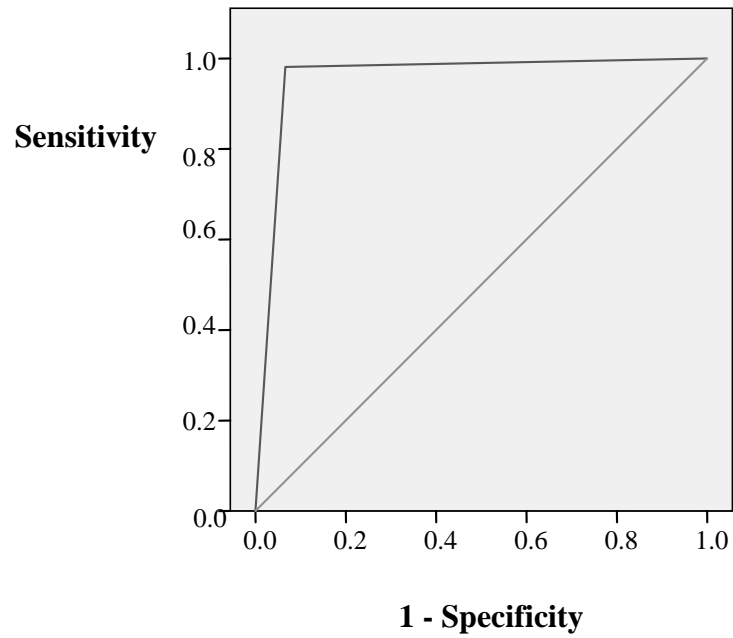
*Diagonal segment depicts line of indifference; points falling on this line discriminate

no better than chance alone

Table 6

Chi Square of Household Demographic Characteristics by Household Food Security

Status

Variable	Chi Square Value
Food Stamp Use[1]	10.998 [b]
School Lunch Program Use[1]	5.486 [a]
School Breakfast Program Use[1]	5.422 [a]
Summer Food Program Use[1]	16.059 [c]
Head Start Use[1]	6.359 [a]
WIC Use[1,2]	6.830 [b]
No-Cost Food Use[1]	10.479 [b]
Program Use[1]	15.659 [c]
Home Garden Use[1]	6.440 [a]
Child Garden Use[1]	5.837 [a]
Family Type[3]	2.713
Family Income[4]	31.651 [c]
Child Skips Breakfast	6.681 [a]
Having a CSHCN[5]	3.818
Age of Child	7.625
Health Status, 2 Categories[6]	4.390 [a]

Table 6 continued:

Variable	Chi Square Value
Race/Ethnicity[7]	25.969 [c]
Gender of Child	0.025
Parent's Education	24.576 [c]

[a] indicates P < 0.05, [b] indicates P < 0.01, [c] indicates P < 0.001

[1] Indicates a yes or no answer

[2] WIC = Special Supplemental Nutrition Program for Women, Infants and Children

[3] Family Type categories: Single Parent, Parent or Grandparent Couple, Other

[4] Family Income categories: $0-$14,999, $15,000-$24,999, $25,000-$34,000, and ≥ $35,000

[5] CSHCN = Children with Special Health Care Needs

[6] Health Status categories: excellent/very good and good/fair

[7] Race/Ethnicity categories: Non-Hispanic White, Hispanic, Other

Table 7

Chi Square of Selected Household Demographic Characteristics by Having a Child with

Special Health Care Needs

Variable	Chi Square Value
Household Food Insecurity[1]	3.818
Health Status, 2 Categories[6]	6.755 [b]
Head Start Use	5.187 [a]

[a] indicates P < 0.05, [b] indicates P < 0.01

Univariate Logistic Regression Analysis. Simple logistic regression results for survey variables and FI are found in Table 8. Results show that having a home garden and having children who garden in it are both associated with reduced odds of household FI. Use of any of the programs offered in the survey, including using at least one program versus using none increased the odds that the family would be food insecure. The only program that did not predict household food security status was use of the Summer Food Program use (P = 0.76). Families of Hispanic ethnicity were almost six times more likely to be food insecure compared to families of White race (P = 0.000).

Families in which the parent reported the child as having good or fair health were two times more likely to be food insecure (P = 0.038) compared to children reported to be in excellent or very good health. A family with a child with SHCN was 2.5 times more likely to be food insecure as well, although this result did not reach significance (P = 0.057). There was an inverse relationship between income and household FI; as income decreased, the odds for FI the family increased (all P < 0.05). Households with a parent who had completed some college or were a college graduate were 0.4 times less likely to be food insecure (P = 0.003) compared to those who completed high school or less. Family type and child's gender were not predictors of FI (P = 0.875), and BMI Z scores were also not significant predictors of FI when analyzed either as a continuous variable or as a trichotomous categorical variable (normal BMI, low BMI, and high BMI).

Table 8

Univariate Logistic Regression Associations between Household Food Insecurity and

Household Characteristics

Variable	Unadjusted OR	95% CI
Family has a Home Garden[1]	0.375[a]	0.172, 0.816
Child Gardens[1]	0.415[a]	0.201, 0.859
Food Stamp Use[1]	2.854[b]	1.515, 5.376
School Lunch Program Use[1]	2.070[a]	1.119, 3.829
School Breakfast Program Use[1]	2.073[a]	1.115, 3.853
Summer Food Program Use[1]	1.979	0.932, 4.202
Head Start or Early Head Start Use[1]	2.242[a]	1.187, 4.236
WIC Use[1,4]	2.310[a]	1.222, 4.366
No Cost Food Use[1]	2.820[b]	1.485, 5.356
Program Use: Used At Least One[1]	8.221[b]	2.463, 27.437
Child Skips Breakfast: Almost Never	Reference Group	
Few Days a Week	2.206	0.756, 5.432
Almost Daily	3.763[a]	1.149, 12.330
Race: White	Reference Group	
Hispanic	5.824[c]	2.761, 12.284
All Other	0.500	0.061, 4.097

Table 8 continued:

Variable	Unadjusted OR	95% CI
Health Status: Good/Fair[2]	2.094[a]	1.040, 4.215
Family Has CSHCN[1,5]	2.534	0.973, 6.599
Income Category: $0-$14,900	15.786[c]	5.044, 49.406
$15,000-$24,900	7.367[c]	2.218, 24.462
$25,000-$34,000	4.103[a]	1.115, 15.104
≥ $35,000	Reference Group	
Education: Some College or College Grad[3]	0.351[b]	0.174, 0.708
Family Type: Single Mom or Dad with Children	Reference Group	
Couple or Grandparents with Children	0.537	0.254, 1.133
Other- 3 Generation House, Foster, Other	0.615	0.169, 2.238
Gender of Child: Male	1.051	0.565, 1.957
BMI Z Score: Normal BMI[6]	Reference Group	
Low BMI	2.743	0.589, 12.789
High BMI	1.590	0.697, 3.627

[a] Indicates $P < 0.05$, [b] indicates $P < 0.01$, [c] indicates $P < 0.001$

[1] Indicates a yes or no answer, all are compared to the "no" response

[2] Compared to health status reported as excellent or very good

[3] Compared to finishing high school or less education

[4] WIC = The Special Supplemental Nutrition Program for Women, Infants and Children

[5] CSHCN = Children with Special Health Care Needs

[6] BMI = Body Mass Index (kg/m^2), Low BMI Z score: < -2.0, High BMI Z score: > 2.0, Normal: –2.0-2.0

Multivariate Regression Model. The final multivariate logistic regression model to determine predictors of household food insecurity in this study sample can be found in Table 9. Variables retained in this multivariate model include: having a CSHCN, race/ethnicity of respondent, household income, use of no-cost food, and use of food stamps. Families with a child with SHCN are three times more likely to be food insecure than those who do not have a CSHCN, after adjusting for the variables in the model (P = 0.046). Race/ethnicity was not a significant predictor of FI, but was identified as a confounder due to beta change more than 10% after taking out the variable and was retained in the model.

When compared with the highest income group, families with incomes of $0 - $14,999 were 10 times more likely to be food insecure (P = 0.003). Families whose incomes were $15,000 - $24,999 were 4.5 times more likely to be food insecure (P = 0.035), and incomes of $25,000 - $34,999 was not a predictor of household FI.

Families who utilized some form of no-cost food were almost four times more likely to be food insecure than non-users (P = 0.005). Food stamp use was not a significant predictor of FI in this model, but was a confounder and was left in to control for that effect. All other variables not included in the final model did not meet the retention criteria for inclusion during the model building process.

Table 9

Associations between Food Insecurity and Family Characteristics, Multivariate Logistic

Regression Model

Variable	N	Odds Ratio, Adjusted	95% CI
Family Has CSHCN	25	3.271[a]	1.020, 10.492
Race/Ethnicity: White	165	Reference Group	
Hispanic	39	2.844	0.913, 8.859
All Other	10	0.422	0.028, 6.453
Income: $0-$14,999	54	10.179[b]	2.235, 46.366
$15,000-$24,999	43	4.510[a]	1.112, 18.302
$25,000-$34,999	36	2.673	0.614, 11.625
$35,000 or Above	72	Reference Group	
No-Cost Food Use	38	3.711[b]	1.487, 9.262
Food Stamp Use	80	0.718	0.246, 2.100

[a] indicates $P < 0.05$, [b] indicates $P < 0.01$

Model N = 183 (This N had complete data for all variables tested in model)

Chapter IV

Discussion

Although this was a preliminary study of the Tillamook region, three main findings were achieved through the analysis which will be reported to the Northwest Regional Educational Service District (NWESD) for application in development of services in the area. The three key results were a description of the prevalence of household food insecurity and children with special health care needs, the identification of a single question screening tool to identify food insecurity, and the predictors of food insecurity in the Tillamook region.

Prevalence of Food Insecurity and Children with Special Health Care Needs. The prevalence of household FI in this population was 23%, twice the state average of household food insecurity and more than twice the national average. The current state average is 11.9%; the national average is 10.9%.[24] There are several possible explanations that may account for the increased incidence of FI in this sample, the first reflected in the results of the demographic survey questions. In general, the sample captured by this survey was financially limited. Sixty five percent of families had an income less than $35,000 with an average family size of 4.4 individuals, and almost three quarters of the families utilized at least one of the child or adult food programs included in the survey that provides support to families with limited resources. Due to the low income status of the families and other demographic information obtained from the

survey, FI is likely to be experienced at a much higher rate by the study sample compared to national and state averages.

Secondly, the nature of the community health screening evaluated may play a large role in the prevalence of FI in this sample. The health screening was a free event at which children were evaluated by health professionals or graduate students from a wide range of health disciplines at no cost to families. If a family were facing financial hardship, the free pre-kindergarten screening would appear to be a viable alternative to costly physician examinations. Therefore the free screening and survey would likely attract more families that were food insecure, and study estimates would be greater than rates reported in the general population.

Another factor that may influence the high prevalence of FI in this study is the rural location in which the health screening took place. A described predictor of food insecurity is living in rural, non metro areas.[13] Rural status could potentially explain above average rates of food insecurity. And finally, as previously mentioned, there is also data to suggest that households with children have higher rates of food insecurity than households without children. As this study focused solely on families with children, this may also contribute to a small percentage of the variance between study prevalence and state and national averages.

A potential bias that may have occurred in this survey has to do with program use and the reporting of food insecurity. Families who qualify for and use various food assistance programs may be more aware of the concept of FI, and thus more likely to

report experiencing FI. This may increase reported rates of FI among those using available programs.

Children with special health care needs accounted for 10.8% of the children in the study. This is below the national average of 13.9% and the Oregon average of 13.6% .[52] However, in this study, we applied a lenient modification of criteria used by MCHB to identify CSHCN. The MCHB criteria for health conditions of CSHCN are 1) the child currently experiences a consequence, 2) the consequence is due to a medical or other health condition, and 3) the duration is 12 months or longer.[60] In contrast in this study we defined CSHCN as children who met the first two criteria but not necessarily the third. The results of this study must therefore be interpreted cautiously; however they are expected to provide useful information to the NWESD and Tillamook County and may provide guidance for program development and for future studies related to food insecurity and CSHCN.

One likely explanation for the low percentage of CSHCN is the age of the children included in the study. The mean age of the sample was 4.5 years old, which may be too young for a wide range of special health care needs to have emerged. Had the mean age been a few years older, a pattern of greater prevalence of CSHCN may have emerged. A second possibility is that because CSHCN average about four times as many hospital stays[23] and three times as many medical encounters as other children,[21] parents may have felt less need to bring their child to the free health screening as all of their basic exams had already been completed. Thus, this group may have been under-represented at the free health screening

Families who were both food insecure and had a child with SHCN made up 3.4% of the children in this study. Household FI and having a child with SHCN were positively associated in chi square analysis; however, this relationship was just above accepted levels of significance (P = 0.051).

Single Question Screening. Question 1 performed the best out of the six questions in the USDA 6-Item Subset of the HFSS (See Appendix B for questionnaire and Table 4 on page 38 for response frequency to each question). The sensitivity of this first question was 98.1% and the specificity was 93.4%. In other words, this question is capable of identifying True Positives 98.1% of the time and shows extremely low rates of occurrence of False Positives (6.6%). This is a very precise and accurate identification using only a single question. The high sensitivity was not surprising considering the first question pertains to the least severe decrease in food quality or quantity and thus may acquire the largest affirmative responses for any degree of FI. The first question also had the largest area under the curve (AUC). AUC shows the balance between sensitivity and specificity measures for a given question, with a larger AUC depicting a better balance. Therefore question 1, despite not having the best specificity, had the best balance of the six questions.

Questions 4 and 6 demonstrated high specificity; they would produce False Positives very infrequently (Q4 and Q6 1-specificity < 0.001). However, these two questions have unacceptable sensitivity for use as a screening tool (Q4 sensitivity = 0.333, Q6 sensitivity = 0.278). Question 2 would correctly identify food insecure individuals (True Positives) 87% of the time while only misclassifying 3.3% of people as

food insecure. This shows question 2 to possess a better ability to screen out the False

Positives than question 1. However, the AUC for question 2 is lower than question 1,

showing question 1 to be the better overall choice. The intended use of this test would be

for screening and follow-up of families or individuals who are found to be food insecure,

and so a question with higher sensitivity and slightly lower specificity would be more

desirable to identify as many food insecure individuals possible. This would enable

health care professionals to reach and provide resources for the greatest number of food

insecure families. There appears to be only one potential drawback of using a screening

question with a high sensitivity and slightly lower specificity. This combination would

result in misclassifying a few individuals as food insecure when they are not. It is

possible that a person would be offended when handed the resource materials for coping

with FI, though this scenario seems unlikely to occur often.

There are no set cut-off points for measures of sensitivity, specificity and AUC

for acceptable or unacceptable levels. The decision to use a screening tool based on the

ROC analysis results depends on the type of screening tool needed and the judgment of

the researchers or the health care providers. As discussed previously, Kleinman and

colleagues reported that a written one-question screener for the presence of hunger that

showed an 83% sensitivity and an 80% specificity represented an "accurate and reliable"

screening tool.[49] The methods of analysis and study design of Kleinman's study were

different from those utilized in the present study, yet the results support the ability of a

one-question screener to accurately discriminate between food insecure and food secure

individuals. Kleinman et al's judgment to accept their results also provides support for the reliability and validity of the present results.

Utilization of a single question as a screening instrument would have limitations. First, there would be no way of distinguishing levels of severity of food insecurity. Second, there would be no method for discriminating whether children were also experiencing food insecurity in the household. Finally, there would be no way to determine if the circumstances were chronic or temporary. However, the primary purpose of this screening question is to eventually be used as a tool in a primary care setting, either in written or verbal form, not for prevalence estimates of FI or demographic reasons. The question could be asked by a dietitian, social worker, physician, or any other trained professional in the health care setting; alternately, the question could be included in a pretreatment paperwork packet. In the event of an affirmative answer, a conversation could be initiated in order to learn more about the patient's specific needs, or the patient could simply be provided information regarding resources that provide aid.

As previously noted, a survey by the Oregon Childhood Hunger Initiative reported that 22% of surveyed health providers did not know how to ask questions to patients about food insecurity, but that 89% were willing to use a standardized screening question to identify FI.[17] Providing a standardized question may take the uncertainty out of asking about this issue for health care providers, and construct a pathway for broader intervention with food insecure children. Testing the appropriateness of a single question

screening tool is the first step toward implementing that tool in health care settings, and the first step towards attempting to alleviate food insecurity with this method.

Predictors of Food Insecurity. A majority of the variables examined in this study were predictors of FI in univariate logistic regression. Having a home garden and children who help to work in the garden are two variables that were associated with decreased risk of food insecurity in this population. On the other hand, use of any federal or community assistance program aside from the Summer Food Program was a predictor of food insecurity before controlling for other factors; so much so that a family who used at least one program compared to families using none was 8 times more likely to report being food insecure.

Children skipping breakfast almost daily and children rated as being in good or fair health, as opposed to excellent or very good health, were both univariate predictors of FI. This seems intuitive, as perhaps inadequate food in the house for the child's breakfast contributed to adverse symptoms of FI observed in the child. This in turn would prompt the parent to rate their child's health status as only good or fair as opposed to excellent or very good. However, without asking any further questions, reasons or causes of the child skipping breakfast or reported as being in good or fair health cannot be ascertained.

There was no statistical difference in BMI between food insecure and food secure families. This finding is similar to that of Kaiser and colleagues (2002) in their study of 211 Mexican-American children aged 3-6 years which also found no statistically significant difference in the BMI Z-scores of FI versus FS children.[33] Because of the

young age of the children sampled in this study as well as Kaiser's, it is possible that weight problems, especially overweight, may have not yet emerged, and if the same group were to be retested at older ages in the future, the results would differ as discussed by Alaimo et al (2001). Those results showed no association between overweight and FI in the 2-7 age group, but did find that older girls in the 8-16 age group were more likely to be overweight than their FS peers.[42]

Multivariate Predictors of Food Insecurity. The largest predictor of FI in this population as indicated by an odds ratio of over 10 was a mean income of below $15,000. This is not surprising as previous data shows the prevalence of food insecurity increases as income decreases. The other significant predictors in this model, when controlling for other factors, were having a SHCN child in the family and usage of no-cost food. A family with a SHCN child was 3.2 times more likely to be food insecure. The probable reasons for CSHCN as a predictor of FI were discussed in the introduction, and include more out of pocket costs for medical care for the child[22,23] and fewer hours worked for the parents,[52,53] both of which contribute to financial strain. It makes sense that use of no-cost food is a multivariate predictor of FI as food banks, soup kitchens, etc. are designed to help those most in need of food. Use of food stamps was associated with a decreased risk for FI, although this result did not reach statistical significance. Had the sample size been larger, this result may have been significant and demonstrated that use of food stamps actually helps to prevent household food insecurity, which is an objective of food stamp utilization.

Limitations. As with any study, there are limitations to the current study. The main limitation is with regard to the study sample. The sample was not randomly chosen; it was a convenience sample taken from a free health screening. This would naturally draw a select population with inherent ascertainment bias, so the ability to generalize beyond this sample is limited.

A second limitation is the sample size. Participation in the survey was optional with no incentives offered for completion. The relatively small sample size and limited power may have prohibited the finding of significant results for some variables. Multivariate predictors of food insecurity may have been more numerous had the sample size been larger, and it may also have provided a greater ability to identify associations between FI and CSHCN.

It was not possible to classify or identify CSHCN in the standard manner defined by the MCHB. Therefore, comparisons cannot be made with other studies that use the standard definition of CSHCN. Limited conclusions can be made about the children with special needs in this study. Because the prevalence of CSHCN in this analysis was lower than the state and national averages, a potential limitation that may result due to possible misclassification of CSHCN is to assume that CSHCN status in this population does not require consideration. Additionally, the low prevalence made it difficult to observe a relationship between food security status and CSHCN. Evaluation of a lager sample representative of the regional population is necessary to fully identify CSHCN in Tillamook County.

Contributions. There are several potential significant contributions associated with this study. One of the primary objectives of the study was to assess the reliability and validity of a one question screening tool for identification of food insecure individuals for potential use in primary care settings. As noted, the assessment question chosen showed adequate sensitivity and specificity for identification of individuals at risk for household FI.

The characteristics of the participants were ideal for analyzing the predictors of FI despite a relatively small sample size, and were instrumental in testing the one-question screening tool. The survey was succinct, yet covered a broad variety of household and food behavior questions. The screening setting also allowed for collection of measured weights and heights for calculation of BMI data, which is more accurate than utilizing survey-reported heights and weights.

This study also has child and public health implications. Although use of a convenience sample from the Tillamook Preschool screening may have introduced bias and overestimation of FI in Tillamook County, results illustrate the need that regions served by the NWESD and perhaps other rural counties have for expanded income and food assistance programs. Results provide confirmation for various predictors of FI, including having a child with SHCN in the family. This study also serves as a pilot study for future work addressing FI and CSHCN in this location and others.

Future Directions. Future research testing the validity of the single question screening tool in other populations would be a beneficial next step toward implementation of the

screening question in primary care settings and then assessing its impact. Future studies

in this area could also focus on larger sample sizes with older children in order to obtain

more information about CSHCN and the association with FI. Focus groups may be

especially advantageous in gaining insights and discovering the specific needs of families

who are both food insecure and have a child with SHCN. Focus groups may also provide

valuable information about families with CSHCN who are food secure versus those who

are food insecure. The food secure families with CSHCN may have techniques and

practices that make them more resilient to FI that can be shared with others. If steps can

be made to implement a screening tool for food insecurity in primary care or toward

learning more about the needs of the population that is food insecure and has CSHCN,

perhaps more progress can be made toward the prevention or alleviation of food

insecurity.

In the meantime, steps can be made now to decrease FI at the community level.

The county can encourage community gardens and school gardens, to both provide fresh

produce and to educate children about gardening. Churches, libraries, schools and others

can sponsor free or low cost lunches and community gatherings to provide food for

families in need. Public health professionals can advocate for state-wide or national

policy changes, such as increasing minimum wage, increasing food stamp provision and

many more. With some creativity, many things can be done in addition to the programs

available to reduce food insecurity in this county and others.

Chapter V

Summary and Conclusions

In conclusion, there were two main objectives for this study. First, to test the hypothesis that a single question from the 6-Item Subset of the HFSS would have appropriate sensitivity and specificity to be an accurate screening tool in primary care; and second, to test the hypothesis that having a child with special health care needs in the family would predict household food insecurity.

Results of ROC analyses showed that the first question of the six displayed the largest area under the curve, showing the best balance between sensitivity and specificity. The first hypothesis was supported, in that a single question was identified as a candidate for a screening tool for identification of food insecure individuals.

The second hypothesis was also supported as having a CSHCN in the house was shown to be a multivariate predictor of household food insecurity. In addition to having a child with SHCN in the family, having a family income below $25,000 and using no-cost food were also shown to be multivariate predictors of household food insecurity.

The results of this study will be shared with Tillamook County and the NWRESD to help with identification of modifiable risk factors (predictors) of household FI. The results are also likely to be useful for planning strategies to address the needs of this population and work to reduce the prevalence of food insecurity and associated impacts on health and education.

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Multi Modular Preschool Screening: Survey of Household Food Needs

Please help us learn about food use and food needs of Tillamook preschool children and their families. The information you provide will be used by the NW Regional Education Service District to help improve programs and services for children and families in Tillamook.

Participation is voluntary and all responses are completely confidential.
We do not need your name.

Section 1: These questions ask about household food use and food needs in the past 12 months

1a.   Families get food in a variety of ways. During the past 12 months, has <u>anyone</u> in your household grown vegetables or fruits in a home garden?

1   Yes   2   No

1b   Has/have your preschool child/children helped with growing vegetables or fruits in a home garden during the past 12 months?

1   Yes   2   No

2.   There are several different programs that families use to get food. During the past
       12 months, did <u>anyone</u> in your household use:

	Circle Yes or No	
a. Food stamps?	Yes	No
b. School lunch program?	Yes	No
c. School breakfast program?	Yes	No
d. Summer Food Program?	Yes	No
e. Head Start or Early Head Start?	Yes	No
f. Food or food vouchers through the WIC program?	Yes	No
g. Food from a food pantry, church, or other place that gives food at no cost to families in need?	Yes	No

These next questions are about the food eaten in your household in the last 12 months and whether you were able to afford the food you need.

3. Were the following statements OFTEN, SOMETIMES, or NEVER true for you or the other members of your household in the last 12 months:

   (a) The food that we bought just didn't last, and we didn't have money to get
        more. (Please mark one answer.)

   ^{1}☐ Often true ^{2}☐ Sometimes true ^{3}☐ Never true

   (b) We couldn't afford to eat balanced meals.

   ^{1}☐ Often true ^{2}☐ Sometimes true ^{3}☐ Never true

4. In the past 12 months, did you or other adults in your household ever cut the size of your meals or skip meals because there wasn't enough money for food? (Please mark one answer.)

    1☐ Yes   2☐ No   3☐ I don't know

    4b. **If #4 is Yes**, how often did this happen
    1☐ Almost every month
    2☐ Some months but not every month
    3☐ Only one or two months
    4☐ I don't know

5. In the last 12 months, did you ever eat less than you felt you should because there wasn't enough money to buy food?

              1☐ Yes   2☐ No   3☐ I don't know

6. In the last 12 months, were you ever hungry but didn't eat because you couldn't afford enough food?

              1☐ Yes   2☐ No   3☐ I don't know

Section 2: this section asks about the people in your household.

7. Which best describes the people in your household? (Please mark one answer.)

   1   Single mother living with child(ren)

   2   Single father living with child(ren)

   3   Couple living with child(ren)

   4   Grandparent(s) living with child(ren)

   5   3-generation household--grandparent(s), parent(s),
         and child(ren)

   6   Foster parent(s) living with child(ren)

   7   Other:

8. How many persons live in your household, counting all adults and children
   <u>including</u> yourself?   ____   persons

9. What ethnic or racial group(s) do you consider yourself?
   (Please mark all that apply.)

   1   African American or Black

   2   American Indian or Alaskan Native

   3   Asian, Native Hawaiian or other Pacific Islander

   4   Latino, Hispanic

   5   White

   6   Some other group

10. How much income do you expect your household to get this year from all sources, including wages, social security, public assistance, and all other cash income? (Please mark one answer.)

1 $0 - $5,000

2 $5,000 - $9,999

3 $10,000 - $14,999

4 $15,000 - $24,999

5 $ 25,000 - $34,999

6 $35,000 and over

11. What is the highest grade or year of school you've completed? (Please mark one answer.)

1 I never went to school

2 8th grade or less

3 Some high school, but I did not graduate

4 High school (or I got a GED)

5 Some college or junior college, but I did not graduate from a four-year college

6 College graduate (from a four-year college or university) or more

12. How many children do you have participating in the Multi Modular screening this year? *(Please mark one number.)*

1. 1   2. 2   3. 3   4. 4

Please complete questions on the next 2 pages (questions13-18) once for each child participating in the Multi Modular Screening.

- If you have more than one child participating, please answer the following questions one time for each child.

If you need additional forms, please ask for them at the screening.

What is the age of the child you are answering these questions for?
_____ years   and _____ months

Section 3: These questions ask about your preschool child's (or children's) diet and health

13. In a typical 5-day week (Monday-Friday), <u>about</u> how often does <u>this preschool child</u> skip breakfast? (Please mark one answer.)

   1   Almost every day

   2   A few days

   3   Almost never

14. **If #13 is "almost every day",** which of the following is true:
     (Please mark one answer.)

   1   My child usually does not want to eat early in the morning

   2   I don't usually have time to offer breakfast

   3   All of the above

   4   None of the above

15. In general, would you say this child's health status is:

   1   Excellent

   2   Very good

   3   Good

   4   Fair

   5   Poor

16. Does this child need or use more medical care, mental health, or education services than is usual for most children of the same age? (Please mark one answer.)

   1   Yes

   2   No → skip to end of last page. Thank you.

   3   Don't Know→ skip to the last page

17. **If #16 is Yes**,
   Is this child's need for medical care, mental health or educational services because of ANY medical, behavioral, or other health condition? (Please mark one answer.)

   1   Yes

   2   No

   3   Don't Know

18. **If #17 is Yes:**

Is this a condition that has lasted or is expected to last 12 months or longer? (Please mark one answer.)

1. Yes

2. No

3. Don't Know

Thank you very much for taking the time to answer these questions. Please give these pages to assistants at the last station of the multi modal screening.

Your responses will be used to help programs and services for the health and nutrition of children and families in Tillamook.

Please be sure to stop at the nutrition station if you have questions about child nutrition, or if you would like to pick up some handouts about food and nutrition.

Appendix B

USDA 6-Item Subset (Short Form) of the 12-month Food Security Scale – Questionnaire

These next questions are about the food eaten in your household in the **last 12 months** and whether you were able to afford the food you need. Please **circle** the answer that best describes your household.

Q1 The food that I bought just didn't last, and I didn't have money to get more. Was that often, sometimes, or never true for your household in the last 12months?

[1] Often true

[2] Sometimes true

[3] Never true

[4] Don't Know

Q2 I couldn't afford to eat balanced meals. Was that often, sometimes, or never true for your household in the last 12 months?

[1] Often true

[2] Sometimes true

[3] Never true

[4] Don't know

Q3 In the last 12 months, since (date 12 months ago), did you or other adults in your household ever cut the size of your meals or skip meals because there wasn't enough money for food?

[1] Yes

[2] No (GO TO 5)

[3] Don't know (GO TO 5)

Q3a If you answered yes to the last question, how often did this happen --almost every month, some months but not every month, or in only 1 or 2 months?

[1] Almost every month

[2] Some months but not every month

[3] Only 1 or 2 months

[4] Don't know

Q4 In the last 12 months, did you ever eat less than you felt you should because there wasn't enough money to buy food?

[1] Yes

[2] No

[3] Don't know

Q5 In the last 12 months, were you ever hungry but didn't eat because you couldn't afford enough food?

[1] Yes

[2] No

[3] Don't know

<center>**Appendix C**</center>

Children with Special Health Care Needs (CSHCN) Screener©

1. Does your child currently need or use **medicine prescribed by a doctor** (other than vitamins)?

Yes →Go to Question 1a

No →Go to Question 2

1a. Is this because of ANY medical, behavioral or other health condition?

Yes →Go to Question 1b

No → Go to Question 2

1b. Is this a condition that has lasted or is expected to last for *at least* 12 months?

Yes

No

2. Does your child need or use more **medical care, mental health or educational services** than is usual for most children of the same age?

Yes →Go to Question 2a

No →Go to Question 3

2a. Is this because of ANY medical, behavioral or other health condition?

Yes →Go to Question 2b

No →Go to Question 3

2b. Is this a condition that has lasted or is expected to last for *at least* 12 months?

Yes

No

3. Is your child **limited or prevented** in any way in his or her ability to do the things most children of the same age can do?

Yes →Go to Question 3a

No →Go to Question 4

3a. Is this because of ANY medical, behavioral or other health condition?

Yes →Go to Question 3b

No →Go to Question 4

3b. Is this a condition that has lasted or is expected to last for *at least* 12 months?

Yes

No

4. Does your child need or get **special therapy**, such as physical, occupational or speech therapy?

Yes →Go to Question 4a

No →Go to Question 5

4a. Is this because of ANY medical, behavioral or other health condition?

Yes →Go to Question 4b

No → Go to Question 5

4b. Is this a condition that has lasted or is expected to last for *at least* 12 months?

Yes

No

5. Does your child have any kind of emotional, developmental or behavioral problem for which he or she needs or gets **treatment or counseling**?

Yes →Go to Question 5a

No

5a. Has this problem lasted or is it expected to last for *at least* 12 months?

Yes

No