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Food Security Status of Households With Special Health Care Needs

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Food Security Status of Households of Children with Special Health Care Needs

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CERTIFICATE OF APPROVAL

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LIST OF ABBREVIATIONS

Abbreviation	Definition
BMI	Body Mass Index
CAHMI	Child and Adolescent Health Measurement Initiative
CACFP	Child and Adult Care Food Program
ERS	Economic Research Service
ESD	Educational Services District
HbA1C	Hemoglobin A1C
MMPS	Multi-Modular Preschool Screening
NHANES	National Health and Nutrition Examination Survey
NSLP	National School Lunch Program
SHCN	Special Health Care Needs
SNAP	Supplemental Nutrition Assistance Program
SPSS	Statistical Package for the Social Sciences
USDA	United States Department of Agriculture
US	United States
WIC	Special Supplemental Nutrition Program for Women, Infants, and Children

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ABSTRACT

Background

Food insecurity is defined as "the limited or uncertain availability of nutritionally adequate and safe foods or the limited ability to acquire acceptable foods in socially acceptable ways" (1). In the United States (US), 14.5% of households are classified as food insecure (2). Consequences of food insecurity include increased risk for compromised health and developmental growth of children (3-6).

Children with special health care needs (SHCN) are defined as those "who have or are at increased risk for 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". One in five US households includes at least one child with SHCN (7). Families of children with SHCN often have financial costs associated with increased health care (7, 8). As a result, these families are likely at increased risk for food insecurity.

Objectives

This study was designed to determine the relationship between household food security status and SHCN status among children who attended the Multi-Modular Preschool Screening (MMPS) in Tillamook County, Oregon in 2012. The specific aims of this study were to:

1. Determine the proportion of children with SHCN among participants of the MMPS held in Tillamook County, Oregon in April 2012.
2. Determine the proportion of children living in food insecure households among participants of the MMPS held in Tillamook County, Oregon in April 2012.

3. Determine whether children with SHCN are more likely to live in food insecure households in this population.

Methods

Surveys were collected from parents/guardians of children who attended the MMPS. The survey included the USDA's 6-item short form questionnaire to assess household food security status. Three questions from the Children with Special Health Care Needs Screener were included to classify children's SHCN status. Demographic data on households and methods used to obtain food were collected. After inclusion criteria were met, 114 surveys were analyzed. Variables were summarized using frequencies and percentages with 95% confidence intervals. Chi square or Fisher's exact tests were used to determine differences in proportions of food security status and in proportions of children's SHCN status ($p < 0.05$).

Results

The proportion of children with SHCN was 10.5%. The proportion of children living in food insecure households was 16.7%. Differences in the proportion of children with SHCN living in food secure versus food insecure households could not be reported due to sample size. Differences were found in family structure, race/ethnicity, use of school meal programs, and gardening and/or hunting in relation to food security status. Differences were found in use of WIC and receiving food from friends, family, and food programs at no cost in relation to children's SHCN status.

Conclusion

Although these results are limited in their generalizability to other populations, the demographic profile and methods used to obtain food are useful to address food

insecurity concerns in this sample. These results can be used to identify and evaluate changes in the health and development of children attending the MMPS screening each year.

Chapter 1: Significance and Specific Aims

Significance

While research on food insecurity has focused on households with individuals with specific disabilities or diseases, there has been limited research assessing the relationship between having a child with special health care needs (SHCN) and household food security status. To help address this gap, this study was designed to determine the relationship between household food security status and children's SHCN status. Results of this study will also be shared with Northwest Regional Educational Services District (ESD) and Tillamook County to identify and evaluate changes in the health and development of children attending the Multi-Modular Preschool Screening (MMPS) from year to year.

Specific Aims

1. Determine the proportion of children with SHCN among participants of the MMPS held in Tillamook County, Oregon in April 2012.
2. Determine the proportion of children living in food insecure households among participants of the MMPS held in Tillamook County, Oregon in April 2012.
3. Determine whether children with SHCN are more likely to live in food insecure households in this population.

We hypothesized that among children participating in Tillamook County's MMPS, the proportion of food insecure households would be higher among children with SHCN compared to children without SHCN.

Chapter 2: Background

Food Insecurity

History of Surveillance

The United States Department of Agriculture (USDA) became interested in measuring food insecurity in 1992. Until then, individual research committees reported and provided literature on prevalence of food insecurity in the US. This posed problems in creating a single instrument to survey populations at the national, state, and local level with equivalent definitions (9).

In 1994, the USDA Food and Nutrition Service and the US Department of Health and Human Services, National Center for Health Statistics sponsored a National Conference on Food Security Measurement and Research to identify the strongest methods to measure food insecurity and hunger nationwide. The findings of this conference led to agreement of the best method to implement food security monitoring. In 1995, the US Census Bureau adopted an 18-item survey to assess household food security for inclusion in the Current Population Survey (See Appendix A). The food security survey was first administered in 1996 and has been administered annually since then. Minor changes have been made to the survey over time but the basic survey content to measure food security in the US has remained the same. One limitation of the methods used by the Current Population Survey is that it does not include homeless persons who are not housed in shelters; this population is therefore underrepresented in national estimates. In 1998, the Economic Research Service (ERS) assumed responsibility for the Current Population Survey to measure food security under supervision of the US Census Bureau (9).

The USDA defines food insecurity as "the limited or uncertain availability of nutritionally adequate and safe foods or the limited ability to acquire acceptable foods in socially acceptable ways." This definition differentiates between limited access to food and the uncertainty of being able to acquire foods, as well as socially acceptable ways to obtain food. Socially acceptable ways to acquire food include purchasing food at grocery stores and restaurants, and using government food assistance programs rather than obtaining food from the garbage or walking long distances to obtain food due to lack of transportation or nearby stores. This definition does not separately distinguish malnutrition, as malnutrition is considered a potential consequence of being food insecure (1).

An expert panel, coordinated by the Committee of National Statistics, conducted an extensive review of food security measurement methods between 2003 and 2006. The panel suggested the USDA distinguish between food insecurity and hunger, as hunger is indicative of a physiological condition that might not be measured by socioeconomic survey questions. To measure hunger would require that the survey include questions assessing pain associated with hunger of individual household members. Therefore, the USDA presented new terminology to replace food security, food insecurity without hunger, and food insecurity with hunger to omit reference to hunger. In 2006, the USDA surveillance categories were changed to food security, low food security, and very low food security, respectively (9). Low food security is defined by "reduced quality, variety, or desirability of diet" with "little or no indication of reduced food intake". Very low food security is defined by "multiple indications of disrupted eating patterns and reduced food intake" (10).

Prevalence of Food Insecurity

The USDA reported the prevalence of food insecurity among US households in 2012, using the Current Population Survey, as 17.6 million or 14.5% of households, the prevalence of very low food security as 7.0 million or 5.7% of households, and the prevalence of food insecurity among children as 3.9 million or 10% of children (2). The 2010 Feeding America report compared prevalence of food insecurity in US households with children at a state level using the Current Population Survey adjusted for state population. The overall prevalence of food insecurity in households including children in the US was estimated to be 21% (11). Figure 3 shows the data described in the 2010 Feeding America report on prevalence of severity of food insecurity in households with children (12).

The US goal for food insecurity is included in the national plan of Healthy People 2020. This goal is National Weight Status 12, which aims to eliminate very low food security among children. The baseline prevalence of very low food security in US children is 1.3% from 2008 data. The goal is to decrease this rate by 0.2% by the year 2020, which will be assessed using the Food Security Supplement to the Current Population Survey by the United States Department of Commerce, Bureau of the Census (13).

Oregon Food Security Status

Between 2002 and 2004, 11.9% of Oregon households qualified as food insecure and 3.8% reported very low food security. Between 2005-2007, 12.4% of households were food insecure and 5.5% were considered to be of very low food security in Oregon. From 2008-2010, 13.7% of households were food insecure and 6.1% had very low food

security in Oregon (14). Between 2006 and 2008, Oregon ranked 11th among states in the US with 20.8% of households containing children classified as food insecure (12). Food insecurity in Oregon remains high but is now consistent with the rest of the US population, potentially due to deteriorating economies in other states (15).

Risk Factors for Food Insecurity

Identifying risk factors for food insecurity will aid in developing programs and interventions that can reduce food insecurity and the consequences that follow. Risk factors for food insecurity include circumstances that limit household resources, such as income, time, education level, and health of the individual. Risk factors also account for circumstances that limit the proportion of those resources available for food acquisition. Examples include costs such as health care, taxes, childcare, and the likelihood that an emergency will occur (1). Households at increased risk for food insecurity include households with low income, headed by a single parent, minority race and ethnicity (African Americans and Hispanics), lower education level, lack of home ownership, lack of savings, poor health, disability, social isolation, reductions in welfare benefits, and decreases in household income. States with higher unemployment, taxes, housing costs, and energy costs pose increased risk for household food insecurity. Research has also shown a relationship between neighborhood characteristics and food insecurity. This includes low-income neighborhoods. Also, urban areas may have less availability to grocery stores and supermarkets, which would make access to food more difficult contributing to higher level of household food insecurity (16).

Bartfeld et al., (2010) assessed the relationship between community and household food security status among 8,396 households with children in Wisconsin. The

data were collected from parents of children enrolled in 65 schools in 26 counties between fall 2003 and fall 2005. The Wisconsin Schools Food Security Survey assessed food security status, including the 6-item food security scale developed and validated by the USDA (16).

Food insecurity was positively associated with higher housing costs when compared to median rent for the area, lack of access to public transportation or reduced proximity to food markets, and urbanicity. There was no significant difference in local poverty level or even use of free/reduced cost meals between food insecure compared to food secure groups. Prevalence of food insecurity was significantly lower among household with adults with a college degree. There was a higher prevalence of food insecurity in rented households rather than owned homes and in households that did not have a working vehicle. With each $100 increase in housing cost, there was a 21% increase in risk for food insecurity. Food insecurity decreased as income rose and increased with more children in the household and when the mother was the head of the household (16).

Melchior et al., (2009) determined whether addressing mothers' mental health problems reduced food insecurity. Data were collected from a nationally representative cohort of 1,116 British families enrolled in the Environmental Risk Longitudinal Study, which followed families with twins born between 1994 and 1995. The study measured food insecurity, family socioeconomic status, maternal mental health and exposure to domestic violence, and children's behavioral outcomes. The authors found that the mother's experience with depression, alcoholism or drug abuse, psychosis spectrum disorder, or domestic violence was associated with household food insecurity. Results

showed 9.7% of households were food insecure. Food insecurity among families of low socioeconomic status was associated with maternal depression, psychosis spectrum disorder, and domestic violence. Food insecurity was determined to be a predictor for increased prevalence of childhood behavioral problems: 27% of these children compared to 10% of food secure children exhibited behavioral problems. Childhood behavioral problems in food insecure households remained consistent after adjusting for maternal mental health problems. Prevalence of food insecurity was higher among families of low socioeconomic status and women who experienced domestic violence in addition to mental health problems. One reason for psychosis relating to food insecurity includes paranoid delusions about food being poisoned so that these foods are avoided. Intense fear could preoccupy mothers with a history of domestic violence causing the mother to put less attention on her child's nutritional needs (3).

Consequences of Food Insecurity on Weight Status

The importance of reducing the incidence of food insecurity is also emphasized because of the possible consequences of food insecurity. There are mixed research findings on whether food insecurity is associated with increased body weight or Body Mass Index (BMI). One hypothesis behind this possible association is that individuals who are food insecure overcompensate by ingesting larger amounts of food when food is abundant (17). People who are food insecure may also be likely to increase consumption of energy dense foods causing higher overall energy (calorie) intake (17, 18).

Most studies use BMI as a measure of obesity because it is easy to calculate and reliable in preventative screenings. There are drawbacks in using BMI as an indicator of obesity and even underweight status. BMI does not measure body fat mass, lean body

mass, or bone mass (17). There is evidence showing that women who are food insecure are significantly more overweight than women who are food secure but there is no definitive evidence about the relationship of food insecurity to weight status among children (4). However one study did find a greater weight and BMI gain in girls when measuring the effect of food insecurity over a 3-year period from kindergarten to third grade (5).

Gunderson et al., (2009) conducted a comprehensive study of household food insecurity and its relation to weight status in children. This study assessed data collected from the National Health and Nutrition Examination Survey (NHANES) conducted between 2001 and 2004 including BMI, waist circumference, triceps skin-fold thickness, trunk fat mass, and body fat and compared it to mean values of food security status using the 18-question Core Food Security Module used by NHANES. NHANES examines about 5,000 people per year, who are selected to provide national representation of the US. After controlling for race, ethnicity, gender, annual household income, and child's age, there was no significant difference in prevalence of obesity observed between food insecure and food secure households (17).

Consequences of Food Insecurity on Mental and Social Development

Food insecurity in children can affect growth rates and mental development and may be associated with conditions including obesity, chronic iron deficiency and vitamin deficiencies, decreased academic performance, and internalizing and externalizing problems (4, 5, 6). Joyti et al., (2005) summarized three studies and reported that among 6-12 year olds, food insecurity was positively associated with poorer math scores, grade repetition, absenteeism, tardiness, visits to a psychologist, anxiety, aggression,

psychosocial dysfunction, and difficulty getting along with others (5, 19-21). Another study of 15-16 year olds reported that food insecurity was associated with depressive disorders and suicide attempts (22).

Jyoti et al., (2005) assessed changes in food insecurity status overtime as it related to reading and math scores and social skills. Children participating in the Early Child Longitudinal Study Kindergarten cohort (n=21,260) were assessed first in kindergarten and again in third grade. Food insecurity data were measured by the USDA 18-item scale, which was reported by the child's guardian. Social skills were assessed by teachers, which included approaches to learning, self-control, and interpersonal skills. Interpersonal skills encompassed forming and maintaining friendships, getting along with others despite differences, comforting or helping others, showing sensitivity, and externalizing or "acting out" or internalizing, which included anxiety, loneliness, low self esteem, or sadness. Food insecurity was significantly associated with impaired academic performance in boys and girls, and social decline (worse in boys but better in girls) (5). The association between food insecurity and interpersonal skills was explained by the fact that eating is a psychological routine. Routines are comforting and give a sense of security to children and without the routine of eating scheduled meals or worrying about the next meal, that psychological comfort is stripped away, which could be associated with social decline (6).

Children with Special Health Care Needs

As noted above, children with Special Health Care Needs (SHCN) are defined as those "who have or are at increased risk for 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" (7). Using this definition, one in five households in the US has at least one child with SHCN. In 2003, an estimated 13.5 million or 18.5% of children in the US have SHCN (7). SHCN include chronic illnesses, disabilities, or emotional or behavioral health problems. Examples of SHCN include severe asthma, autism, attention deficit and hyperactivity disorder, cerebral palsy, cystic fibrosis, diabetes, Down syndrome, mental retardation, sensory impairments, sickle cell anemia, and spina bifida (7).

Families with children with SHCN often have additional financial costs, such as increased therapy costs, more doctor visits, specialized daycare, prescription medications, mental health services, and adapting a home environment to accommodate for disabilities (7, 8). Having a child with SHCN can lead to parental unemployment due to one parent needing to stay home to care take of the child. In the year 2000, it was determined that families with a child with SHCN have average out-of-pocket health care expenditures twice as high as families without a child with SHCN (8, 23). For example, families with a child with autism face additional high out-of-pocket costs to obtain appropriate services to optimize development when compared to families without a child with autism (24).

Families with a child with SHCN are at greater risk of living in poverty. In addition, families living in poverty are at greater risk of having a child with SHCN due to environmental exposure. In 2000, 28% of children with SHCN in the US lived below the federal poverty guidelines compared to 16% of children without special health care needs as the federal poverty guideline does not account for actual consumption that could include elevated health care attention. As income rises above the federal poverty level,

hardship declines in families without a child with SHCN but this is not true for families with a child with SHCN (8).

Financial expenses of families with a child with SHCN are accentuated because many procedures or treatments are not covered by health insurance or the children have no health care coverage at all because families are unable to obtain insurance. Among children with SHCN in the US, 29% lacked needed dental care and 14% lacked needed mental health services. Moreover, 15% of the uninsured children with SHCN did not receive necessary preventive care and 14% did not receive needed specialty care (7). Thirty-eight percent of children with SHCN receive medical coverage through Medicaid and the State Children's Health Insurance Program (7). Children with SHCN essentially require coverage for primary care, diagnostic testing, specialty care, hospital services, preventative and treatment therapies, durable medical equipment, hearing aids, and any other health related services (7).

Marjerrison et al., (2011) evaluated the prevalence of food insecurity in insulin dependent diabetic children and its association with measuring blood glucose less frequently and glucose control. Diabetes management involves extensive diet and carbohydrate control and, sometimes, administration of exogenous insulin, especially in children with Type 1 diabetes. Data was obtained in Sydney and Halifax, Nova Scotia from general pediatric practices in a cross sectional telephone survey. Hemoglobin A1C (HbA1C), which is a measure of glycated hemoglobin, was used to assess level of blood glucose control. This reflects average blood glucose levels for the prior three months. Food insecurity was assessed by the Household Food Security Survey Module Canadian Community Health Survey Cycle 2.2, which was adapted from the USDA Current

Population Survey 18 questions, including 8 child-specific questions. BMI and HbA1C concentration were assessed at the closest clinical visit to when the telephone survey was conducted (25).

The prevalence of food insecurity among children with diabetes was 21.9%, compared to 14.6% of the general population of Nova Scotia. Mean HbA1C was 9.59% among children living in food insecure households, which was significantly higher than 8.96% among children living in food secure households. Significant difference was shown with 30% of food insecure families having hospital-related admission for diabetes compared to 10.5% of food secure families. Income was significantly lower among food insecure families and children in food insecure households were significantly less likely to use insulin pumps versus insulin injections. No significant difference was shown in mean BMI between the groups. The only significant predictors of HbA1C values above 9.0% were child's age and parental education. Food insecurity, income, and other family members with medical conditions were not significant predictors. Food insecurity alone was indicative of higher hospitalization in food insecure children. Strategies used by families of children with diabetes to manage financial burden included: buying cheaper food so money could be used to buy medical supplies and having another family member eat less so the child with diabetes could have enough food. A smaller proportion of households reported reusing needles and testing blood glucose less often, which could increase risk of local infection and chances of becoming hypoglycemic or hyperglycemic. No families reported using less insulin or keeping blood glucose high as to avoid low blood glucose. This study contributes to understanding the relationship of food insecurity to management of Type 1 Diabetes. This is important to consider for improving diabetes

management because unmanaged diabetes can result in ketoacidosis, requiring hospitalization, and hypoglycemia. Poor diabetic control can also have long term effects causing diabetic neuropathy, retinopathy, and nephropathy, and increase risk of developing cardiovascular disease (25).

Association of Food Insecurity and Children with SHCN

The correlation between food insecurity and children with SHCN is not well understood (24). The studies described above suggest families with children with SHCN have additional financial costs and thus are a high-risk group for experiencing food insecurity. In addition, children with certain types of SHCN, like autism, may have additional barriers to consumption of nutritionally adequate foods and additional financial costs based on the child's limited diet. Children with autism often have sensory aversions to foods and co-morbid gastrointestinal symptoms that affect the type and amount of food they consume (24).

Parish et al., (2008) evaluated data from 42,000 households participating in the 2002 National Survey of America's Families by the Urban Institute and Child Trends. Measures included food insecurity, housing instability, health care access, and loss of telephone service. Participants included families with children and adults less than 65 years of age. Analyzed data included characteristics related to health and economic status and material hardship. Disability status was determined by a single question of "Does the child have a physical, learning, or mental health condition that limits his or her participation in the usual kinds of activities done by most children his/her age?" A positive response classified the child as having a disability (8).

Of the households surveyed, 10.6% included a child with SHCN. Families including a child with SHCN had significantly greater destitution than those not including a child with SHCN. Seventy-eight percent of families with a child with SHCN had a greater worry that food would not last and food bought did not last when compared to households without a child with SHCN. Eighty-nine percent of families with a child with SHCN reported greater chance they skipped meals because of lack of money and families below 200% of the poverty level with a child with SHCN were twice as likely to have received emergency food (8).

Combating Food Insecurity

The five largest programs in the USDA's domestic and nutrition assistance programs in the 2012 fiscal year include the Supplemental Nutrition Assistance Program (SNAP), the National School Lunch Program (NSLP), the Special Supplemental Nutrition Program for Women, Infants, and Children (WIC), the Child School Breakfast Program, and the Child and Adult Care Food Program (CACFP) (26). SNAP provides monthly benefits to purchase eligible food items. To be eligible for benefits, available household income, assets and basic expenses are evaluated (9). Schools participating in the NSLP receive cash or commodities to serve nutrient-rich meals at low cost to children of families within 130%-185% of the federal poverty level and free meals to families below 130% of the federal poverty level (27). The School Breakfast Program works in the same manner as the NSLP (9). WIC provides packages of supplemental foods, food vouchers, nutrition education, and health care referrals to eligible low-income women and their families if there is a child less than five years old in the household (9, 27). The CACFP provides subsidized meals for eligible daycare programs. The Healthy Hunger-

Free Kids Act passed in 2010 approved continuation of these programs and made several changes intended to increase program access and quality of meals and snacks provided through these programs (27).

Other programs include the Summer Food Service Program and the Fruit and Vegetable Program. The Fruit and Vegetable Program started in 2002 as a pilot project to volunteer schools of all grades and demographics through the 2002 Farm Act. It is now administered in all 50 states as the 2008 Farm Bill Act passed. The Fruit and Vegetable Program is free to all students regardless of income. After school snack and dinner programs can also be provided as part of the NSLP, CACFP, or through a 3rd party community-based after school program to address gaps during the school year (27).

Larson et al., (2011) summarized the affect that food insecurity and food assistance programs may have on weight status. Articles published from 2000-2010 were reviewed (28). Analysis showed that parents of food insecure households are less likely to adhere to recommended practices for infant feeding, leading to early introduction of solid food that may lead to early childhood obesity (29). Five cross-sectional studies evaluated the role of SNAP and weight status in children and reported no evidence that SNAP recipients are at increased risk for obesity (30-34). Conversely, 3 longitudinal studies reported long-term participation in SNAP was related to higher BMI in girls less than 12 years of age, daughters of obese mothers, and preschool children in cities with high food prices (35-37). Studies accounted for participation in other food and public assistance programs, family structure, maternal education, mother's BMI, household income-to-poverty ratio, and food insecurity. Participation in WIC has shown mixed results in relation to weight status. Some studies report no association, some report a

positive relationship, and some report participation in WIC may reduce risk of obesity but is also not related to increased risk for children being underweight (31, 35, 38-42). Of the four studies found on participation in the NSLP and weight status, two reported no association between the use of NSLP and weight status and one cross sectional and one longitudinal study found that this program helps children maintain healthy body weight. One study assessed NSLP participation, household food insecurity, and weight status of 772 low income 5-12 year olds and found girls in food insecure households who participated in the NSLP were 71% less likely to be obese compared to food insecure households who did not participate in the NSLP (30, 32, 33, 35).

Statistics of Utilization of Food Assistance Programs

Expenditure for the five most widely used food assistance programs previously listed reached $17 billion in 2010 (26, 27). These programs accounted for 97% of the USDA's expenditure for food and nutrition assistance programs in 2012. Also in 2012, the USDA's federal expenditure for all domestic food and nutrition assistance programs was $106.7 billion. Expenditures in 2012 are 3% higher than 2011, which is the 12th consecutive year during which expenditure for food and nutrition assistance programs were higher than its previous year. SNAP accounted for 73% of the $106.7 billion expenditure. Participation in SNAP increased by 4% from 2011 to 2012, which has been the smallest percentage increase since 2007. The US Census Bureau reported the poverty rate grew to 15.1% in 2010, which is the highest it has been since 1993. The higher annual rate of expenditure in food and nutrition assistance programs is consistent with the growing poverty rate. Although, WIC experienced a decrease in participation for its second consecutive year when comparing 2011 to 2012, mostly due to a continued

decrease in births in the US. There was a decrease in participation of the NSLP of less than 1% from 2011 to 2012, which is the first decrease since 1990 (26). The USDA also reported that 59% of food insecure households participated in one or more of the three largest Federal food and nutrition assistance programs of SNAP, WIC, and NSLP (2). Participation in CACFP increased by 1% and participation in the school breakfast program increased by 5% from 2011 to 2012 (26). The Summer Food Service Program served 2.3 million children meals at 39,063 sites daily. In 2001, fifty-eight percent were of elementary school age, 17% were of preschool age, and 25% were older children (27).

Study Population and Instruments

Demographics of Tillamook County, Oregon

Demographic information was obtained to describe the prevalence of risk factors for food insecurity in the Tillamook population, and characteristics of the community where children and families attending the preschool screening live. The total population of Tillamook County, Oregon in 2009 was 26,060 with 21.9% (1,117) of children living in poverty as defined by the federal poverty guidelines (43). The population estimate of Tillamook County in 2012 was 25,305 with 24% of children living in households with incomes below the poverty level in 2010 (44). The median household income in 2010 was $40,797 and unemployment improved in 2012 to 7.8%. From 2007 to 2011, 88.1% of the population was classified as high school graduates and 19.3% was classified as college graduates. Twenty-six percent of the Tillamook population was living within one mile of a supermarket. Fifteen percent could not see a doctor due to cost and approximately 73 children with disabilities counted in 2011. WIC served 51% of pregnant women in Tillamook County in 2011 (44).

In 2008, 58.4% of students in Tillamook County were eligible to enroll in the school lunch program and receive meals at free or reduced cost rates (43). It was estimated 45% of children were eligible for free lunch in 2009 (44). During the school year 2007 and 2008, 2,045 snacks were served in afterschool food assistance programs. In the same year, 2,804 people in Tillamook County were provided SNAP and WIC served 48% of all pregnant women in the county. There were also 7,612 food boxes provided to families to serve as emergency food assistance through the Oregon Food Bank (43).

Multi-Modular Preschool Screening

Each year, Tillamook County provides an optional and free health screening for families with pre-kindergarten-aged children. The Northwest Regional ESD and the Child Development and Rehabilitation Center of the Oregon Health & Science University sponsor the screening. Tillamook Hospital, Portland State University, Oregon State University, and Tillamook Vision, as well as community agencies including the Oregon Food Bank, provide support through volunteers such as physicians, teachers, and students who assist at the screening. The goal of the screening is to identify children who have physical and cognitive or behavioral developmental disorders to make health-related referrals for children to address their individual needs before starting school. The data obtained at these screenings also provide Tillamook County with information to evaluate and track the health and development of children screened from year to year.

In 2006, the Tillamook County annual preschool screening revealed that 27.5% of families were food insecure, 10.8% of families included at least one child with SHCN, and 3.4% of families that were food insecure included at least one child with SHCN. The

difference in percentage of food insecure families with a child with SHCN and food insecure families without a child with SHCN was marginally significant (p-value = 0.051) (45).

Measuring Food Insecurity: 6-Item Short Form

The adapted 6-item short form used in this study has been shown to have minimal bias in detecting food insecurity with respect to the 18-item measure. It does not, however, measure the more severe levels of food insecurity at which child hunger is generally observed, and cannot identify households where child hunger may occur (46). Therefore, food insecurity, as applied for this study, refers to household food insecurity, only.

Measuring Children with Special Health Care Needs

The screening questions used to identify children's SHCN status were adapted from the Children with Special Health Care Needs Screener, which is a five-item tool developed to reflect the federal Maternal and Child Health Bureau's consequence-based definition described previously (See Appendix B). Using this tool, to be classified as a child with SHCN, a child must be currently experiencing a specific consequence of their health condition, the consequence must be due to a health condition, and the duration is or is expected to be 12 months or longer (47).

Hypothesis

Given the background information presented here, the aims of this study were (1) to determine the proportion of children with SHCN among participants of the MMPS held in Tillamook County, Oregon in April 2012, (2) to determine the proportion of

children living in food insecure households among participants of the MMPS held in Tillamook County, Oregon in April 2012 and (3) to determine whether children with SHCN are more likely to live in food insecure households. We hypothesized that among children participating in Tillamook County's MMPS, the proportion of food insecure households would be higher among children with SHCN compared to children without SHCN.

Chapter 3: Methods

Study Design

A cross-sectional study design was used to evaluate data obtained from parents/guardians of children attending the annual Multi-Modular Preschool Screening (MMPS) in Tillamook County on April 18th-20th, 2012. These data were analyzed to determine the relationship between food security status of children's households and the SHCN status of children attending this event. Families who participated in the MMPS with at least one child between the ages of four and six years were included in this study. Data collection was coordinated by the Northwest Regional ESD. Consent to participate in the MMPS was obtained by the ESD. The protocol for this project met the criteria for an expedited review and was approved by the Oregon Health & Science University Institutional Review Board.

Study Sample and Recruitment Procedures

Families with children who lived in Tillamook County, Oregon and who planned to attend kindergarten for the first time in the fall of 2012 were invited to participate in the MMPS. Participation was not restricted to families living in Tillamook County and children living outside Tillamook County may have participated in the screening and been included in the study.

The annual MMPS event is well known in Tillamook County. Families living in the area may have older children who participated in the screening in previous years, parents may have participated in the screening as a child themselves, or they may have heard about the screening by word of mouth. The ESD posted fliers announcing the event in public places including preschools, local newspapers, and grocery markets. Families

wishing to participate were asked to call to register for the screening and to set up an appointment time for their child to attend the event. There was a separate phone number to call for Spanish-speaking families wishing to participate.

Screening Procedures

The MMPS took place at the Tillamook County Fairgrounds, April 18th-20th, 2012, between 8:00 am and 5:00 pm. Participants entered the building at one end, proceeded through fourteen different screening stations, and exited the building through a separate door upon completion. The screening stations included the assessments of height and weight, vision, hearing, physical examination, teeth/dentition, speech, educational development, nutrition, anemia, lead exposure, urine, motor development, immunizations, and optional fingerprinting. Occupational therapists, physical therapists, registered dietitians, speech language pathologists, registered nurses, audiologists, psychologists, social workers, and physicians conducted these assessments. After completing each station, findings were recorded on a referral form that was collected by screening organizers to arrange local follow-up by appropriate providers. The screening took approximately one hour to complete. Only data obtained at the nutrition station was included in this study.

Data Collection

The parent/guardian who registered their child for the MMPS was mailed the MMPS Survey of Household Food Needs (See Appendix C), and was asked to complete and to return the survey in person at the screening event. Parents/guardians who did not receive, who did not complete, or who forgot to return the survey were asked to complete the survey at the screening event. Surveys were completed anonymously and contained

no personal identifiers. Volunteers at the nutrition station collected the surveys to assess needs and for subsequent data entry and analysis.

Survey Instrument: MMPS Survey of Household Food Needs

The 2012 MMPS Survey of Household Food Needs (See Appendix C) was a self-administered 32-item tool available to parents/guardians in Spanish or English, depending on their preference at the time of registration. The survey addressed three topic areas: (1) household food use and food needs during the 12 months prior to administration, (2) household characteristics of the child participating in the screening, and (3) diet and health characteristics of the child participating in the screening.

The MMPS survey included the 6-item short form of the USDA questionnaire, adapted from the 18-item USDA core food security module (See Appendix A). These six questions were used to classify the household of the child by food security status. A parent/guardian who responded affirmatively, or answered "yes", "often true", or "sometimes true", to two or more of the six food security questions was classified as living in a food insecure household.

The MMPS survey also included three questions to determine the SHCN status of the child participating in the screening. These three questions were adapted from the Children with Special Health Care Needs (CSHCN) Screener, developed by the Child and Adolescent Health Measurement Initiative to identify children with SHCN and formatted for conditional responses (47). For example, if the respondent answered "no" to the first question, they were instructed to skip the last two questions and the child was defined as not having SHCN. Answering "yes" to one or more of the three questions classified the child as having SHCN.

Other questions in the MMPS survey assessed methods used to obtain food (11 questions), demographic information (11 questions), and breakfast consumption practice of the child participating in the screening (1 question). Responses for the methods of obtaining food within the family included use of SNAP, national school breakfast/lunch programs, WIC, and other similar public assistance programs. Most questions required "yes" or "no" responses or selection of the one best answer when offered multiple choices. Two questions required fill-in-the-blank responses for the number of children/adults in household and the child's month and year of birth.

Data Management

Study data were managed using the Oregon Clinical & Translational Research Institute's Research Electronic Data Capture (REDCap) System. REDCap is a secure internet application designed to support data capture for research providing user-friendly, web based case report forms, real-time data entry validation (for data types and numerical range checks), audit trails, and a de-identified data export mechanism to common statistical packages (48).

Each survey was assigned a unique identification number. When a response to a specific question was missing, it was coded as a missing value. If missing values were included in the questions used to determine household food security status or SHCN status of the child, the survey was excluded from the analysis. On the other hand, if all questions used to determine household food security status and SHCN status of the child were answered but there were missing values for other survey items, the survey was included in the analysis. Only children between four and six years of age were included in analysis. Since the child's age was recorded only by month and year of birth, we

assumed a child born in the month of data collection, April, had their birthday prior to the date of the preschool screening. For example, a child born with a recorded birth in April 2005 was excluded, as they would have already turned seven years old. A child born April 2008 was included, as they would have just turned four years old. Some households had more than one child who participated in the MMPS. In this case, surveys were collected for each child, not for each household, and each survey was included in the analysis.

Statistical Analysis

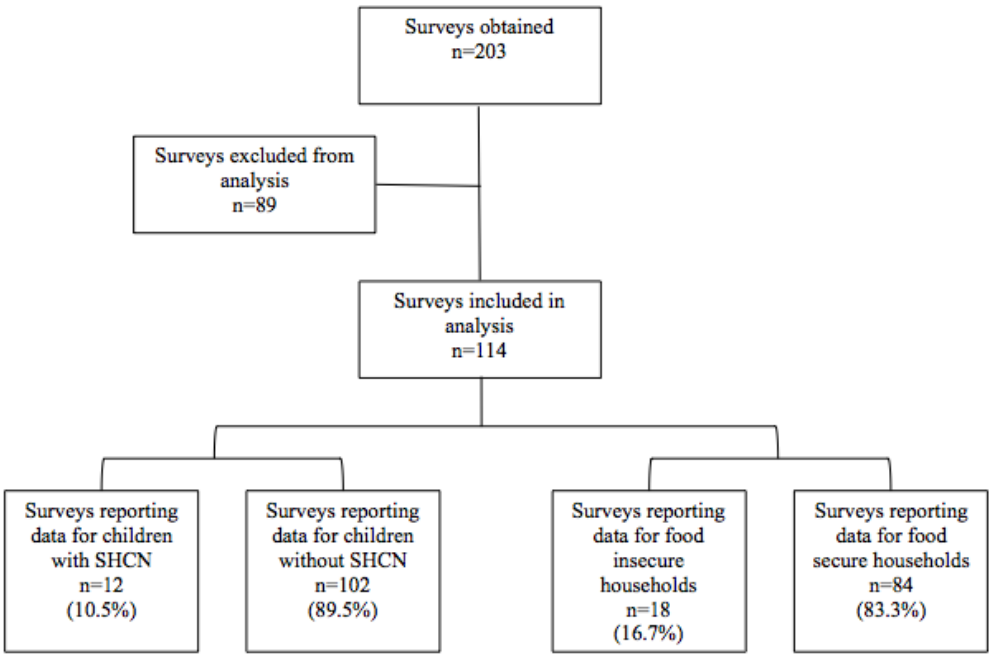
Data analysis was carried out using the Statistical Package for the Social Sciences (SPSS) version 21 (Armonk, NY) and Stata Data Analysis and Statistical Software version 10 (College Station, TX). Descriptive analyses were carried out to address Aims 1 and 2, which were to determine the proportion of children with SHCN and the proportion of children living in food insecure households among the study sample. Variables are reported as frequencies and percentages in relation to children's SHCN status and then in relation to household food security status. Demographic variables included the age and sex of the child, household characteristics included family structure, income, and number of children residing within the home, and parent/guardian characteristics included race/ethnicity and education level. Chi square or Fisher's exact tests were used to determine significant differences between proportions of these variables with respect to food security status. Chi square or Fisher's exact tests were also used to determine significant differences between proportions of these variables with respect to children's SHCN status. All variables are shown with 95% confidence intervals. Unpaired t-tests were used to determine whether mean age was significantly different

between groups. Fisher's exact test was used to address Aim 3, which was to determine whether children with SHCN are more likely to live in food insecure households in this sample. For each analysis, differences were considered significant when p-values were <0.05.

Chapter 4: Results

Two hundred and three surveys were collected (see Figure 1), of which 89 (43.8%) were excluded from analysis. Of those excluded, 15 (7.4%) contained incomplete responses to questions used to determine household food security status, 12 (5.9%) had incomplete responses to questions used to determine children's SHCN status, 61 (30.1%) were excluded because the child was younger than 4 years of age, and 1 (0.5%) was excluded because the child was older than 6 years of age. Of the 114 remaining surveys, 12 (10.5%) identified the reference child to have SHCN and 102 (89.5%) identified the reference child to have no SHCN. Nineteen (16.7%) children lived in food insecure households, while 95 (83.3%) lived in food secure households. Because of small sample sizes, especially among children with SHCN living in food insecure households, some values and comparisons of interest are not reported.

Figure 1. Distribution of Surveys by Chilren's SHCN Status and Houshold Food Security Status



Child, Parent/Guardian, and Household Demographic Characteristics

Demographic characteristics of children in the study sample who met the inclusion criteria are presented in Table 1. The average age of the study sample was 60.4 ± 7.5 months. The average age of children with and without SHCN was 58.5 ± 5.8 months and 60.7 ± 7.7 months respectively. The average age of children living in food insecure and food secure households was 60.6 months ± 6.1 months and 60.4 ± 7.8 months, respectively.

Males comprised 48.7% of the total study sample, 58.3% of the children with SHCN, and 47.5% of the children without SHCN. Six of the 19 (31.6%) children living in food insecure households were male compared to 52.1% of children living in food secure households. There were no significant differences in mean age or the proportion of males between any of the groups compared.

Demographic characteristics of households categorized by children's SHCN status and household food security status are presented in Table 2. Categories of family structure were combined to include (1) single male and single female households as "single parent", (2) two-parent households as "two-parent", and (3) grandparents, 3-generation, foster, and other households as "other" (See Table 2). Most (72.3%) children sampled lived in a two-parent household. The association between family structure and food security status was significant (Fisher's exact test, p=0.004) in that thirty seven percent of children that lived in food insecure households lived in a single parent home, while 9.7% of children that lived in food secure households lived in a single parent home. No children that lived in food insecure households and 16.1% of children that lived in food secure households identified their family structure as "other".

Table 1. Demographic Characteristics of Children by SHCN Status and Household Food Security Status*

Characteristic		All	Children with SHCN (n=12)	Children without SHCN (n=102)	Food Insecure (n=19)	Food Secure (n=95)
Age (months) (n=113)	mean (±SD)	60.4 (7.5)	58.5 (5.8)	60.7 (7.7)	60.6 (6.1)	60.4 (7.8)
	48 to <60	50.0 [57] (40.5, 59.5)	41.7 [5] (15.2, 72.3)	51.0 [52] (40.9, 61.0)	52.6 [10] (28.9, 75.6)	49.5 [47] (39.1, 59.9)
	60 to <72	40.4 [46] (31.3, 49.9)	58.3, [7] (27.7, 84.8)	38.2 [39] (28.8, 48.4)	NR	NR
	72 to <84	9.6 [11] (4.9, 16.6)	0	10.8 [11] (5.5, 18.5)	NR	NR
Sex (n=113)	Male	48.7 [55] (39.5, 57.9)	58.3 [7] (30.4, 86.2)	47.5 [48] (37.8, 57.3)	31.6 [6] (12.6, 56.6)	52.1 [49] (41.6, 58.4)

* No significant differences (p ≥0.05) between groups based on Fisher's exact test (when cell counts were <5) or Chi square test.
Values are reported as % [cell or column group n] (±95% Confidence Interval)
SHCN, Special Health Care Needs
SD, Standard Deviation
NR, not reported due to insufficient cell size to protect confidentiality

Table 2. Demographic Characteristics of Households by Children's SHCN Status and Household Food Security Status

Characteristic		All	Children with SHCN (n=12)	Children without SHCN (n=102)	Food Insecure (n=19)	Food Secure (n=95)
Family Structure (n=112)	Single-Parent	14.3 [16] (8.4, 22.2)	NR	NR	36.8 [7] (16.3, 61.6)	9.7 [9]* (4.5, 17.6)
	Two-Parent	72.3 [81] (63.1, 80.4)	66.7 [8] (34.9, 90.1)	73.0 [73] (63.2, 81.4)	63.2 [12] (38.4, 83.7)	74.2 [69] (64.1, 82.7)
	Other	13.4 [15] (7.7, 21.1)	NR	NR	0	16.1 [15] (9.3, 25.2)
Income (n=103)	≤ $24,999	40.8 [42] (31.2, 50.9)	NR	NR	52.9 [9]	38.4 [33] (29.2, 76.7)
	≥ $25,000	59.2 [61] (49.1, 68.8)	NR	NR	47.1 [8] (23.3, 70.8)	61.6 [53] (51.4, 71.9)
Number of Children in Household (n=112)	≤ 2	58.9 [66] (50.0, 68.1)	50.0 [6] (21.1, 78.9)	60.0 [60] (49.7, 69.7)	52.6 [10] (30.2, 75.1)	60.2 [56] (50.3, 70.2)
	≥ 3	41.1 [46] (31.9, 50.8)	50.0 [6] (21.1, 78.9)	40.0 [40] (30.3, 50.3)	47.4 [9] (24.9, 69.8)	39.8 [37] (29.8, 49.7)

Values are reported as % [cell or column group n] (±95% Confidence Interval)
SHCN, Special Health Care Needs
NR, not reported due to insufficient cell size to protect confidentiality
* p=0.004

Parents/guardians were asked to report annual household income as: $0-$5,000, $5,000-$9,999, $10,000-$14,999, $15,000-$24,999, $25,000-$34,999, and $35,000 and over. However, due to small cell sizes, these categories were collapsed. Fifty percent of parents/guardians of children with SHCN reported an annual household income of $25,000-$34,999. The majority (41.8%) of parents/guardians with children without SHCN reported an annual household income of at least $35,000. There is a significant difference in annual household income between households with and without a child with SHCN ($p=0.017$) when categories were analyzed before they were combined. When annual household income was collapsed into categories of $\leq$ $24,999 and $\geq$ $25,000, cell sizes were too small to report income in relation to children's SHCN status.

Almost sixty percent (58.9%) of children in the study sample lived in households with two or fewer children. Half of the children with SHCN and 60.0% of the children without SHCN lived in households with two or fewer children. Slightly over half (52.6%) of the children that lived in food insecure households and 60.2% of the children that lived in food secure households lived in households with two or fewer children.

Demographic characteristics of parents/guardians of children who participated in the screening are presented in Table 3 by children's SHCN status and household food security status. The majority (57.1%) of parents/guardians identified themselves to be of white race. Almost one third (29.5%) of the parents/guardians were of Hispanic ethnicity. Parents/guardians who identified their race as African American, American Indian or Alaskan Native, Asian, Native Hawaiian or other Pacific Islander, and participants who identified as more than one race/ethnicity were combined into one category of "other" race; this category accounted for 13.4% parents/guardians. Cell sizes were too small to

Table 3. Demographic Characteristics of Parents/Guardians by Children's SHCN Status and Household Food Security Status

Characteristic		All	Children with SHCN (n=12)	Children without SHCN (n=102)	Food Insecure (n=19)	Food Secure (n=95)
Ethnicity (n=112)	Latino, Hispanic	29.5 [33] (21.2, 38.8)	NR	NR	42.1 [8] (20.3, 66.5)	26.9 [25]* (18.2, 37.1)
	White	57.1 [64] (47.4, 66.5)	75.0 (9) (42.8, 94.5)	55.0 [55] (44.7, 65.0)	31.6 [6] (12.6, 56.6)	62.4 [58] (51.7, 72.2)
	Other	13.4 [15] (7.7, 21.1)	NR	NR	26.3 [5] (9.1, 51.2)	10.8 [10] (5.3, 18.9)
Education (n=112)	Not college graduate	86.6 [97] (78.9, 92.3)	100.0 [12] (73.5, 100.0)	85.0 [85] (76.5, 91.4)	NR	NR
	College graduate	13.4 [15] (7.7, 21.1)	0	15.0 [15] (8.6, 23.5)	NR	NR

Values are reported as % [cell or column group n] (±95% Confidence Interval)
SHCN, Special Health Care Needs
NR, not reported due to insufficient cell size to protect confidentiality
* p=0.026

report differences between groups for Latino, Hispanic and other races in relation to the SHCN status of a child. Fisher's exact tests revealed a significant association between ethnicity and food security status (p=0.026). Forty-two percent of parents/guardians of children that lived in food insecure households identified themselves to be of Hispanic ethnicity and 31.6% identified themselves to be of white race compared to 26.9% of parents/guardians of children that lived in food secure households who identified themselves to be of Hispanic ethnicity and 62.4% who identified themselves to be of white race. Parents/guardians who identified with other races/ethnicities comprised 26.3% of food insecure households and 10.8% of food secure households.

Responses to parent/guardian education level were coded as "not a college graduate" which included responses of no school, completing 8th grade or less, completing some high school, high school graduate or obtained a GED, and completing some college, and "college graduate" which included graduating from a four-year college or more. The majority (86.6%) of parents/guardians were not college graduates. Of the fifteen parents/guardians who graduated from college, all were parents/guardians of children without SHCN. Cell sizes were too small to report level of parent/guardian education in relation to food security status.

Methods of Obtaining Food

The methods reported by parents/guardians to obtain food for their household are summarized by children's SHCN status and by food security status in Table 4. Forty five (39.5%) households reported using SNAP. SNAP was used by a higher proportion of households of children with SHCN (50.0%), than households of children without SHCN (38.2%). SNAP was also used by more food insecure households (57.9%) than food

Table 4. Household Methods Used to Obtain Food by Children's SHCN Status and Household Food Security Status

Methods used	All	Children with SHCN (n=12)	Children without SHCN (n=102)	Food Insecure (n=19)	Food Secure (n=95)
SNAP (n=114)	39.5 [45] (30.4, 49.1)	50.0 [6] (21.1, 78.9)	38.2 [39] (28.8, 48.4)	57.9 [11] (35.7, 80.1)	35.8 [34] (26.1, 45.4)
School Meal Programs (n=110)	34.5 [38] (25.7, 44.2)	41.7 [5] (15.2, 72.3)	33.7 [33] (24.4, 43.9)	55.6 [10] (32.6, 78.5)	30.4 [28]* (21.0, 39.8)
Head Start (n=111)	24.3 [27] (16.7, 33.4)	58.3 [7] (27.7, 84.8)	20.2 [20]** (12.8, 29.5)	33.3 [6] (13.3, 59.0)	22.6 [21] (14.6, 32.4)
WIC (n=113)	46.9 [53] (37.7, 56.1)	75.0 [9] (50.5, 99.5)	43.6 [44]* (33.9, 53.2)	63.2 [12] (41.5, 84.8)	43.6 [41] (33.6, 53.6)
Friends/Family/Programs providing food at no cost (n=110)	30.9 [34] (22.4, 40.4)	75.0 [9] (42.8, 94.5)	25.5 [5]** (17.2, 35.3)	58.8 [10] (35.4, 82.2)	25.8 [24]** (16.9, 34.7)
Garden or Gathering	52.3 [57] (42.9, 61.7)	50.0 [6] (21.7, 78.3)	52.6 [51] (42.6, 62.5)	NR	NR*

Values are reported as % [cell or column group n] (±95% Confidence Interval)
SHCN, Special Health Care Needs
SNAP, Supplemental Nutrition Assistance Program
P-values determined using Fisher's exact test (when cell counts were <5) or Chi square test; *p <0.05, ** p<0.01.
WIC, Special Supplemental Nutrition Program for Women, Infants, and Children
NR, not reported due to insufficient cell size to protect confidentiality

secure households (35.8%). Households using the school lunch program, the school breakfast program, and the summer meal program were combined to allow for larger cell sizes. Thirty eight (34.5%) households participated in at least one of the three school meal programs. The proportion of food insecure households who used school meal programs was higher (55.6%) than the proportion of food secure households (30.4%) (p=0.040). Over half (58.3%) of the households with children with SHCN participated in Head Start programs compared to 20.2% of the households with children without SHCN (p=0.008). Fifty three (46.9%) parents/guardians reported using WIC as a way to obtain food. WIC participation rates were different for households with children with (75.0%) and without (43.6%) SHCN (p=0.039). Households using programs such as food pantries, churches, or other places that provide food at no cost were combined with households receiving food from friends, family, or neighbors to increase cell size. Seventy five percent of households with children with SHCN and 25.5% of households with children without SHCN reported receiving food from friends, family, neighbors, or programs providing food at no cost (p=0.001). Among the food insecure households, 58.8% reported obtaining food from friends, family, neighbors, or programs providing food at no cost, while only 25.8% of food secure households reported obtaining food in this way. Households that obtained food from hunting, fishing, or other food gathering techniques were combined with those using gardens to obtain food to increase cell size. While cell sizes were too small to report the number and proportion of households that obtained food in this way by food security status, the difference was significant with a higher percentage of food secure households obtaining food from gardening, hunting, fishing, or other food gathering techniques than food insecure households (p= 0.016).

Chapter 5: Discussion

The first two aims of this study were to determine the proportion of children with SHCN and the proportion of children living in food insecure households among participants of the MMPS held in Tillamook County, Oregon in April 2012. A cross-sectional study design was used with a convenience sample to estimate these proportions. Of the 114 children included in this analysis, twelve (10.5%) had SHCN and nineteen (16.7%) lived in food insecure households. The third aim of this study was to determine whether children with SHCN are more likely to live in food insecure households. We were unable to report these results due to the small proportion of children with SHCN living in food insecure households.

Prevalence of Food Insecurity

The prevalence of household food insecurity in this sample of MMPS participants was 16.7%, which is higher than the national prevalence of 14.5% and the state of Oregon prevalence of 13.6% (2). The demographic characteristics of the MMPS participants may explain, in part, the higher prevalence of food insecurity. Household income of less than $24,999 was reported by 41.8% of participants of the MMPS, which is close to the 2012 federal poverty line of $23,283 for households of two children and two adults (2). Nationally, food insecurity was higher among households with lower annual incomes and households near or below the federal poverty line (2, 16). This trend is seen in households of children who participated in the MMPS. A higher prevalence of food insecurity was reported among households with annual incomes <$24,999 compared to households with annual incomes ≥$25,000. This study sample contained a high percentage of parents/guardians identifying as Latino and/or Hispanic ethnicity

compared to the population surveyed for household food security status by the USDA (2). US data show that Hispanic households are at increased risk for household food insecurity (2, 16). As shown in Table 3, there was a higher prevalence of household food insecurity among Latino and/or Hispanic parents/guardians of children who participated in the screening ($p=0.026$). About 20% of the parents/guardians in this study sample did not graduate from high school, which is higher than the proportion of adults who did not graduate from high school in Tillamook County (12%) and the state of Oregon (11%) from 2007-2011 (44). Lower education level has been associated with increased risk of household food insecurity (16).

The context of this preschool health screening could contribute to the higher observed prevalence of food insecure households. The study sample was drawn from participants at the MMPS that provided free health screening for pre-kindergarten-aged children by a wide variety of health professionals. Families with lower income may be more likely to participate in MMPS screening, than families with higher incomes, to avoid costly health and developmental examinations. Therefore households with lower income may be overrepresented in this study sample and contribute to the higher prevalence of household food insecurity (8, 51). The location of the health screening may also contribute to the higher prevalence of household food insecurity since rural communities such as Tillamook County are known to have higher rates of food insecurity (2).

Since the study sample was derived from households with a child attending the MMPS, all of the households included in this analysis contained at least one child. Households with children are recognized to be at increased risk of food insecurity

compared to households without children (2, 12). The national prevalence of food insecurity in households with children is 20%, while in Oregon it is 20.8% (2, 12). Furthermore, national data show that households with children younger than six years of age are at higher risk for food insecurity compared to households with older children (2). Compared to the national and state prevalence of food insecurity in households with children, the prevalence of food insecurity among those attending the MMPS is low. This could be due to the relatively large percentage (72.3%) of two-parent households, which is associated with a lower risk for food insecurity (2, 16). Food security status was significantly related to family structure in the MMPS sample. A larger proportion of food secure households (74.2%) identified as two-parent households compared to food insecure households (63.2%).

Prevalence of Children with Special Health Care Needs

Of the children in the MMPS sample, 10.5% had SHCN, which is below the national estimate of 18.5% of children with SHCN (7). The lower percentage of children with SHCN found in this sample may be a result of the age of children at the time of the MMPS. Children between four to six years of age were included, while the national statistics described above include all children under the age of eighteen (7). By restricting our age range to four to six years, some SHCN may not have yet emerged resulting in a lower percentage of children with SHCN in this study sample. The national prevalence of 15.8% of children identified with SHCN reflects prevalence at adolescence, and includes children 12-17 years of age (7). All of the children identified as having SHCN in this study group were younger than 6 years old. Nationally, just fewer than 8% of children up

to five years of age had SHCN, which is closer to the prevalence found in the children who participated in the MMPS (7).

If a child had already been identified as having SHCN, parents/guardians may not have felt the need to have them evaluated at a free health screening. This could help explain the lower percentage of children with SHCN in this study sample. Health professionals may have already completed basic evaluations for children with SHCN due to the increased number of doctor visits seen in children with SHCN (7, 8). Parents/guardians of children with SHCN may also have had additional barriers to bringing their child to the MMPS on the days it was provided.

The prevalence of children with SHCN reported in this study should be interpreted with the recognition that the three questions used to identify a child with SHCN were adapted from a five-item tool developed to reflect the federal Maternal and Child Health Bureau's definition of SHCN (47). This definition describes children with SHCN as those "who have or are at increased risk for 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" (7). For a child to qualify as having SHCN using the Children with Special Health Care Needs Screener, these criteria must be met: (1) currently experiencing a specific consequence, (2) the consequence is due to a health condition, and (3) the duration is or is expected to be 12 months or longer (47). In contrast, for a child to qualify as having SHCN in this study, only the first criterion had to be met, although, the majority (66.7%) of children identified with SHCN in this study met all three criteria. Parish et al., found a similar percentage (10.6%) of households with children with SHCN using a single question identification scheme (8).

Methods of Obtaining Food

Our results show that 39.5% of households participating in the MMPS received SNAP benefits, which is higher than the national average of 15% (2). The higher prevalence among the MMPS sample could be due to 72% of national SNAP participants being families with children, which means this study population would be more likely to participate in SNAP (49). The state of Oregon also has one of highest SNAP participation rates in the nation (50). Of the individuals eligible for SNAP benefits in Oregon, 100% actually received SNAP benefits with a 90% CI of 94-100% (50). This is compared to a SNAP eligible participation rate of 75% in the nation (50). It is possible all SNAP eligible families included in our analysis were receiving SNAP benefits. A higher percentage of food insecure households participated in SNAP than food secure households at 57.9% and 35.8%, respectively. The USDA reports prevalence of food insecurity in households that participate in SNAP and who have an income less than 130% of the poverty level, finding 51.8% of households remain food insecure despite SNAP benefits (2). Of the households who participated in SNAP in this study, 24% were food insecure. The lower percentage seen in this study sample may be due to the inclusion of all income levels in our analysis. We also found a higher prevalence of children with SHCN in households participating in SNAP, which could be related to additional financial costs associated with the care of children with SHCN (7, 8).

Participation in the school lunch, breakfast, and summer meal programs were assessed among the MMPS participant households. These programs were combined to achieve adequate cell sizes for analysis and included participation by any member of the household. Households with children participating in the MMPS reported participating in

at least one of these three programs at a lower prevalence of 34.5% compared to the national prevalence (60%) of participation in the National School Lunch Program (51). The National School Lunch Program and the School Breakfast Programs are available through Head Start and 24.3% of this study sample participated in Head Start. Since these programs are also available to children in kindergarten, it is possible that reported participation in school meal programs was related to older children in the same household. If there were no older children in the household and the child participating in the MMPS did not attend Head Start or other community preschools participating in these programs, it would not be possible to report participation in these programs for the household. Participation in these programs was significantly higher among food insecure households. Greater prevalence of participation by food insecure households in school meal programs is also shown at a national level compared to food secure households (51).

WIC participation was reported by 46.9% of households in this study sample. This rate of participation is comparable to the measured 51% of pregnant women served by WIC in Tillamook County (44). A lower prevalence of participation in WIC is expected in households with children of our inclusion age range as WIC services extend to children through 5 years of age, only. Trends show a greater prevalence of participation by pregnant women, which declines as their child reaches the cut-off age of 5 years (52). Children's SHCN status in relation to WIC participation was significant with a higher prevalence of children with SHCN living in households that utilized WIC. This was expected because of higher financial costs associated with caring for a child with SHCN and WIC's ability to provide food vouchers for its participants. A higher percentage of food insecure households participated in WIC compared to food secure

households. In this study, 23% of households that participated in WIC were food insecure, compared to 39.5% at the national level (2). The lower prevalence of food insecure households, who participated in WIC in this study sample, could be due to inclusion of all income levels while the USDA analysis included only households with income less than 185% of the poverty level (2).

Households with children with SHCN reported receiving food from a food pantry, church, or other place that provided food at no cost to families in need, and/or friends, family, or neighbors at a higher proportion (75.0%) than reported by households with children without SHCN (25.5%). The difference in proportions between groups based on children's SHCN status and obtaining food in this way was significant. Before combining these two variables, our analysis showed that all of the families with children with SHCN that received food from programs at no cost also received food from friends, family, or neighbors. Although we were unable to report specific percentages of food secure and food insecure households that obtained food through gardening or hunting, a greater proportion of food secure households obtained food in this way ($p=0.016$).

Limitations

The extent to which findings from this study can be generalized to Tillamook or other populations is limited by the method used to identify the study sample. As the intended purpose of data collection was to provide information to the Northwest Regional ESD and Tillamook County about households of children attending the MMPS, only families attending Tillamook County's MMPS April 18th-20th, 2012 were included in this sample. Sampling bias may influence this sample, as the sample was a convenience sample of households that attended this free health screening. The small sample size is

also a limitation. The small sample size made some subgroups of interest, especially among children with SHCN, too small to report or to compare results on proportions within groups. The small sample size also contributed to fairly large confidence intervals of variables of small proportions, making it hard to identify significant differences.

The classification of children's SHCN status and food security status in this analysis makes it difficult to interpret results comparing SHCN status of the child and household food security status. The survey used identified the individual child attending the screening as having or not having SHCN, but the child's household as being food secure or insecure. To better determine relationships between having a child with SHCN and food security status, the SHCN status of all children in the household needs to be considered. In addition, households with more than one child who attended the screening may be overrepresented in this study because surveys were collected on each child, not each household. For these reasons, some level of systematic bias may be present.

Contributions

The results obtained as part of this study provide the Northwest Regional ESD the ability to assess the community needs of Tillamook County, Oregon. This study shows that food insecurity is present in households of children that attended the MMPS in 2012. The demographic information and food acquisition methods may be useful to identify subgroups at risk for food insecurity within Tillamook County.

Recognizing the methods families use to obtain food in relation to their food security status provides insight as to how households in Tillamook County cope with insufficient food supplies. It also shows where Tillamook County has been successful in addressing needs of households, especially those at high risk for food insecurity, and

where there are further opportunities. The USDA report, Household Food Security in the United States in 2012, found 59% of food insecure households utilized at least one of the three largest federal food and nutrition assistance programs (SNAP, WIC, or NSLP) (2). Among the food insecure household sample that attended the MMPS, 83.3% reported using one or more of these programs. Of the respondents using one or more of these programs, 21% were food insecure while the remaining proportion was food secure. This means that Tillamook County programs are reaching a high percentage of food insecure households, possibly reducing the incidence of household food insecurity within its community. A higher percentage of food secure households obtained food from their own garden or a community garden compared to food insecure households among MMPS participants. Continued expansion of opportunities for home and community gardens could assist in creating increased household food security.

Future Research

This study shows that a larger sample size is needed to assess the relationship between household food security status and children's SHCN status. Findings from the information gathered would provide more robust community information if the sample could be increased by expanding the age range for which data are collected. To assess impact of evolving community services on this pre-kindergarten population in Tillamook County, the study design could be modified to include longitudinal cross-sectional assessment of surveys collected over multiple years of the MMPS.

In addition to quantifying methods of obtaining food, it may be useful to obtain qualitative data from families with children with SHCN in relation to food security status. This could provide insight into how families with children with SHCN acquire food.

Food secure households with children with SHCN may use different techniques to acquire food than food insecure households with children with SHCN, which make them more resistant to food insecurity. It may also be useful to describe the combinations of food resources used in relation to household food security status and children's SHCN status.

Chapter 6: Conclusion

In conclusion, 10.5% of children who attended the MMPS held in Tillamook County, Oregon in April 2012 had SHCN. In addition, 16.7% of children lived in food insecure households. We were unable to report whether children with SHCN were more likely to live in food insecure households due to small sample size.

However, we were able to provide frequencies of various demographic variables in relation to children's SHCN status and in relation to food security status. Most notably, differences were seen in family structure and ethnicity/race characteristics in relation to food security status. We were also able to provide data on methods of obtaining food in relation to food security status showing that a higher proportion of food insecure households used school programs and a lower proportion of food insecure households used gardens or hunting to obtain food. We saw that a higher percentage of children with SHCN obtained food through WIC and friends, family, and food programs at no cost to the family.

These findings will be reported to Tillamook County and the Northwest Regional ESD to help with their ongoing assessment of community needs. These results will provide information that can be used to evaluate and track the health and development of children attending the MMPS from year to year. It may also be used to identify gaps in food assistance programs in certain populations suggesting opportunities for improvement in combating food insecurity in Tillamook County.

Appendix A. 18 Item USDA Food Security Questionnaire

1. "We worried whether our food would run out before we got money to buy more." Was that often, sometimes, or never true for you in the last 12 months?

2. "The food that we bought just didn't last, and we didn't have money to get more." Was that often, sometimes, or never true for you in the last 12 months?

3. "We couldn't afford to eat balanced meals." Was that often, sometimes, or never true for you in the last 12 months?

4. In the last 12 months, did you or other adults in the household ever cut the size or your meals, or skip meals because there wasn't enough money for food? (Yes/No)

5. (If yes to question 4) How often did this happen – almost every month, some months but not every month, or in only 1 or 2 months?

6. In the last 12 months, did you ever eat less than you felt you should because there wasn't enough money for food? (Yes/No)

7. In the last 12 months, were you ever hungry but didn't eat, because there wasn't enough money for food? (Yes/No)

8. In the last 12 months, did you ever lose weight because there wasn't enough money for food? (Yes/No)

9. In the last 12 months, did you or other adults in your household ever not eat for a whole day because there wasn't enough money for food? (Yes/No)

10. (If yes to question 9) How often did this happen – almost every month, some months but not every month, or in only 1 or 2 months?

(Questions 11-18 were asked only if the household included children ages 0-18 years)

11. "We relied only on a few kinds of low-cost food to feed our children because we were running out of money to buy food." Was that often, sometimes, or never true for you in the last 12 months?

12. "We couldn't feed our children a balanced meal, because we couldn't afford that." Was that often, sometimes, or never true for you in the last 12 months?

13. "The children were not eating enough because we just couldn't afford enough food." Was that often, sometimes, or never true for you in the last 12 months?

14. In the last 12 months, did you ever cut the size of any of the children's meals because there wasn't enough money for food? (Yes/No)

15. In the last 12 months, were the children ever hungry, but you just couldn't afford more food? (Yes/No)

16. In the last 12 months, did any of the children ever skip a meal because there wasn't enough money for food? (Yes/No)

17. (If yes to question 16) How often did this happen – almost every month, some months, or in only 1 or 2 months?

18. In the last 12 months, did any of the children ever not eat for a whole day because there wasn't enough money for food? (Yes/No)

Appendix B. 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

Appendix C. 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.

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 anyone 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 a variety of programs and approaches that families use to get food.

During the past 12 months, did anyone in your household use the following: (Please 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
h. From friends, families or neighbors?	Yes	No
i. Hunting, fishing or other food gathering?	Yes	No
j. Home or community garden	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

4a. 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. Are you: 1 □Male 2 □Female

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

1 □ Single female parent with child(ren) under 18
2 □ Single male parent with child(ren) under 18
3 □ Two parents/adults with child(ren) under 18
4 □ Grandparent(s) living with child(ren) under 18
5 □ 3-generation household--grandparent(s), parent(s), and child(ren) under 18
6 □ Foster parent(s) living with child(ren)
7 □ Other:

9. How many adults and children live in your household, counting all adults and children including yourself?

____ adults ____ children

10. 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

11.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

12. 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

13. 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

Section 3: These questions ask about your preschool child's diet and health

Complete these questions about your oldest child participating in today's screening.

14. What is the sex of this child? M F

15. In which month and year was he or she born?

Month: _____ Year: _____

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

1 □ Almost every day
2 □ A few days
3 □ Almost never

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

1 □ Excellent
2 □ Very good
3 □ Good
4 □ Fair
5 □ Poor

18. In general, would you say your health status is:

1 □ Excellent
2 □ Very good
3 □ Good
4 □ Fair
5 □ Poor

19. 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

20. **If #19 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

21. **If #20 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.

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