

Effects of Food Insecurity on Fast Food Consumption  
A Cross Sectional Study

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A thesis  
submitted in partial fulfillment  
of the requirements for the degree of

Master of Science in Dentistry

University of Washington

2012

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Program Authorized to Offer Degree:

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**Abstract**

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**Introduction:** The purposes of this study were: (1) to document the prevalence of food insecurity in a university based pediatric dentistry clinic, (2) to describe factors related to food insecurity, and (3) to determine the association between food insecurity and fast food consumption.

**Methods:** English-speaking parents/ caregivers of children presenting for dental care at The Center for Pediatric Dentistry (CPD) in Seattle (WA) were recruited (N=212). Caregivers completed a 36-item survey, which included a validated USDA food security questionnaire. Descriptive statistics were determined for all variables. T-tests and Chi-square tests were used to test associations between food insecurity and fast food consumption. Logistic regression with robust variance estimation was used to further evaluate this association between food insecurity and fast food consumption after adjusting for potential confounders. In addition, multivariate logistic regression with robust variance estimates was used to determine associations with covariates of interest and fast food consumption.

**Results:** Two hundred twelve subjects participated in this study. The mean age was 39.7 years (SD = 9.7). The majority was female (77%), White (58%), born in the United States (69%), married (56%), and had public dental insurance (63%) Almost half (46%) had some college education or vocational training. Twenty seven percent had an annual income of more than \$50,000. Twenty-eight percent of the families were food insecure. After adjusting for these covariates, the following factors were significantly associated with food insecurity: loss of job (OR=3.82, 95% CI =1.24-11.76), poor mental health status (OR=2.58, 95% CI=1.09-6.10), housing insecurity (OR=3.01, 95% CI=1.22-7.44) and annual household income  $p=0.007$ . After adjusting for the covariates, public dental insurance became significantly associated with fast food consumption (OR=0.33, 95% CI=0.13-0.84). There was no statistically significant association between food insecurity and fast food consumption ( $p=0.531$ ).

**Conclusions:** The prevalence of food insecure households was 28% at CPD. Factors associated with insecurity included: housing instability, lost job within the last year, poor mental health, and income. There was no statistically significant association between food insecurity and fast food consumption.

## **ACKNOWLEDGEMENT**

This research project would not have been possible without the support of many people. The author wishes to express her sincere gratitude to her advisor and committee members: Dr. Marcio da Fonseca, Dr. Donald Chi, and Dr. JoAnna Scott without whom this study would not have been successful.

Special thanks are given to all her co-residents, dental assistants, staff, and faculty at The Center for Pediatric Dentistry for their insight and assistance in the development and completion of this project.

## **DEDICATION**

To my family for their endless belief, inspiration, and patience through the duration of this journey.

To Raj Lotwala for his endless support, love, and patience.

To my wonderful co-residents for all the great memories in residency.

## TABLE OF CONTENTS

List of Figures .....	ii
List of Tables .....	iii
Introduction.....	1
Materials and Methods.....	8
Results.....	13
Discussion.....	15
Conclusions.....	21
Appendix 1.....	22
Appendix 2.....	23
Appendix 3.....	28
References.....	39

## LIST OF FIGURES

Figure Number

1. Conceptual Model.....	9
2. Sample Characteristic: Gender .....	30
3. Sample Characteristic: Household Income.....	30
4. Sample Characteristic: Education .....	31
5. Sample Characteristic: Race .....	31
6. Prevalence of Food Insecurity .....	32
7. Prevalence of Food Fast Food Consumption.....	32
8. Distribution of Fast Food Consumption .....	33

## LIST OF TABLES

Table Number

1. Population Demographics .....	34
2. Demographic Variables with Food Insecurity and Fast Food Consumption .....	35
3. Stability Variables with Food Insecurity and Fast Food Consumption .....	36
4. Unadjusted and Adjusted Associations with Food Insecurity .....	37
5. Unadjusted and Adjusted Associations with Fast Food Consumption .....	38

## **Introduction**

### ***Poverty in the world***

In 1995, the United Nations defined absolute poverty as “a condition characterized by severe deprivation of basic human needs, including food, safe drinking water, sanitation facilities, health, shelter, education and information. It depends not only on income but also on access to social services.” The poverty threshold or poverty line is the minimum level of income deemed adequate in a given country. This amount is significantly higher in developed countries than in developing countries; the common average international poverty line is roughly \$1.25 per day<sup>1</sup>.

### ***Poverty in the United States***

The Census Bureau of the United States defines poverty using family unit size and income thresholds; individuals or families are poor if their annual pretax cash income falls below this federal poverty threshold that is recalculated each year<sup>2, 3</sup> (Appendix 1). Families of four, for example, that earn less than \$23,018 will be considered poor while a family of six would be considered poor if they earn less than \$30,841<sup>2</sup>. The official poverty rate in the United States during 2010 was 15%, up from 14% in 2009, and represents 46.2 million Americans. The poverty rate for all persons masks considerable variations between ethnic and racial subgroups, however, as poverty rates for Blacks and Hispanics greatly exceed the national average. In 2010, 27% of Blacks and 26% of Hispanics were poor, compared to 9% of non-Hispanic Whites and 12% of Asians<sup>3</sup>. Similarly, children represent a disproportionate share of the poor in the United States<sup>4</sup>.

Twenty two percent of children under the age of 18 in the United States live in poverty<sup>3</sup>. This number represents a 1% increase over the previous year, and reflects the third consecutive

annual increase in the poverty rate<sup>5</sup>. With a nationwide unemployment rate of 8.9% in 2011<sup>6</sup>, increases in food and gas prices, and the country in an economic recession, millions of families have been faced with poverty<sup>7</sup>. Although the U.S. economy officially reached the end of the recession in June of 2009 and has started to show minor signs of recovery, the number of unemployed workers remains nearly double pre-recession levels<sup>8</sup>. Worse yet, evidence suggests that it will be at least several more years before the economy recovers, and low-income families often take longer to reach their pre-recession income levels than those with higher incomes<sup>9,10</sup>. This leaves many children exposed to continued risk of hunger as their families attempt to make ends meet.

### ***Food insecurity***

Food insecurity, a consequence of poverty, is defined by the U.S Department of Agriculture (USDA), 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” due to financial resource constraints<sup>11,12</sup>. Food insecurity stems from an inadequate food available for a household because of a shortage in money to purchase food<sup>13</sup>. Possible contributors to a decreased available income for food include the following: increases in food and gasoline prices, substance abuse, reduced public assistance benefits, natural disasters, migration, economic recession, and high costs of housing, utilities, and health care<sup>14</sup>. Worse yet, the already high food prices are predicted to remain elevated until at least 2015<sup>14</sup>. In order to measure the prevalence of food insecurity, the USDA sponsors a yearly survey conducted by the U.S Census Bureau<sup>12</sup>. If three or more questions are answered positively, the household is classified as food insecure<sup>12</sup>. A reliable and validated six-item survey module is also available to identify households with food insecurity<sup>15</sup>. A study conducted in 2010 of 44,757 U.S households showed that approximately 14% of the population was food insecure at least once during the past twelve

months<sup>12</sup>. Higher rates of food insecure households were observed among single parent household with children, African American and Hispanic households, and families living below the poverty threshold<sup>12</sup>.

### *Associations with food insecurity*

Poverty is closely associated with food insecurity and has been shown to have deleterious effects on child development<sup>16</sup>. These harmful outcomes include learning, social development, health, obesity, diabetes, and malnutrition<sup>17, 18</sup>. Additionally, adverse effects on oral health have been noted, with studies indicating that malnutrition is strongly correlated with increased risks of early childhood caries<sup>19</sup>. Children living in poverty consume unhealthy diets, which are low in cost, high in fatty foods and sweetened drinks, and low in fresh vegetables<sup>20</sup>. Retail price increases for fruits and vegetables have been shown to be greater than price increases for sweets and fats over time<sup>18</sup>. Among the unhealthy diets are meals at fast food restaurants, the consumption of which has increased by children<sup>21</sup>. In the United States, diet is dictated in part by socioeconomic status, education, and income<sup>18</sup>. Higher socioeconomic groups consume fast foods mainly due to convenience and limited time availability<sup>22</sup>. Less clear, however, is the relationship between food insecurity and fast food consumption.

Attempting to alleviate hunger, the government has several public assistance programs available such as the Supplemental Nutrition Assistance Program (SNAP), the Special Supplemental Nutrition Assistance Program for Women, Infants, and Children (WIC), and the Nutritional School Lunch Program (NSLP)<sup>23, 24</sup>. These resources are utilized by 35%, 14%, and 34% of the population respectively<sup>12</sup>. SNAP, formerly known as the Food Stamp Program, is administered by the USDA to combat hunger and improve nutrition. To be eligible for its benefits, children and adults must live in a household that falls below a predetermined income

standard, based on the federal poverty line. In a family of four, for example, a net monthly income of less than \$1,838 will qualify<sup>25</sup>. WIC, in a similar fashion, uses income standards to qualify participants though their guidelines are less extreme. SNAP is available for those at the very lowest end of poverty and unemployment, while it is not unusual for WIC participants to be regularly employed at low-paying jobs. Families of four, for example, that earn less than \$41,348 will qualify for WIC while a family of six would need a yearly income of less than \$55,482<sup>24</sup>. SNAP is designated as an entitlement program. If the number of eligible families exceeds the available funding for WIC, then a waiting list is established with priority given to families based on life stage of the children. Additional qualifications for WIC include the presence of a pregnant, new mother, or one child under the age of five in the household<sup>24</sup>. Since both SNAP and WIC are run by the USDA, a high level of coordination between the two programs exists helping ensure that low income households have access to both. Families with young children on SNAP may apply for WIC and once they age out, they can continue to access other available resources, such as the NSLP. Income eligibility for NSLP is identical to WIC, and allows qualified children to receive nutritious lunches at a reduced cost or free of charge<sup>23</sup>. A study published in 2011 found that 57% of food insecure households claimed to have used at least one food assistance program within the previous thirty days<sup>12</sup>. Similarly, half of all U.S. children live in a household that will, at some period in their childhood, turn to government assistance for financial and dietary help<sup>26</sup>.

### ***Food insecurity and dentistry***

Food insecurity is especially concerning due to its impact on oral health problems. An individual's diet can affect the development of teeth, the presence of dental caries, dental erosion, periodontal disease, and even oral cancer<sup>27</sup>. Vitamin D is closely involved in calcium

metabolism, and its deficiency (rickets) has long been known to be associated with enamel hypoplasia<sup>28,29</sup>. Though rickets is fairly rare in the United States, it is important to note that children ages 6 months to 24 months are at greatest risk due to the rapid bone growth they experience during this time<sup>30</sup>. Several studies have also shown that early childhood malnutrition is linked to increased dental caries and salivary gland hypofunction<sup>19,31,32</sup>. Dental caries are associated with increased sugar consumption, decreased intake of fresh vegetables, and failure to have breakfast<sup>33</sup>. In addition to that, certain foods may have cariostatic properties. Cheese products, for example, are thought to prevent caries by stimulating salivary flow and reducing levels of cariogenic bacteria<sup>34</sup>. Similarly, fruits contain fiber and polyphenol compounds that may interfere with plaque formation and the production of acids by cariogenic bacteria<sup>35</sup>. In addition to the harmful acids created by bacteria, acids from exogenous dietary sources such as soft drinks can erode dental enamel<sup>36</sup>. Low intake of vitamin C or calcium have been shown to increase both the risk and the severity of periodontal disease<sup>37-39</sup>. Diet and nutrition can also play a role in oral cancer. Alcohol and tobacco use are by far the most important dietary influences on the occurrence of oral cancer, with increased synergistic risks for those who frequently consume both<sup>40</sup>. Conversely, fresh vegetables and fruits have consistently been associated with decreased risks for cancer of the mouth and pharynx<sup>41-43</sup>. A meta-analysis of 15 case control studies reported statistically significant protective associations, with the risk of cancer of the mouth and pharynx being one-half among those who eat fruit and vegetables daily; these protective associations have remained significant even after adjusting for tobacco use and high alcohol consumption<sup>43</sup>. Current dietary guidelines published by the USDA and the US Department of Health and Human Services (DHHS) recommend a diverse diet, low in fat, with plenty of vegetables, fruits, and whole grains<sup>44</sup>. These recommendations, however, may not be

realistic considering the high costs of healthy diets for families that are not able to afford such practices. Foods with increased amounts of refined grains, added sugars, or high levels of fat are less expensive and more palatable, while healthier alternatives are more costly and are more easily perishable<sup>45</sup>. Consequently, food insecure families are more likely to purchase these high-density foods<sup>45</sup>, which have decreased nutritional quality and are more cariogenic.

### ***Fast food consumption***

Fast food restaurants are those where orders are placed at a counter with no waiter and waitress present<sup>46</sup>. Fast foods are highly palatable, large in portion, and high in calories<sup>47</sup>. They are everywhere, with such foods now being sold in drive-through restaurants, zoos, airports, public schools, supermarkets, gas stations, and even hospitals<sup>48</sup>. With the increased availability has come increased consumption<sup>47</sup>. In 1970, Americans spent about \$6 billion on fast food, while in 2001 an estimated \$110 billion was spent<sup>48</sup>. In addition to the monetary toll, adverse health effects have been noted such as higher total caloric intake, increased fat intake, elevated sodium intake, decreased nutrient and vitamin intake, and increased likelihood of obesity<sup>21, 49, 50</sup>. In a dietary survey of 17,370 adults and children, the consumption of fast food may have contributed to decreased intake of milk, fruits, and vegetables<sup>22</sup>. In another study, it was found that children who consumed fast foods, compared to those who did not, had higher intakes of sugar sweetened beverages<sup>21</sup>. This is notable as there is a positive association between soft drink consumption and the odds of a child or young adult becoming obese<sup>51, 52</sup>. Obesity has been shown to track from childhood to adulthood, thus childhood eating behaviors can have a huge impact on adult health<sup>53</sup> given that it increases the risk of cardiovascular disease, stroke, hypertension, various types of cancer, and diabetes<sup>54</sup>. The implications of obesity and high sugar intake by children and adolescent demonstrate the important role played by the pediatric dentist

in nutrition education. Fast food consumption has been shown to be higher among children, adolescence, young adults, and, interestingly, those families with higher incomes<sup>22</sup> as they may have more discretionary money<sup>21</sup>. An association was also found between increased household size and fast food use<sup>22</sup>. Reasons for consumption of fast food include time constraints and convenience<sup>22, 55</sup>. This study hopes to elucidate any associations between fast food consumption and food insecurity and create awareness among dental providers to allow for improved anticipatory guidance. By examining these topics, pediatric dentists can better tailor counseling on topics such as diet and overall health.

## **Materials and Methods**

### ***Purposes of this Study***

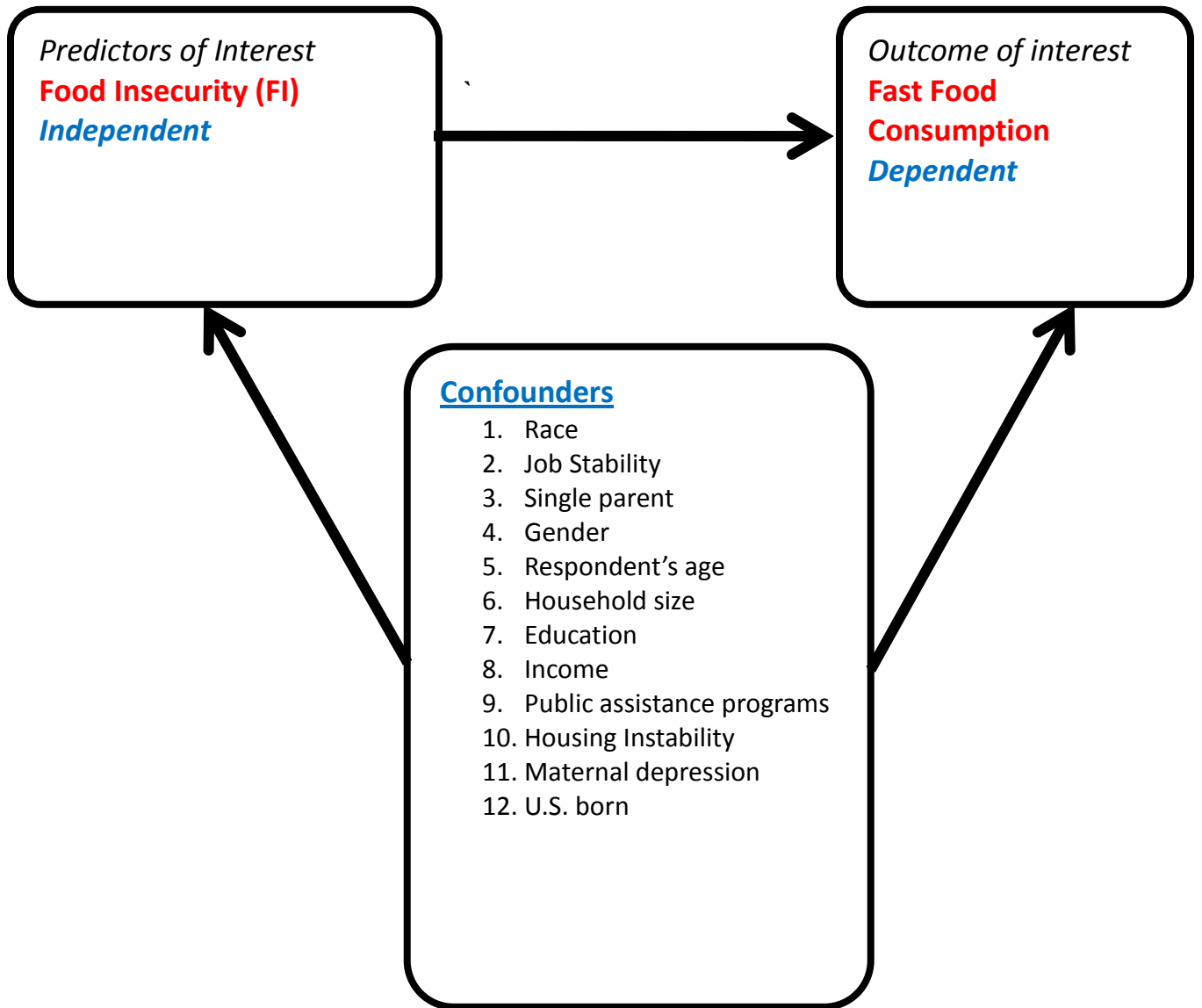
The purposes of this study were: (1) to document the prevalence of food insecurity in a university based pediatric dentistry clinic, (2) to describe factors related to food insecurity, and (3) to determine the association between food insecurity and fast food consumption.

### ***Hypotheses***

It was hypothesized that: (1) food insecurity is associated with increased fast food consumption among families attending a university-based pediatric dentistry clinic and (2) food insecurity is higher in families attending a university dental clinic compared to the U.S. national average.

### ***Conceptual Model***

The conceptual model shown in Figure 1 guided the framework of this project. The primary predictor of interest was food insecurity and the primary outcome of interest was fast food consumption. In this model, food insecurity may have a direct effect on fast food consumption. Several factors were evaluated as potential confounders: race, gender, age, marital, household size, education, income, and U.S. born status, use of public assistance, housing insecurity, loss of job, and maternal depression.



**Figure 1: Conceptual Model of Food Insecurity in relation to Fast Food Consumption**

### ***Study design***

The study protocol was approved by the Institutional Review Board at the University of Washington.

This was a cross-sectional study in which surveys were administered to a sample of caregivers/ parents of children seeking oral and dental care in the Center for Pediatric Dentistry, at the University of Washington School Of Dentistry.

The survey was composed of 36 questions (Appendix 2). There were 13 demographic questions, 6 questions which were used to assess food security, 4 questions addressing the use of community assistance resources, 2 questions regarding fast food consumption practices, 2 questions addressing housing stability, 2 questions looking at neighborhood safety, 2 questions about supermarket preferences, and 5 questions gauging mental health status.

Food security questions are extracted from the USDA. This document was created by Bickel et al 2000. These questions were developed by researchers at the National Center for Health Statistics and first published by Blumberg et al in 1999 (Appendix 3). Fast food consumption questions were developed from previous research published by the Center for Disease Control and Prevention and can be found in Anderson et al 2011. Housing insecurity questions were gathered from Ma et al 2008. Mental status question were taken as is from the five-item Mental Health Inventory, which is used to screen for signs of depression. These questions were derived from Berwick et al 1991.

The inclusion criteria for participation in the study were English-speaking parents/caregivers who brought their children for dental care. Parents or caregivers were approached either by the principal investigator or pediatric dentistry residents in the Center for Pediatric Dentistry from December 1, 2011 to January 30, 2012. Verbal consent was obtained

prior to the administration of the survey. A prepared script was used to inform the subjects to the nature of the study and to verify that the inclusion criteria were met. Subjects were administered the survey which had no identifiers. Once completed, the survey was returned to the principal investigator or resident in a sealed envelope.

### ***Coding of the survey***

#### ***Food insecurity***

Coding for the food insecurity questions followed the guidelines provided in the “*Guide to Household Food Insecurity*”<sup>13</sup>. Answer choices were scored as affirmative for questions 14 and 15 if the responses were either “Often true” or “Sometimes true.” They were scored as negative if “Never true” was the response given. Affirmative responses were recorded for questions 16, 18, and 19 if “Yes” was reported. For question 17, an affirmative response was recorded if “Almost every month” or “Some months but not every month” answers were chosen. A total of three or more affirmative responses out of six classified a family into the “food insecure” group. Two or less affirmative responses from the survey classified the family into the “food secure” group.

#### ***Fast food consumption***

Fast food consumption was recorded as a binary response (Yes/No). Fast food consumption was defined as one or more meals per week at a fast food restaurant.

#### ***Data analysis***

Data was entered into an Excel (Microsoft; 2007 version) spreadsheet and then exported into STATA (HP; Version 11) for statistical analysis. Descriptive statistics (means, standard deviations, counts, and percentages) were determined for all variables. T-tests were calculated

for all continuous variables to test for association with food insecurity or fast food consumption. Chi-square tests were used to evaluate association between categorical variables with food insecurity and fast food consumption. Multivariate logistic regression with robust variance estimation was used to further evaluate the association between food insecurity and fast food consumption after adjusting for potential confounders. In addition, multivariate logistic regression with robust variance estimates was used to determine associations with covariates of interest and fast food consumption. These models were adjusted for demographic variables, job stability, poor mental health, public assistance, and housing instability. Odds ratios were calculated to provide an estimate of the risk associated with our dependent and independent variables. The logistic regression models were used to compute adjusted and unadjusted odds ratios as well as the 95% CI for all the covariates in the models. There was concern that there was multicollinearity between the four primary stability variables: job stability, mental health status, public assistance, and housing stability. Therefore we assessed the collinearity between all four variables and found that there was not severe multicollinearity (VIF = 1.09, 1.08, 1.22, and 1.26 respectively). P-values less than or equal to 0.05 were considered statistically significant.

## **Results**

### ***Population demographics***

Two hundred twelve subjects participated in this study. The mean age was 39.7 years (SD = 9.7). The majority was female (77%), White (58%), born in the United States (69%), married (56%), and had public dental insurance (63%) (Table 1). Almost half (46%) had some college education or vocational training. Twenty seven percent had an annual income of more than \$50,000.

### ***Food insecurity and covariates***

Twenty-eight percent of the families were food insecure. No significant differences were found with regards to age, gender, race, marital status, U.S. born status, or fast food consumption in relation to food insecurity (Table 2 and 3). There were, however, several variables strongly associated with food insecurity such as education, household income, usage of public dental insurance, lost job, mental health, use of public assistance, and housing instability (Tables 2 and 3). People with lower education (high school or less) have higher rates of food insecurity compared to those with 4 or more years of college (37% vs. 15%). This is a significant difference ( $p= 0.026$ ). Annual household income was also found to be significantly associated with food insecurity ( $p<0.001$ ) with 42% of those reporting a household annual income of less than \$20,000 being food insecure compared to 3% with income greater than \$50,000. More than one third (36%) of those who had public dental insurance were food insecure ( $p= 0.001$ ) compare to only 15% who did not have public dental insurance. More than half (55%) of those who lost a job within the past year were food insecure ( $p<0.001$ ) compared to 22% who did not lose a job within the same period of time. In addition, signs of poor mental health status were significantly associated with food insecurity with 41% of individuals with poor mental health being food

insecure compared to 19% who did not have poor mental health ( $p = 0.001$ ). Use of public assistance was associated with food insecurity, with 44% of individuals on public assistance being food insecure, compared to 19% who did not use public assistance ( $p < 0.001$ ). Housing instability was significantly associated with food insecurity ( $p < 0.001$ ) with 53% reporting housing instability to be food insecure compared to 16% who were not housing instable.

### ***Adjusted model-food insecurity***

After adjusting for covariates, the following factors were significantly associated with food insecurity: loss of job (OR=3.82, 95% CI=1.24-11.76), poor mental health status (OR=2.58, 95% CI=1.09-6.10), housing instability (OR=3.01, 95% CI=1.22-7.44) and annual household income ( $p=0.007$ ). Education level or uses of public dental insurance were not associated with food insecurity (Table 4).

### ***Fast food consumption and covariates***

In unadjusted models, fast food consumption was not statistically significantly related to gender, race, education, annual income, U.S.-born status, marital status, usage of public dental insurance, poor mental health status, usage of public assistance, housing instability, or food insecurity (Tables 2 and 3). A distribution of fast food consumption per week can be found in Figure 8.

### ***Adjusted model- fast food consumption***

Parents who were food insecure were 1.33 times as likely to report consumption of fast food than parents who were not food insecure after adjusting for covariates, though this finding was not significant ( $p=0.531$ , OR=1.33, 95% CI= 0.54-3.29) (Table 5). After adjusting for the covariates, public dental insurance became significantly associated with fast food consumption (OR=0.33, 95% CI=0.13-0.84).

## Discussion

In this study, 28% of the families were found to be food insecure, which is almost double the 2010 U.S prevalence of 14.5%<sup>56</sup>. Although the Center for Pediatric Dentistry (CPD) is a university-affiliated dental clinic, it is located in a fairly wealthy neighborhood of Seattle, where the median household income is \$72,398<sup>57</sup>. On the other hand, the rate of food insecurity in this study was substantially lower than the 52% prevalence found at Odessa Brown Children's Clinic (OBCC) by Chatzopoulos et al in 2009<sup>58</sup>. This clinic is situated in the Central District of Seattle serving primarily a low-income African American population, where the median household income is \$41,846<sup>57</sup>. The affluent neighborhood that CPD is located in may pose an obstacle in terms of access to care, as families living in poverty likely live some distance away. In addition, CPD is distant from the freeway (approximately 4 miles away), and public transportation would require multiple transfers. By contrast, the Odessa Brown Children's Clinic is more easily accessible by freeway, public transportation, or on foot.

Although our study did not find a statistically significant association between race and food insecurity, Holben found higher rates associated with minority populations<sup>59</sup>. In his study, 23.7% of households headed by a black non-Hispanic, and of 21.7% Hispanic households were food insecure. At OBCC, the patients are predominantly African American (45%), followed by Hispanic (15%), Asian/Pacific Islander (16%), and White (9%)<sup>58</sup>. In contrast, our study population was predominantly White (58%). Thus, the lower percentage of minorities in our study may help explain the lower prevalence of food insecurity when compared to OBCC.

Several factors were found to be significantly associated with food insecurity in the adjusted model. Annual household income was significantly associated with food insecurity

after adjusting for other variables in the model ( $p = 0.007$ ). Having an annual household income greater than \$50,000 was significantly associated with a decreased risk of food insecurity compared to having an annual household income of less than \$20,000 (OR = 0.12, 95% CI = 0.02 - 0.82). Having an annual household income of \$20,000-30,000, \$30,000-40,000, or \$40,000-50,000 were not found to be significantly associated with food insecurity compared to the reference category of annual household income of less than \$20,000. It is not a surprise that household income was found to be associated with food insecurity because lower income families have many expenses and limited resources; transportation, food, rent, and daycare payments may all be competing needs. Loss of job within the past year and housing instability are factors representing the highest risk for food insecurity with odds ratios of 3.82 (95% CI=1.24-11.76) and 3.01 (95% CI=1.22-7.44) respectively. With the economic recession and slowing rates of job creation, high numbers of individuals are finding themselves unemployed or underemployed, and food insecurity may result. Similarly, housing instability may result from the current economic climate, as housing and food may be competing for limited resources. The prevalence of housing instability was shown to fall anywhere from 24% to 46%<sup>60</sup>, which is in agreement with our study (32%). Although a link between housing instability and food insecurity had already been reported by Gelberg et al in 1997, the current study further validates their finding<sup>61</sup>.

For healthcare providers, this information is particularly disturbing since food insecurity and housing instability have been shown to be associated with postponed access to health care and increased usage of acute care services<sup>60</sup>. As low-income families work low-paying jobs, they may not meet eligibility cutoffs for free public dental insurance. Thus, the receipt of preventative dental care becomes a competing financial need with other daily necessities, and

these families may tend to seek care only in emergencies. Additionally, these low-paying jobs may not have paid sick-days or flexible schedules, creating further challenges in accessing care during business hours<sup>62</sup>. The situation is further complicated by the fact that these individuals are more likely to have health problems as housing instability has been associated with negative health outcomes, particularly depression<sup>63</sup>.

There was not a significant association between U.S. native status and food insecurity in our study, which is in disagreement with previous studies<sup>64, 65</sup>. This may be explained by the fact that our study only included English-speaking families, which tend to be U.S. born or those that have been living in the U.S. for extended periods of time. Had the surveys been translated to other languages, many immigrants who would be expected to have the greatest risk of food insecurity may have been included in the study, possibly leading to similar results to previous studies. Chilton found that English, Spanish, and Somali speaking low-income mothers who had lived in the U.S. for greater than 10 years were at a significantly lower risk of food insecurity than new immigrants<sup>65</sup>.

Our study showed that 56% of families with food insecurity utilized at least one public assistance program, a result that was statistically significant in the unadjusted model ( $p < 0.001$ ). That is in agreement with the national average of food-insecure households that participated in a public assistance program (59%)<sup>12</sup>. It has been shown that low-income families spend a large majority of their income on basics needs such as food and shelter (70-80%)<sup>14</sup>. Thus, it makes sense that families who are food insecure will need to supplement their resources with some type of governmental support. Prior research has demonstrated that 50% of U.S. households with children will need to turn to public aid, either for dietary or financial assistance<sup>26</sup>. Still, the extent to which the government should aid remains controversial. With the increasing

prevalence of obesity and diabetes among low income populations<sup>18</sup>, some have questioned the role of food assistance programs in contributing to such non-communicable diseases as an unintended consequence<sup>66</sup>. One aim of future research may be to examine food choices by families utilizing public assistance programs in the area. A study which investigated food choices of Food Stamp recipients showed increased intakes of soft drinks and decreased intakes of fruits, compared to Food Stamp eligible non-participants<sup>67</sup>. It would be helpful to determine if such discrepancies exist in our sample population in order to better educate them on healthy dietary practices.

Although food insecure families are found to consume diets high in fats,<sup>20, 68</sup> our study failed to show any significant association between food insecurity and fast food consumption ( $p=0.531$ ). In our study, families with an income between \$20,000-30,000 had the highest rate of fast food consumption, with 71% of families consuming fast food at least once per week. The lowest rate of fast food consumption was for the lowest income bracket; 51% of families with an annual income of less than \$20,000 reported consuming fast food within the past week.

Although the differences in fast food consumption rates were not statistically significant ( $p=0.265$ ), it was thought that those in the lowest income bracket may eat more fast food, as they may lack cooking skills, tend to eat foods high in fat to stay full, lack adequate storage space for fresh fruits and vegetables, and tend to be less informed on healthy food choices<sup>69, 70</sup>. Our study, however, did not find an association between fast food consumption and income, which is in agreement with Anderson et al<sup>55</sup>.

Food insecurity can have many harmful health effects on children, including learning disabilities, decreased psychosocial development, depression, and overall poor health<sup>17</sup>. Of particular concern to pediatric dentists, behavior management may be more difficult with these

patients because poverty can negatively impact the behavior of children and adults<sup>71</sup>. Similarly, one study examining a population of poor Massachusetts children found hunger to be associated with internalizing behavior problems, higher levels of anxiety, and greater rates of depression<sup>72</sup>. Our study also found that individuals with food insecurity were at increased risk of also showing signs of depressive symptoms (OR=2.58 95% CI=1.09-6.10), which is in agreement with other studies<sup>73, 74</sup>. Even when parents do their best to shield their children from the effects of poverty and provide for their children as a first priority, past research has shown that maternal depressive symptoms can affect the child, which in turn can affect the child's behavior<sup>75</sup>. Furthermore, these parental depressive symptoms may influence the oral care of the children, with decreased attention being paid to brushing, eating healthy, and flossing, and might ultimately lead to increased caries.

Several limitations must be considered. Food insecurity was assessed using the self-administered USDA-validated food security survey, with the survey being completed by the parent or caretaker of the pediatric patient. Therefore, the experience was reported from an adult perspective and not from a child's perspective. In order to understand the association between food insecurity and a child's nutrient intake, it would be highly beneficial to conduct a child self-reported food security survey. This information can then be used to directly screen nutritional deficiencies in children. Another limitation of the study is the recall bias. Subjects were asked to remember their weekly consumption of fast food. Perhaps dietary intake on a 24-hour basis instead of a one-week period would have been a more accurate way of recording dietary intake. Even if the information is recalled accurately, it may not be recorded as such. Despite the anonymity of surveys, social desirability bias may have caused respondents to under-report fast food consumption. In addition to that, although the survey examined jobs loss within the past

year, it is possible that many of the caregivers were full-time mothers, thereby skewing some of the data obtained. The ability to generalize the results may be diminished due to the small sample, having the surveys available in English only, and limiting the survey distribution to one area in Seattle. Finally, our study was a cross-sectional study, therefore, causality cannot be concluded.

It is hoped that the current study will raise awareness to food insecurity and its associated adverse outcomes within the dental profession. In addition the negative impacts on oral health, poor dietary habits and hunger can lead to aggression, depressive symptoms, anxiety, and uncooperative behavior. The ability to understand the hardships faced by these families will create a more compassionate environment when patients are tardy, miss their appointments, or behave negatively in the dental setting. As pediatric dentists, it is imperative that we ask questions regarding hunger to better understand our patients, and create nonjudgmental environments to insure optimal physical and mental development of our patients.

## **Conclusions**

The following conclusions can be made from this study:

1. The prevalence of food insecure households was 28% at the Center for Pediatric Dentistry.
2. No significant association between food insecurity and fast food consumption could be detected.
3. Job loss within the past year, housing instability, poor mental health, and income level represented the highest risk for food insecurity in the adjusted model.
4. Having public dental insurance was highly associated with fast food consumption.
5. No association was found between food insecurity and factors such as gender, age, race, and marital status in the adjusted model.
6. Individuals with food insecurity showed signs of depressive symptoms.

## Appendix 1

U.S. DEPARTMENT OF COMMERCE BUREAU OF THE CENSUS WASHINGTON, D.C. 20233	
PRELIMINARY ESTIMATE OF WEIGHTED AVERAGE POVERTY THRESHOLDS FOR 2011	
Size of Family Unit	Estimated Threshold
1 person (unrelated individual).....	\$11,491
Under 65 years .....	11,702
65 years and over .....	10,788
2 people .....	\$14,667
Householder under 65 years .....	15,139
Householder 65 years and over .....	13,610
3 people .....	\$17,922
4 people .....	23,018
5 people .....	27,274
6 people .....	30,841
7 people .....	35,082
8 people .....	39,131
9 people or more .....	46,647
<p>Note: The preliminary estimates of the weighted average poverty thresholds for 2011 are calculated by multiplying the 2010 weighted average thresholds by a factor of 1.031565, the ratio of the average annual Consumer Price Index for All Consumers (CPI-U) for 2011 to the average annual CPI-U for 2010. These estimates may differ slightly from the final thresholds that will be published in September 2012 with the release of the official poverty estimates for 2011.</p>	

## Appendix 2

**You are invited to participate in our survey about food practices. Your feedback is important to us as it may give us insight on your needs. Your participation in this study is completely voluntary. The data collected for this survey is solely for research purposes.**

**Your responses will be confidential and anonymous.**

If you have any questions about the research study, please contact

Dr. A. Mai Dinh, Resident Dentist or

Dr. Marcio da Fonseca, Professor

The Center for Pediatric Dentistry

University of Washington

Phone: 206-543-5800

**Thank you very much for taking the time to complete this survey!**



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

- Often true    Sometimes true    Never true

**15. (I/we) couldn't afford to eat balanced meals. Was that often, sometimes, or never true for (you/your household) in the last 12 months?**

- Often true    Sometimes true    Never true

**16. In the last 12 months, did (you/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?**

- Yes    No

**17. How often did this happen --almost every month, some months but not every month, or in only 1 or 2 months?**

- Almost every month    Some months but not every month    Only 1 or 2 months

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

- Yes    No

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

- Yes    No

#### **QUESTIONS ABOUT USE OF COMMUNITY RESOURCES**

**20. In the past 12 months, did you use WIC ( Special Supplemental Program for Women, Infants, and Children)**

- Yes    No

**21. In the past 12 months, did you use Food Stamps?**

- Yes    No

**22. In the past 12 months, did your child eat free meals at school as part of the National School Lunch Program?**

- Yes    No

**23. In the past 12 months, did you make use of these resources? Please check all that apply.**

- |   |   |
|---|---|
| <input type="checkbox"/> Hopelink           | <input type="checkbox"/> Low Income Home Energy Assistance Program (LIHEAP) |
| <input type="checkbox"/> Welfare            | <input type="checkbox"/> Low Income Flexible Transportation Program (LIFT)  |
| <input type="checkbox"/> Head Start Program | <input type="checkbox"/> Other (specify) _____                              |
| <input type="checkbox"/> Food Pantry/ Bank  |   |

#### **QUESTIONS ABOUT FAST FOOD**

**24. About how many meals per week do you and your family eat from a fast food restaurants?**

Fast foods are defined as restaurants where orders are placed at a counter with no waiter and waitress present. *The following are considered fast food: Burger King, 7 Eleven, Dick's Drive in Restaurant Jack in the Box, Mc Donald's , Taco Bell, KFC, Panda Express*

- 0    1    2    3    4    5    6    7    8    9    10+

**25. When you go to a fast-food restaurant, what is the main reason you choose this type of a restaurant instead of another type?**

- Taste of the food, you enjoy going to fast food restaurants
- Value or cost
- Convenience, fast service, it's quick
- Person you are with wants to go
- Your children like fast-food restaurants
- Fast-food restaurants are conveniently located
- Other reasons (specify) \_\_\_\_\_

**QUESTIONS ABOUT YOUR HOUSING SITUATION**

**26. During the last 12 months, was there a time when (you and/or your family) were not able to pay your mortgage, rent, or utility bills?**

- Yes
- No

**27. During the last 12 months, did you or your children move in with other people even for a little while because you could not afford to pay your mortgage, rent, or utility bills?**

- Yes
- No

**QUESTIONS ABOUT YOUR NEIGHBORHOOD**

**28. How safe from crime do you consider your neighborhood to be?**

- Extremely safe
- Slightly safe
- Quite safe
- Not at all safe

**29. Overall, how would you rate your neighborhood as a place to walk? Would you say...**

- Very good/good
- Fair
- Poor/Very poor

**QUESTIONS ABOUT YOUR SUPERMARKET PREFERENCES**

**30. What is the most important factor when you go grocery shopping?**

- Quality of food
- Prices of items offered
- Availability of food (variety, brand choices)
- Availability of EBT (Electronic Benefit Transfer)
- Travel time to the grocery store

**31. What is the distance you are willing to travel to get groceries?**

- 0 – 5 miles
- 5 – 10 miles
- More than 10 miles
- Distance is not an issue

**QUESTIONS ABOUT HOW YOU ARE FEELING**

**32. During the past month, how much of the time were you a happy person?**

- All of the time
- Most of the time
- A good bit of the time
- Some of the time
- A little of the time
- None of the time

**33. How much of the time, during the past month, have you felt calm and peaceful?**

- All of the time     Most of the time     A good bit of the time     Some of the time     A little of the time
- None of the time

**34. How much of the time, during the past month, have you been a very nervous person?**

- All of the time     Most of the time     A good bit of the time     Some of the time     A little of the time
- None of the time

**35. How much of the time, during the past month, have you felt downhearted and blue?**

- All of the time     Most of the time     A good bit of the time     Some of the time     A little of the time
- None of the time

**36. How much of the time, during the past month, did you feel so down in the dumps that nothing could cheer you up?**

- All of the time     Most of the time     A good bit of the time     Some of the time     A little of the time
- None of the time

### Appendix 3

#### U.S. Household Food Security Survey Module: Six-Item Short Form

July 2008

HH3. I'm going to read you several statements that people have made about their food situation. For these statements, please tell me whether the statement was often true, sometimes true, or never true for (you/your household) in the last 12 months—that is, since last (name of current month).

The first statement is, “The food that (I/we) bought just didn't last, and (I/we) didn't have money to get more.” Was that often, sometimes, or never true for (you/your household) in the last 12 months?

- Often true
- Sometimes true
  
- Never true
- DK or Refused

HH4. “(I/we) couldn't afford to eat balanced meals.” Was that often, sometimes, or never true for (you/your household) in the last 12 months?

- Often true
- Sometimes true
- Never true
- DK or Refused

AD1. In the last 12 months, since last (name of current month), did (you/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?

- Yes
- No (Skip AD1a)
- DK (Skip AD1a)

AD1a. [IF YES ABOVE, ASK] How often did this happen—almost every month, some months but not every month, or in only 1 or 2 months?

- Almost every month
- Some months but not every month
- Only 1 or 2 months
- DK

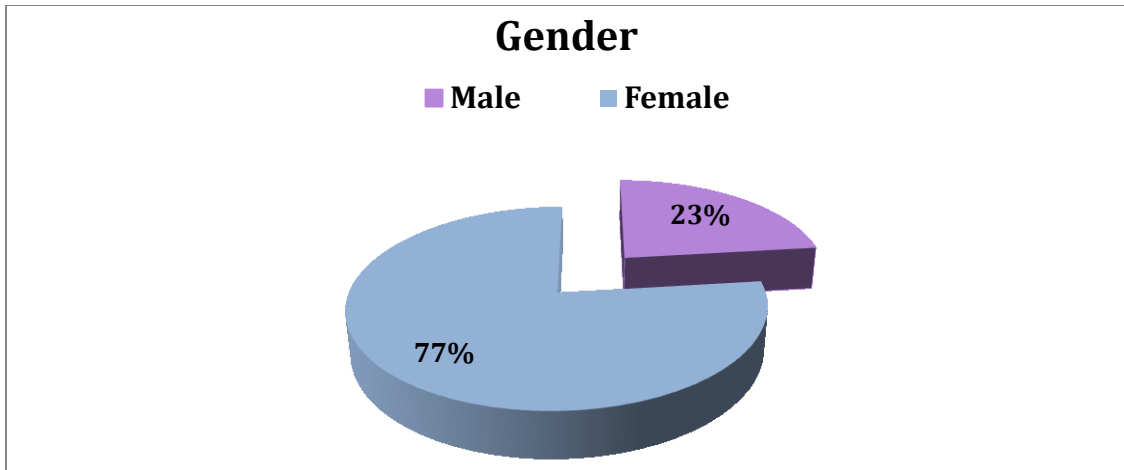
AD2. In the last 12 months, did you ever eat less than you felt you should because there wasn't enough money for food?

- Yes
- No
- DK

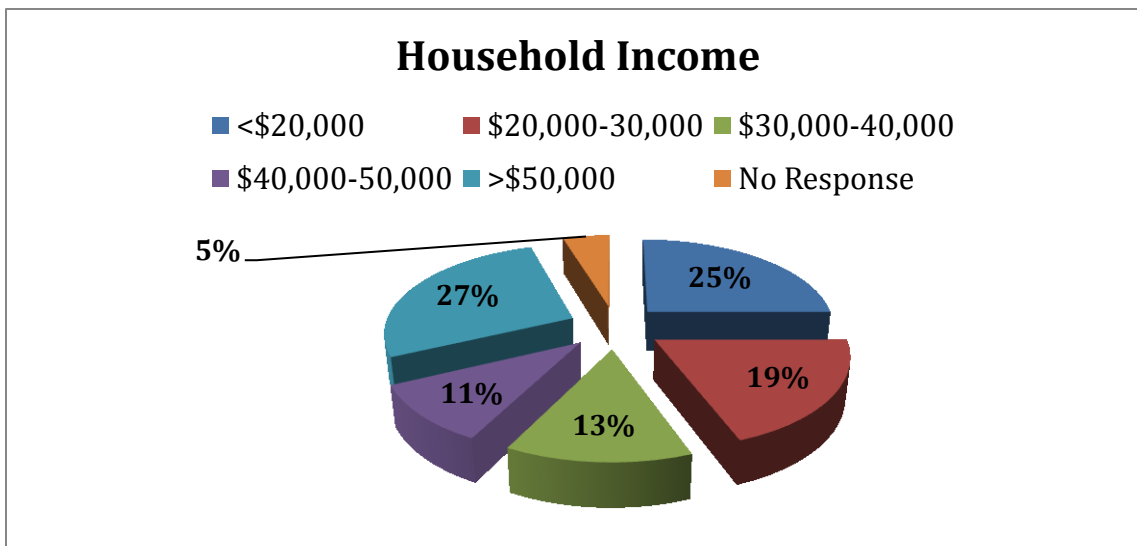
AD3. In the last 12 months, were you every hungry but didn't eat because there wasn't enough money for food?

- Yes
- No
- DK

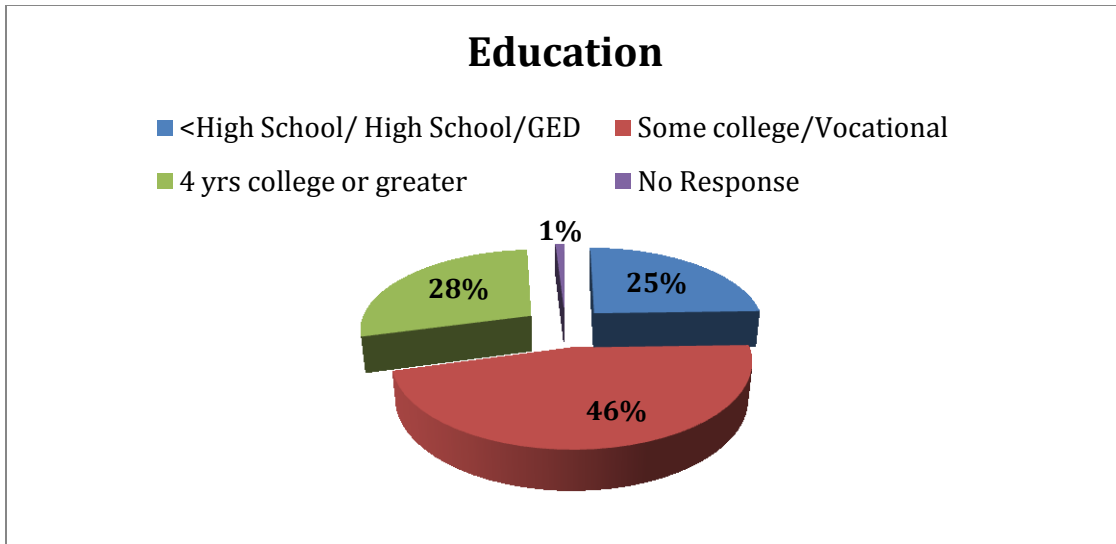
**[End of Six-Item Food Security Module]**



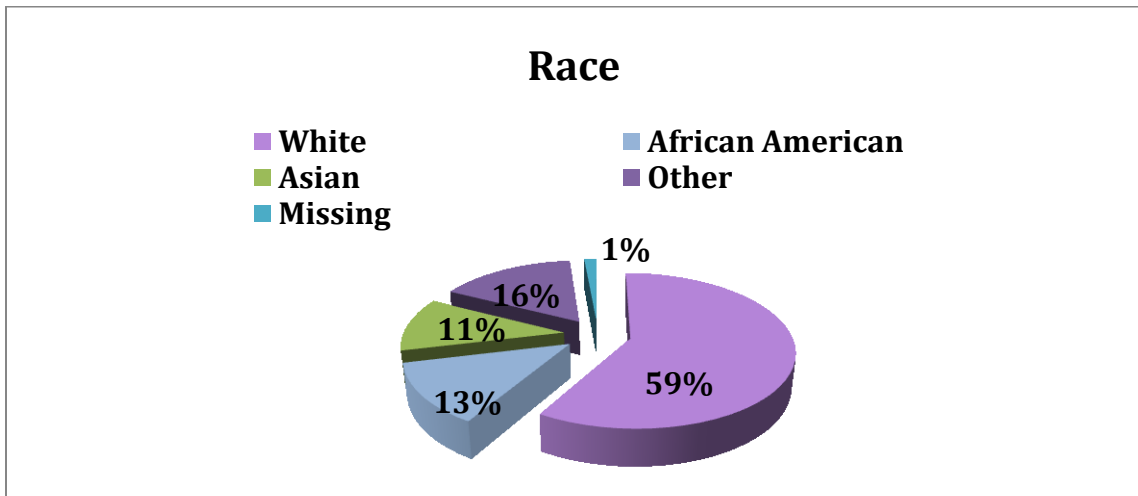
**Figure 2. Sample Characteristic: Gender**



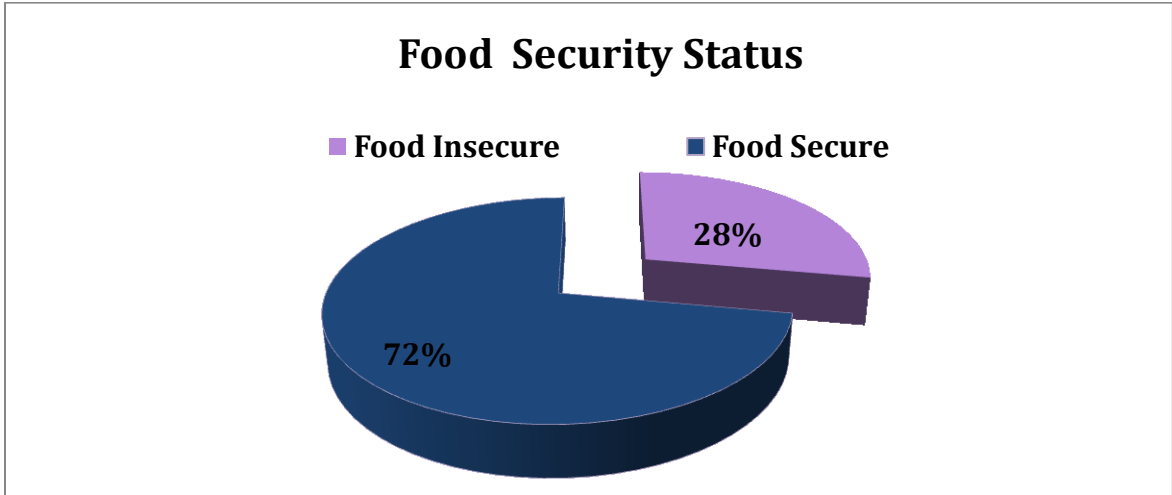
**Figure 3. Sample Characteristic: Household Income**



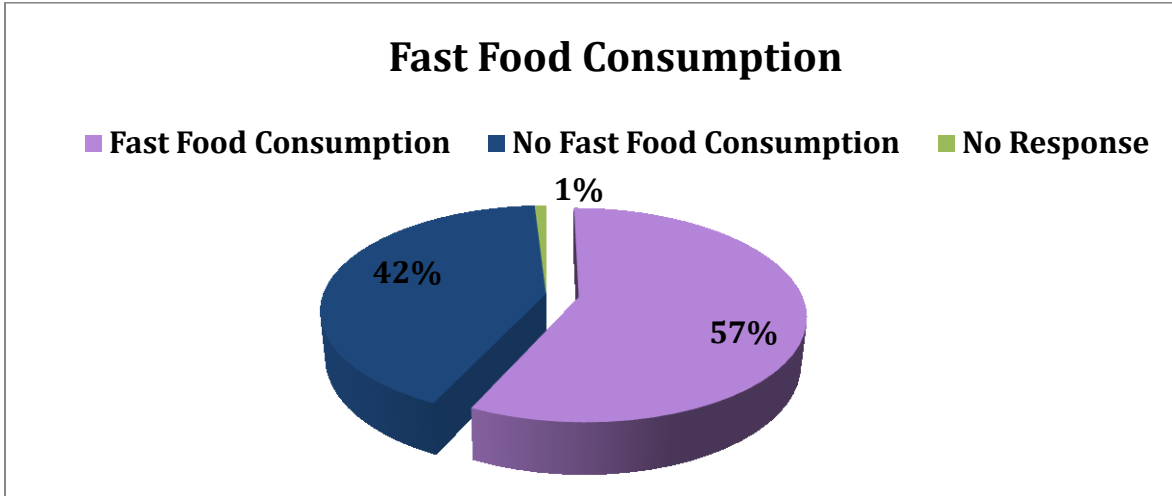
**Figure 4. Sample Characteristic: Education**



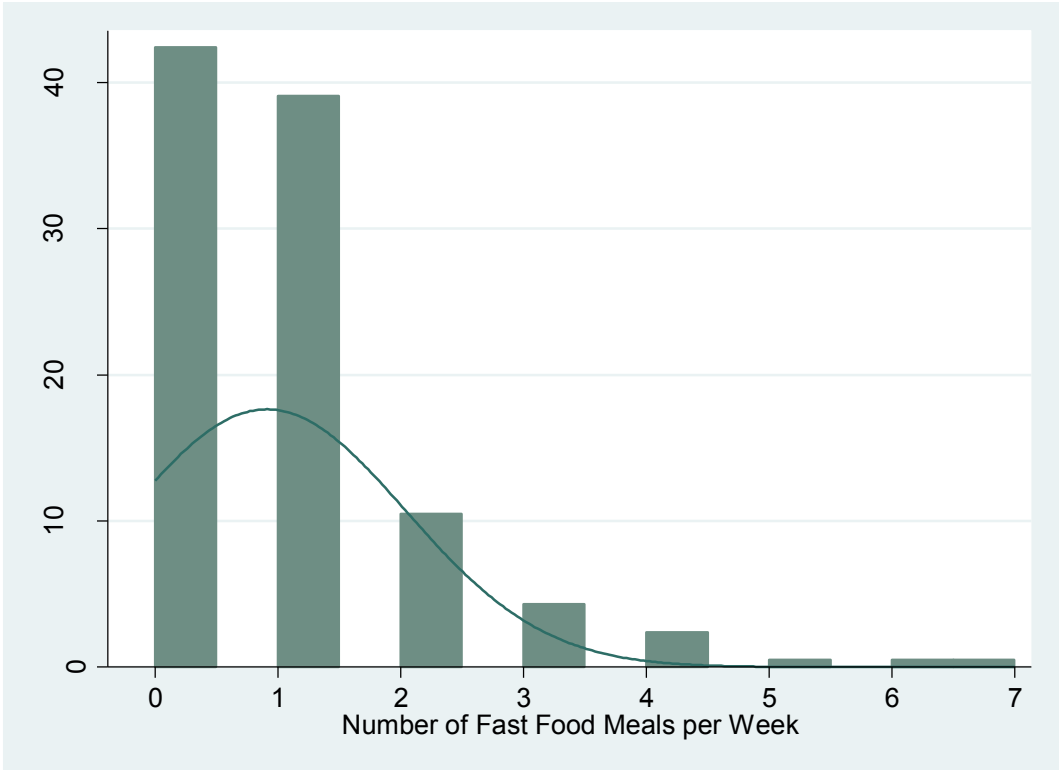
**Figure 5. Sample Characteristic: Race**



**Figure 6. Prevalence of Food Insecurity**



**Figure 7. Prevalence of Fast Food Consumption**



**Figure 8. Distribution of Fast Food Consumption**

**Table 1: Population Demographics**

	Total (N = 212)
	Mean(SD)
<i>Age (years)</i>	39.7 (9.7)
	N (%)
<i>Gender</i>	
Male	49 (23%)
Female	163 (77%)
<i>Race</i>	
White	124 (58%)
Black/African American	27 (13%)
Asian	24 (11%)
Other	34 (16%)
Missing	3 (2%)
<i>Education</i>	
<High School/ High School/GED	52 (25%)
Some college/Vocational	98 (46%)
4 yrs college or greater	60 (27%)
Missing	2 (2%)
<i>Household Income</i>	
<\$20,000	53 (25%)
\$20,000-30,000	41 (19%)
\$30,000-40,000	28 (14%)
\$40,000-50,000	22 (10%)
>\$50,000	58 (27%)
Missing	10 (5%)
<i>US Born</i>	
Yes	147 (69%)
No	63 (30%)
Missing	2 (1%)
<i>Married</i>	
Yes	119 (56%)
No	91 (43%)
Missing	2 (1%)
<i>Public Dental Insurance</i>	
Yes	134 (63%)
No	75 (36%)
Missing	3 (1%)

**Table 2: Demographic Variables with Food Insecurity and Fast Food Consumption.**

	Food Insecurity			Fast Food Consumption		
	Yes (N = 59)	No (N =153)	P Values	Yes (N = 121)	No (N = 89)	P Values
	Mean(SD)	Mean(SD)		Mean(SD)	Mean(SD)	
<i>Age (years)</i>	37.6 (8.2)	40.5 (10.2)	0.058	39.0 (9.6)	40.8 (9.8)	0.205
	N (%)	N (%)		N (%)	N (%)	
<i>Gender</i>						
Male	14 (29%)	35 (71%)	0.895	33 (69%)	15 (31%)	0.076
Female	45 (28%)	118 (72%)		88 (54%)	74 (46%)	
<i>Race</i>						
White	27 (22%)	97 (78%)	0.132	71 (58%)	52 (42%)	0.861
Black/African American	10 (37%)	17 (63%)		15 (56%)	12 (44%)	
Asian	8 (33%)	16 (67%)		15 (62%)	9 (38%)	
Other	13 (38%)	21 (62%)		17 (52%)	16 (48%)	
Missing	1 (33%)	2 (67%)		3 (100%)	0 (0%)	
<i>Education</i>						
<High School/ High School/GED	19 (37%)	33 (63%)	0.026*	30 (60%)	20 (40%)	0.213
Some college/Vocational	30 (31%)	68 (69%)		61 (62%)	37 (38%)	
4 yrs college or greater	9 (15%)	51 (85%)		29 (48%)	31 (52%)	
Missing	1 (50%)	1 (50%)		1 (50%)	1 (50%)	
<i>Household Income</i>						
<\$20,000	22 (42%)	31 (58%)	<0.001*	26 (51%)	25 (49%)	0.265
\$20,000-30,000	15(37%)	26 (63%)		29 (71%)	12 (29%)	
\$30,000-40,000	12 (43%)	16 (57%)		18 (64%)	10 (36%)	
\$40,000-50,000	6 (27%)	16 (73%)		12 (55%)	10 (45%)	
>\$50,000	2 (3%)	56 (97%)		30 (52%)	28 (48%)	
Missing	2 (20%)	8 (80%)		6 (60%)	4 (40%)	
<i>US Born</i>						
Yes	37(25%)	110 (75%)	0.150	83 (57%)	62 (43%)	0.842
No	22(35%)	41 (65%)		37 (59%)	26 (41%)	
Missing	0 (0%)	2 (100%)		1 (50%)	1 (50%)	
<i>Married</i>						
Yes	33(28%)	86 (72%)	0.893	65 (55%)	54 (45%)	0.347
No	26(29%)	65 (71%)		55 (61%)	35 (39%)	
Missing	0 (0%)	2 (100%)		1 (100%)	0 (0%)	
<i>Public Dental Insurance</i>						
Yes	48 (36%)	86 (64%)	0.001*	72 (54%)	61 (46%)	0.264
No	11 (15%)	64 (85%)		46 (62%)	28 (38%)	
Missing	0 (0%)	3 (100%)		3 (100%)	0 (0%)	

**Table 3: Stability Variables with Food Insecurity and Fast Food Consumption.**

	Food Insecurity				Fast Food Consumption			
	Yes (N = 59)	No (N =153)	Total (N = 212)	P Values	Yes (N = 121)	No (N = 89)	Total (N = 210)	P Values
	N (%)	N (%)	N (%)		N (%)	N (%)	N (%)	
<i>Lost Job</i>								
Yes	21 (55%)	17 (45%)	38 (100%)	<0.001*	27 (71%)	11 (29%)	38 (100%)	0.076
No	37 (22%)	132 (78%)	169 (100%)		93 (55%)	75 (45%)	168 (100%)	
Missing	1 (20%)	4 (80%)	5(100%)		1 (25%)	3 (75%)	4 (100%)	
<i>Poor Mental Health</i>								
Yes	34 (41%)	49 (59%)	83 (100%)	0.001*	45 (56%)	36 (44%)	81 (100%)	0.632
No	25 (19%)	104 (81%)	129 (100%)		76 (59%)	53 (41%)	129 (100%)	
<i>Public Assistance</i>								
Yes	33 (44%)	42 (56%)	75 (100%)	<0.001*	44 (59%)	31 (41%)	75 (100%)	0.819
No	26 (19%)	111 (81%)	137 (100%)		77 (57%)	58 (43%)	135 (100%)	
<i>Housing Instability</i>								
Yes	35 (53%)	31 (47%)	66 (100%)	<0.001*	40 (62%)	25 (38%)	65 (100%)	0.590
No	23 (16%)	117 (84%)	140 (100%)		80 (58%)	59 (42%)	139 (100%)	
Missing	1(17%)	5 (83%)	6 (100%)		1 (17%)	5 (83%)	6 (100%)	
<i>Food Insecure</i>								
Yes	-	-	-	-	37 (63%)	22 (37%)	59 (100%)	0.351
No	-	-	-		84 (56%)	67 (44%)	151 (100%)	
<i>Fast Food Consumption</i>								
Yes	37 (31%)	84 (69%)	121 (100%)	0.351	-	-	-	-
No	22 (25%)	67 (75%)	89 (100%)		-	-	-	
Missing	0 (0%)	2 (100%)	2 (100%)		-	-	-	

**Table 4: Unadjusted and Adjusted Associations with Food Insecurity.**

Food Insecurity	Unadjusted		Adjusted Model ‡	
	OR (95% CI)	p-values	OR (95% CI)	p-values
Age	0.97 (0.94 – 1.00)	0.039*	0.98 (0.94 – 1.02)	0.399
Gender		0.895		0.680
M	1		1	
F	0.95 (0.47 - 1.94)		1.24 (0.45 – 3.40)	
Race		0.140		0.690
Black	2.11 (0.87 - 5.16)		1.03 (0.28 – 3.75)	
Asian	1.80 (0.69 - 4.65)		1.84 (0.47–7.27)	
White	1		1	
Other	2.22 (0.98 - 5.02)		1.85 (0.59– 5.74)	
Education		0.032*		0.857
<HS, HS/GED	1		1	
Some College	0.77 (0.38 - 1.56)		0.74 (0.25- 2.21)	
4+ Years College	0.31 (0.12 - 0.76)		0.88 (0.24–3.25)	
Income		0.002*		0.007*
<\$20,000	1		1	
\$20,000-\$30,000	0.81 (0.35 – 1.88)		1.12 (0.40 – 3.16)	
\$30,000-\$40,000	1.06 (0.42 – 2.68)		3.22 (0.81 – 12.77)	
\$40,000-\$50,000	0.53 (0.18 – 1.57)		0.98 (0.23 – 4.14)	
>\$50,000	0.05 (0.01 – 0.23)		0.12 (0.02 – 0.82)	
US Born		0.152		0.792
Yes	1.60 (0.84 - 3.02)		1.15 (0.40 – 3.31)	
No	1		1	
Married		0.893		0.073
Yes	0.96 (0.52 - 1.76)		2.30 (0.93- 5.70)	
No	1		1	
Public Dental Insurance		0.002*		0.277
Yes	3.25 (1.56 – 6.76)		0.52 (0.16-1.69)	
No	1		1	
Lost Job		< 0.001*		0.019*
Yes	4.41 (2.11 – 9.22)		3.82 (1.24– 11.76)	
No	1		1	
Poor Mental Health		< 0.001*		0.030*
Yes	2.89 (1.55 - 5.36)		2.58 (1.09–6.10)	
No	1		1	
Public Assistance		< 0.001*		0.085
Yes	3.35 (1.79 - 6.27)		2.36 (0.89 – 6.25)	
No	1		1	
Housing Instability		< 0.001*		0.017*
Yes	5.74 (2.97 - 11.11)		3.01 (1.22–7.44)	
No	1		1	

‡Adjusted for Demographic Variables and other Stability Variables: Job stability, Poor mental health, Public assistance, Housing instability

Table 5: Unadjusted and Adjusted Associations with Fast Food Consumption.

Fast Food Consumption	Unadjusted OR (95% CI)	p-values	Adjusted Model ‡ OR (95% CI)	p-values
Age	0.98 (0.95 - 1.01)	0.205	0.97 (0.94 - 1.01)	0.131
Gender		0.079		0.198
M	1		1	
F	0.54 (0.27 - 1.07)		0.57 (0.25 - 1.34)	
Race		0.863		0.566
Black	0.91 (0.40 - 2.12)		0.60 (0.18-2.01)	
Asian	1.22 (0.49 - 3.01)		0.77 (0.23- 2.65)	
White	1		1	
Other	0.78 (0.36 - 1.68)		0.52 (0.19- 1.43)	
Education		0.218		0.263
<HS, HS/GED	1		1	
Some College	1.01 (0.55 - 2.21)		0.79 (0.33- 1.90)	
4+ Years College	0.62 (0.29 - 1.33)		0.46 (0.17- 1.24)	
Income		0.278		0.266
<\$20,000	1		1	
\$20,000-\$30,000	2.32 (0.97 - 5.55)		2.60 (0.86 - 7.86)	
\$30,000-\$40,000	1.73 (0.67 - 4.48)		1.61 (0.51- 5.08)	
\$40,000-\$50,000	1.15 (0.42-3.15)		1.36 (0.40 - 4.62)	
>\$50,000	1.03 (0.48 - 2.19)		0.82 (0.23 - 2.89)	
US Born		0.842		0.583
Yes	1.06 (0.58 - 1.94)		1.29 (0.52 - 3.21)	
No	1		1	
Married		0.349		0.286
Yes	0.77 (0.44 - 1.34)		0.68 (0.33 - 1.39)	
No	1		1	
Public Dental Insurance		0.266		0.021*
Yes	0.72 (0.40 - 1.28)		0.33 (0.13 - 0.84)	
No	1		1	
Lost Job		0.081		0.114
Yes	1.98 (0.92 - 4.26)		2.19 (0.83 - 5.80)	
No	1		1	
Poor Mental Health		0.633		0.796
Yes	0.87 (0.50 - 1.53)		0.91 (0.45 - 1.84)	
No	1		1	
Public Assistance		0.819		0.452
Yes	1.07 (0.60 - 1.90)		0.73 (0.32 - 1.67)	
No	1		1	
Housing Instability		0.591		0.860
Yes	1.18 (0.65 - 2.16)		1.08 (0.46 - 2.56)	
No	1		1	
Food Insecurity		0.352		0.531
Yes	1.34 (0.72 - 2.49)		1.33 (0.54 - 3.29)	
No	1		1	

‡Adjusted for Demographic Variables and other Stability Variables: Job stability, Poor mental health, Public assistance, Housing instability, and Food insecurity

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