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Impact of Personal Preference and Motivation on Fruit and Vegetable Consumption
of WIC Participating Mothers and Children in Atlanta, Georgia

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Global Epidemiology

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Bachelor of Science in Education
The University of Georgia
2008

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Abstract

Impact of Personal Preference and Motivation on Fruit and Vegetable Consumption of WIC Participating Mothers and Children in Atlanta, Georgia

By: David Y. Chen

Purpose: The purpose of this study is to determine the effect of psychosocial and sociodemographic factors on the consumption of fruits and vegetables for women and children participating in Women Infant Children (WIC) in metro-Atlanta.

Background: Consumption of fruits and vegetables has been linked to decreased rates of chronic diseases, such as, cancer, stroke, cardiovascular disease and obesity. Only a quarter of Americans meet the recommended-daily intake of five servings of fruits and vegetables. Previous WIC studies have shown that low-income populations are linked with low intake of fruits and vegetables. Understanding psychosocial and sociodemographic determinants are crucial for successful development of new WIC initiatives and education programs.

Methods: Data from Emory's WIC Study was used in this analysis to determine participants' personal preference and motivation on fruit and vegetable consumption. Fruit and vegetable consumption for each participant was determined by adding together six different consumption variables: fruit juice, fruit, potatoes, carrots, green salad and other vegetables. A dichotomous variable was created for fruit and vegetable consumption classifying participants on meeting the recommended daily intake of five servings of fruits and vegetables. Eight psychosocial variables were analyzed that measured to personal preference and motivation. Sociodemographic variables of age, race, education, marital status and size of household were analyzed as confounders. Frequencies were recorded for fruit and vegetables consumption, psychosocial determinants and sociodemographic variables. A bivariate analysis was done to determine the significance of each psychosocial and sociodemographic variable on fruit and vegetable consumption.

Results: Only 27.7% of the mothers and 44.2% of children consumed 5 or more servings of fruits and vegetables a day. Variables regarding food preparation and spoilage tested significant for effect on fruit and vegetable consumption. Other psychosocial and sociodemographic variables were not significant on effecting consumption, but showed significant trends.

Conclusion: Food storage and preparation as a motivation factor resulted in significant differences in meeting the criteria for fruit and vegetable consumption. Other variables analyzed in this study need to be further examined due to weaknesses in sample size and demographic construct of this study. Future initiatives should include cooking classes and emphasis on food storage and preparation techniques.

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Table of Contents

Introduction.....	1
<i>Importance of Fruit and Vegetable Consumption</i>	4
<i>Background on WIC and FMNP</i>	5
<i>Potential Barriers for the WIC Population</i>	7
Methods.....	8
<i>Study Design</i>	8
<i>Study Population</i>	9
<i>Data Measures</i>	10
<i>Analysis</i>	14
Results.....	17
Discussion.....	21
<i>Strengths and Weaknesses</i>	24
<i>Conclusion</i>	25
References.....	26
Tables.....	29
Appendices.....	37

Introduction

Fruit and vegetable consumption are associated with decreased risks of chronic diseases such as cancer, stroke, cardiovascular disease and obesity.¹⁻⁴ In the United States, only a quarter of adults and only one in five children meet the recommended daily intake of five servings of fruits and vegetables.^{5,6} In addition, fifty-one percent of children in the United States consume less than one serving of vegetables daily.⁶

Low-income populations have been linked to poor dietary patterns, specifically with lower intakes of fruits and vegetables.^{5, 7-11} Healthy foods, including fruits and vegetables, are more expensive and less available in low-income neighborhoods.¹² The lack of availability and convenience of healthy foods in low-income neighborhoods results in even lower fruit and vegetable intake among low-income populations.^{7, 9, 12} The government has created food subsidies to help supplement the nutrition intake of low-income pregnant women and children less than five years of age.¹³⁻¹⁷

Women Infant Children (WIC) is a special supplemental nutrition program for women, infants and children. Participants of the WIC program all meet a certain guideline that focuses on categorical, residential, income and nutritional risk requirements.¹³ The WIC program offers a supplemental food package, nutrition education and referrals to healthcare and other services to its participants.¹³ Supplemental food packages are distributed in three different avenues. Food can be obtained through WIC authorized retail vendors, home delivered to the participant's home, or picked up from storage facilities operated by government agencies.¹³ In

addition to WIC subsidies, the Farmer's Market Nutrition Program (FMNP) was introduced to provide additional nutrition support to the current food subsidies. The FMNP was created to provide fresh and locally grown fruits and vegetables through farmers' markets and to promote awareness of use of farmers' markets.¹⁷ Another new program is the New WIC Package, which replaces the previous WIC package. The New WIC Package is a subsidy that seeks to increase fruit and vegetable intake.^{13, 17} Both the FMNP and the new WIC package are policy-based approaches aimed to increase the intake of fruits and vegetables in pregnant women and infants.^{13, 15, 16} Approaches in public health have often been focused on education, but recent attention has been placed on the importance of environmental and policy approaches.

Low-intake of fruit and vegetable consumption in low-income populations have been attributed to multiple psychosocial and sociodemographic factors.^{9, 18-22} Sociodemographic variables of race, education, marital status and smoking status have been examined in prior studies with mixed outcomes.^{9, 18, 22} Psychosocial factors of perceived environment, self-efficacy, knowledge, attitude and social support have also been examined in previous studies.^{9, 19-21} Studies have shown that self-efficacy and positive attitude reinforcement are correlated with fruit and vegetable consumption. The focus of this study is to examine personal preference and knowledge of fruit and vegetable availability and preparation among WIC participants in the state of Georgia.

The present study is a Centers for Disease Control and Prevention funded study that evaluates the impact of the current WIC Farmer's Market Nutrition

Program and the new WIC package on WIC recipients in Georgia. Four main objectives were identified for this study. The first objective is to examine the impact of the FMNP on the fruit and vegetable consumption of mothers and children who participate in the Georgia WIC FMNP. The second objective is to estimate the incremental cost per fruit and vegetable consumption with the WIC Farmer's Market coupons versus without a coupon. The third objective is to examine the benefits and barriers of the FMNP for WIC recipients in general and also among different demographic groups and WIC agency locations. The fourth objective is to examine the benefits and barriers of the new WIC package for fruit and consumption. The present study aims to provide baseline data for both the third and fourth objective. Benefits and barriers will be examined for all three groups of participants (Original WIC, FMNP, New WIC).

The primary objective of the present study is to examine the relationship between personal preference and motivation of healthy eating habits to the consumption of fruits and vegetables among mothers and children participating in the WIC program in the state of Georgia. As a secondary objective to the psychosocial exposure factors of personal preference and motivation, sociodemographic factors will also be examined as possible confounders of low fruit and vegetable consumption. Understanding the barriers and factors influencing low-intake of fruits and vegetables among low-income populations will allow for future progression and effectiveness of the WIC program with improving nutrition. Additional background information on the importance of fruit and vegetable consumption and potential barriers will allow for a deeper understanding in the

examination of personal preference and motivation and its effectiveness on fruit and vegetable consumption.

Importance of Fruit and Vegetable Consumption

Fruits and vegetables have fiber, minerals and essential vitamins that can be preventative from chronic diseases such as stroke, cardiovascular diseases and certain cancers.²³ Increasing fruit and vegetable consumption can also help with maintaining and achieving a healthy weight. Replacing high calorie foods with low calorie fruits and vegetables allows for lower calorie intake resulting in weight loss.²⁴ The National Cancer Institute and Centers for Disease Control and Prevention has recommended that a minimum of five servings of fruits and vegetables be consumed daily for a healthy diet.^{25, 26, 27}

In 2009, only 32.5% of adults consumed fruit two or more times a day and 26.3% of adults consumed vegetables three or more times a day.²⁷ Fruit and Vegetable consumption in the United States decreased between 2000-2009 from 34.4% and 26.7% of adults meeting the recommended daily intake of fruits and vegetables in 2000. In 2010, the CDC reported that certain demographic populations had a higher prevalence of fruit and vegetable consumption than others.²⁷ Women were more likely to consume fruits and vegetables than men. College graduates had a higher percentage of individuals who met the recommended daily consumption compared to those who did not finish college. Persons aged 65 and older had a higher consumption rate compared to all other age groups above 18 years.²⁷ Current evidence shows that fruit and vegetable consumption is lower among African Americans compared to white Americans.²⁸ The state of Georgia averages a higher

vegetable intake and lower fruit intake compared to the national average. In the state of Georgia, 29.9% of adults consumed fruit two or more times a day and 29.5% of adults consumed vegetables three or more times a day compared to the national average of 32.5% and 26.3%, respectively.²⁷

Background on WIC and FMNP

Women Infant Children was created in 1972 in response to the recognition that many low-income pregnant women and infants were malnourished. Many studies in the 1960's showed hunger as a major problem in the United States and special attention was placed on pregnant women, infants and children.¹⁶ Currently WIC services approximately 8 million participants with a slight growth around five-percent annually.¹⁴ To qualify for WIC, participants must meet categorical, residential, income and nutritional risk eligibility requirements.¹³

WIC participants meet categorical eligibility by being either a pregnant woman, a non-breastfeeding woman up to six months postpartum, a breastfeeding woman up to one year postpartum, an infant up to his/her first birthday or a child up to his/her fifth birthday.¹³ Participants must also reside in their state of declared eligibility and meet income guidelines established by the WIC (see appendix). WIC participants are also required to meet nutritional risk requirements, proving nutritional deficiency or predisposed conditions for nutritional deficiency.¹³

WIC is administered through the USDA's Food and Nutrition Service Agency (FNS).¹⁶ The USDA federal agency has allowed WIC State agencies to make decisions on specific brands, forms and package sizes that are appropriated for WIC recipients.¹³ State agencies also assist local agencies in program operations. The

Federal government provides 100% of funding for the WIC program. In 2008, \$6.2 billion was spent on the WIC program.¹⁴ Additional funding is also allocated for programs attached to WIC like the Farmer's Market Nutrition Program.

The WIC Farmer's Market Nutrition Program (FMNP) was created in response to knowledge of access and affordability barriers of fruits and vegetables to low-income populations. The Food and Nutrition Service Agency began the program in 1992 to provide low-income populations with an additional source of fruit and vegetable intake. The FMNP provides coupons for WIC recipients to receive fresh, unprepared and locally grown fruits and vegetables.¹³ In addition to promoting fruit and vegetable consumption, the FMNP was created to expand awareness and sales at local farmers' markets.¹³ As of 2007, the FMNP was available in 38 states, the District of Columbia, Guam, Puerto Rico and five Indian Tribal Organization.¹³ In Georgia, the FMNP coupons are offered on a first come, first served basis. The FMNP coupon is given in addition to the regular WIC vouchers. The coupons are redeemable at approved Georgia farmers markets and are not able to be used at grocery stores.¹⁷

The FMNP is funded by both the federal and state government; the federal government supports all of the food costs and splits administrative costs with each state government.¹³ In 2007, the state of Georgia distributed over 35,000 coupons for the Farmer's Market Nutrition Program, which totaled over one million dollars. Currently Georgia is the 7th largest FNS Farmer's Market appropriation. Each WIC eligible recipient in Georgia can receive thirty dollars in redeemable FMNP coupons each growing season (i.e. twice a year).²⁹

Potential Barriers for the WIC Population

Psychosocial factors of self-efficacy, knowledge, attitudes and social support have been shown to influence fruit and vegetable consumption, especially in low-income populations.⁹ Cost, convenience, taste and personal preference have been identified in several studies to influence dietary patterns.³⁰ In addition to psychosocial factors of motivation and knowledge, many studies have shown that sociodemographic factors influence the effect of psychosocial factors on fruit and vegetable intake.³¹ Sociodemographic factors examined include race, gender, age and household income.

For the current study, psychosocial and sociodemographic evidence will be examined to provide evidence of its effect on fruit and vegetable consumption in the metro Atlanta area. The demographic population of the current study in Atlanta, Georgia differentiates this study from prior studies. The majority of WIC participants in the current study are African American who reside in an urban setting (Fulton and DeKalb Counties). The present study will provide data relating the various effects of personal preference and motivation barriers on fruit and vegetable consumption among WIC participants in the metro Atlanta area. Information from this study will be important in constructing future education initiatives and determining ways to increase fruit and vegetable consumption.³²

Methods

Study Design

Data from the IRB approved Emory WIC Study was used in this analysis to determine the impact of participants' motivation and personal preference on fruit and vegetable consumption. Data was collected during three survey-based interviews with participants. Participants were first interviewed in person for the baseline survey, then completed a one-week follow-up phone interview and concluded with a one-month phone interview. In the present study, only data from the baseline survey will be used in the examination of fruit and vegetable intake because psychosocial and sociodemographic data was only collected during the baseline survey. Interviews were conducted in three phases, each phase pertaining to a separate study group. The three groups included: 1) original WIC group, 2) Farmer's Market Nutrition Program (FMNP) and 3) New WIC package group. Participants were selected at two metro-Atlanta WIC agencies, Adamsville-Fulton and Kirkwood-DeKalb. Data in the present study will use the baseline data collected from these three groups at the two different locations.

Participants in the study were classified in three arms as 'Original WIC', 'Farmer's Market (FMNP)' and 'New WIC' (group information defined in background section). A total of 249 participants were given the baseline survey; 82 individuals completed the baseline survey in the original WIC package, 89 individuals completed the baseline survey for the FMNP package, and 77 individuals completed the baseline survey for the New WIC Package.

Original WIC package participants received the regular WIC food package without the FMNP coupons and without the new fruit and vegetable subsidy.

Original WIC package participants were interviewed prior to the FMNP season, in March and April 2009. FMNP participants were interviewed in May and June 2009 after receiving both the regular WIC food package and the FMNP coupon without the new WIC fruit and vegetable subsidy.

The FMNP coupon consisted of an extra thirty dollars per season for use at Farmer's Markets for fresh fruits and vegetables.¹³ Finally, the New WIC group received the new WIC food package which consisted of a six to ten dollar per month fruit and vegetable subsidy, without the farmer's market coupon.¹⁷ Participants in the New WIC group were interviewed starting in October 2009. Participants in all three groups received a juice subsidy (288 oz/month for 'Original WIC Package' and 'FMNP', 128 oz/month for 'New WIC Package') and nutrition education.

Study Population

All participants of the study had to meet a set of inclusion criteria to be eligible for selection into the study. The inclusion criteria for participants are that they have to be at least 18 years of age, an English speaker, receives WIC coupons/vouchers at the Fulton Adamsville or DeKalb Kirkwood WIC clinic, has at least one child receiving WIC vouchers between the age of one and less than five (if mother had more than one child on WIC, only the oldest child's Fruit and Vegetable consumption was surveyed), and Receives WIC vouchers on date of interview (Original WIC package); WIC vouchers AND Farmer's Market Coupon (FMNP Package).

Data Measures

The data analysis for this study will use the baseline survey from the Emory WIC study. Data collected from the Original WIC Package, FMNP and New WIC Package participants will be included in the data analysis. In the survey, six questions were asked pertaining to the outcome of fruit and vegetable intake for the mother. The same six questions were asked to the mother regarding fruit and vegetable consumption of the oldest child receiving the food voucher. The six questions, for both mother and child, given in the survey asked about the daily or weekly consumption of six different categories of fruits and vegetables. Fruit and vegetable consumption were divided into the following six categories: fruit juice, fruit, green salad, potatoes (not including French fries), carrots and other vegetables.

Fruit and Vegetable Consumption Outcome Variable

The six questions pertaining to the outcome of fruit and vegetable intake on the baseline survey indicate the number of times a participant eats fruits and vegetables each day or week. The questions are stated so that participants can answer by number of times a day, number of times a week, 'Never', 'Don't Know', or 'Refused'. The response choices for the questions focusing on the fruit and vegetable consumption of the oldest child have the same answer choices as those asked to the mother. The six questions on the outcome of fruit and vegetable consumption for both mother and child were added together to create a single variable to better define the outcome variable. Participant's response for each of the six questions was

converted to weekly intake. Participants who answered by daily intake had their answer multiplied by a factor of 7 to denote servings of consumed per week.

Participants who answered with 'Never' were given a '0' value to denote no intake of in that fruit and vegetable category, those who answered 'Don't Know' or 'Refused' were also be given a value of '0'. Weekly consumption of each of the six fruit and vegetable categories were added together for total fruit and vegetable weekly consumption. The total weekly intake for each participant was then divided by seven to create a new variable denoted as average daily intake per participant. The daily intake will be compared to the recommended daily intake of 5 servings per day to determine if each participant meets the criteria. A final dichotomous variable was created classifying participants as "Meets Criteria" and "Does Not Meet Criteria". This procedure was carried out identically on the six questions pertaining to the oldest child's fruit and vegetable consumption.

Psychosocial Exposure Variable

The psychosocial exposure factors examined are focused on personal preference and motivation factors of fruit and vegetable consumption for participants. In total, thirteen subtopics of personal preference and motivation were asked in this survey. The available answer selections for each question were Strongly Disagree, Disagree, Neutral, Agree and Strongly Agree. The thirteen exposure statements were as follows: 1) I didn't grow up eating many fruits and vegetables, 2) I don't like the taste of most fruits and vegetables, 3) My family doesn't like fruits and vegetables, 4) I already eat plenty of fruits and vegetables, 5) I don't know how to choose good quality fruits and vegetables, 6) I don't know when

certain fruits and vegetables are in season, 7) I don't know how to store most fresh fruits and vegetables, 8) It is difficult to store fresh fruits and vegetables in my home, 9) They often spoil before I get a chance to eat them, 10) I don't know how to prepare most fresh fruits and vegetables, 11) Fresh fruits and vegetables take too much time to prepare, 12) Fresh fruits and vegetables cost too much money and 13) Fresh fruits and vegetables are too big and/or too bulky to carry home easily.

Out of these thirteen exposure subtopics, eight were used in the final analysis to measure the effect of each on fruit and vegetable consumption. The other psychosocial subtopics were eliminated due to lack of relevancy or strong correlation with another subtopic. The exposure subtopics selected for final analysis were 1) Didn't grow up eating many fruits and vegetables, 2) Don't like the taste of fruits and vegetables, 4) Already Eat Plenty of Fruits and Vegetables 4) Don't know when certain fruits and vegetables are in season, 5) Difficult to store fresh fruits and vegetables, 6) They often spoil before I eat them, 7) Don't know how to prepare fruits and vegetables, and 8) Fresh fruits and vegetables cost too much.

For the analysis, the five answer choices for each exposure statement were classified into three answer choices. "Strongly Disagree" and "Disagree" were categorized as one variable and "Strongly Agree" and "Agree" were categorized as one variable and the neutral variable remained the same. After the reclassification of answer choices, a correlation analysis was performed to determine the variables that would be used for the final analysis.³³ The purpose of the correlation analysis was to eliminate redundancy among the statements to provide the most accurate model. In addition, each statement was examined for relevance to the study. After

performing the correlation analysis, eight of the thirteen exposure statements were chosen for the final model. The six statements were eliminated due to a strong correlation with another question or a lack of relevancy to the study of psychosocial effects and fruit and vegetable consumption.

Sociodemographic Confounder Variable

In addition to the eight psychosocial measures, seven sociodemographic variables were identified as potential confounders. These confounder variables included race, age, education status, marital status, number of children in the household, number of adults in the household and concern about having money to purchase nutritional meals. These variables were chosen based on information provided in other studies suggesting possible confounding.^{9, 12, 18-22, 28, 30-32} The question pertaining to 'concerned about having enough money to eat nutritious meals' was reclassified as a psychosocial effect due to the nature of the question. For the analysis, the answer choices for this question were kept as 'yes', 'no', 'don't know' and 'refused'. The remaining six sociodemographic confounder questions were race, age, education level, marital status, number of children in the household and number of adults in the household.

For the question regarding race, six answer choices were available: 'White', 'Black or African American', 'Asian', 'Native Hawaiian or Other Pacific Islander', 'American Indian or Alaska Native' and 'Other'. The answer choices were kept in the same format for analysis and missing and refused values were omitted. The question regarding age was given so that participants would answer with a continuous number. For the analysis, participants were divided into four age ranges:

'18-24', '25-29', '30-34' and '35+'. A variable for categorical age and continuous age were both created for final analysis using SAS. Marital Status contained six answer choices that were classified into three categories. The first category was 'Single', the second category combined 'Married' and 'Unmarried Couple', and the third category combined 'Separated' "Divorced' and 'Widowed.' Education level contained nine answer choices that were combined to form four categories. The four categories for education level were '< High School', 'High School Graduate', 'Some College' and 'College Graduate.' Number of children in household was kept as a continuous variables and number of adults in the household was kept as a six-answer choice variable. Categorical classification for age, marital status and education were derived from prior research studies.^{9,19}

Analysis

First, frequencies were calculated to determine the average consumption of the six fruit and vegetable categories for mothers and for the oldest child (separately). The mean and standard deviation of all participants were then calculated for their daily consumption and reported. The mean and standard deviation were reported using Microsoft Excel. Using the frequencies of fruit and vegetable consumption, a dichotomous variable was a created classifying participants as 'Meets Criteria' and 'Does Not Meet Criteria'. The percentage of mothers and of the oldest child who met the criteria was reported. The mean and standard deviation for each of the six fruit and vegetable categories were created to display each participant's diet.

Frequencies were also calculated for the psychosocial variables. The variables were separated based on whether the mother met the fruit and vegetable consumption criteria. Then percentage frequencies were classified by the answer spread (Agree, Neutral, Disagree) for those who met and did not meet the fruit and vegetable consumption criteria. Psychosocial variables were classified and reported in six categories; Agreed (with statement) and Met (Criteria), Agreed Did Not Meet, Neutral Met, Neutral Did Not Meet, Disagree Met, Disagree Did Not Meet.

Percentages were also calculated and reported for sociodemographic data. Sociodemographic data for age, race, marital status and education level were analyzed by separating participants into two groups (meets criteria and does not meet criteria). Sociodemographic data on number of children in the household and number of adults in the household were analyzed by taking the mean and standard deviation of each dichotomized category. Sociodemographic data was reported with percentages of each category (i.e. race), showing both the results for the dichotomized criteria groups and also the total number of participants.

A logistic model was fitted in the analysis with the dependent variable as the measured outcome of fifteen independent exposure variables. The fifteen independent variables included eight psychosocial variable and six sociodemographic confounder variables. The outcome variable is defined as fruit and vegetable intake by mother and by child. The fruit and vegetable intake of mother and child will be analyzed separately using two different models.

A bivariate analysis was performed using a logistic regression function on the fifteen independent variables and the dichotomous fruit and vegetable consumption

variable for both mother and oldest child. Each of the fifteen independent variables was individually fit into a bivariate analysis with the dichotomous variable of mother's fruit and vegetable consumption as the outcome. Outcome measures of the coefficient estimate, p-value, odds ratio and confidence interval were collected and reported. Upon collecting data from the bivariate analysis, variables with a p-value of less than 0.5 were noted and fit into the final full model. Two variables were fit into the final model of mother's fruit and vegetable consumption, these variables were 'Fruits and Vegetables often spoil before I eat them' and 'Don't know how to prepare most fruits and vegetables.' The full model was then analyzed using a logistic function and outcome measures were reported. An identical bivariate analysis was performed using all fifteen independent variables with the oldest child's fruit and vegetable consumption as the outcome. Only one variable had a p-value of less than .05, so a full model was not necessary for the reporting of the outcomes for oldest child's fruit and vegetable consumption. The analysis for this study utilized SAS 9.2 statistical software.³⁴

Results

Table 1 summarizes the number for both the mother and oldest child who were included in the data analysis. Of the 248 participants who completed the survey, 82 of them were in the Original WIC Package, 89 in the FMNP and 77 individuals were part of the New WIC package.

Table 2 presents the outcome data for mother's fruit and vegetable consumption. Fruit Juice and Fruit had the highest average intake with 1.12 and 1.08 respectively. Carrots, Potatoes and Green Salad had the lowest average daily consumption at .23, .24 and .36 servings, respectively. The average total daily intake of fruits and vegetables among mothers was 3.92 servings. Only 27.7% of mothers met the daily-recommended intake of five servings of fruits and vegetables. Average total daily intake of fruits and vegetables by mothers ranged from 0 to 18 servings.

Average total daily intake of fruits and vegetables of the oldest child participating in the WIC study (reported by mothers) is reported in Table 3. Fruit Juice and Fruits had the highest daily intake at 1.94 and 1.32 servings, respectively. Green Salad, Carrots and Potatoes had the lowest average daily intake with .26, .28 and .32 servings, respectively. The average reported daily intake of the oldest child is 5.25 with 44.2% of children meeting the recommended-daily intake of 5 servings of fruits and vegetables. The range of average daily intake of fruits and vegetables by the oldest child ranged from 0 to 21 servings.

Frequencies from the thirteen psychosocial exposure variables identified from the survey are reported in Table 4. Overall, participants in both criteria groups disagreed with the following statements: 1) Didn't grow up eating many fruits and

vegetables, 2) Don't like the taste of fruits and vegetables, 3) Family doesn't like fruits and vegetables, 4) Fruits and vegetables take too much time to prepare, 5) Fresh fruits and vegetables are too big or bulky to carry home. Answer choices for these groups had uniform responses among the dichotomous criteria group with over 85% of participants disagreeing with the statement.

Participants also disagree with the statements of 1) Don't know how to choose fresh fruits and vegetables, 2) Don't know which fruits and vegetables are in season, 3) Don't know how to store fresh fruits and vegetables and 4) Fresh fruits and vegetables cost too much. Between 70% and 85% of participants disagreed with these statements with minor frequency differences between the dichotomous criteria variable. Participants disagreed with the following statements, but with variability among the dichotomous criteria group 1) Difficult to store fresh fruits and vegetables, 2) Fruits and vegetables often spoil before I eat them and 3) Don't know how to prepare fresh fruits and vegetables. These variables were analyzed with a logistic function to determine the significance of variability among the dichotomous criteria variable. The majority of participants agreed with the statement that they 'already eat plenty of fruits and vegetables'; however, those who met criteria had a larger percentage of 'agrees' compared to those who did not meet criteria.

Sociodemographic confounding data for the Emory WIC study is presented in Table 5. The age range of mothers participating in the study ranged from 18-66. The majority of mothers in this study were in the age category of 18-24 (30.5%) and 25-29 (28.5%). Frequencies of age distribution among the four categories did not differ

between the dichotomous criteria groups. African-Americans consisted of 99.6% of the participants with the other .4% accounting for multi-racial African-Americans. Single mothers accounted for 75.9% of participants, another 15.7% reported being married or having a live-in partner and 8.4% reported having been separated, divorced or widowed. The marital status frequencies did not differ significantly between the dichotomous criteria variable. The majority of participants in this study were high school graduates (48.0%), 13.3% of participants completed some high school, 30.7% completed some college and 6.1% of participants were college graduates. Those who met the recommended-daily intake of fruits and vegetables had a slightly higher percentage of individuals who completed college. Participants in this study averaged 2.4 children and 1.2 adults in the household. The number of children in the household ranged from 1-8 and number of adults ranged from 1-6. The majority of participants in this study (69.4%) did not report concern about money; however, those who met criteria had a higher percentage of individuals who did not have concern about money compared to those who did not meet criteria.

Table 6 presents the outcomes of the bivariate analysis for the fifteen independent variables and the dichotomous criteria variable for mother's fruit and vegetable consumption. Out of the fifteen variables, only three variables showed a significant difference between mothers who met criteria and mother's who did not meet criteria. The variables 'Already eat plenty of fruits and vegetables' had a p-value of 0.4, 'Fruits and vegetables often spoil before I eat them' had a p-value of 0.2 and 'Don't know how to prepare most fruits and vegetables' had a p-value of 0.4.

The other variables did not show a significant difference in outcomes for meeting the criteria of mother's fruit and vegetable intake.

The outcome of the bivariate analysis for child's fruit and vegetable consumption along with the fifteen independent variables is presented in Table 7. Only two variables had a significant difference in outcome of child's fruit and vegetable intake. 'Already eat plenty of fruits and vegetables' had a p-value of 0.4 and 'Concerned about money' had a p-value of 0.2. None of the other variables showed a significant difference in the outcome of child's fruit and vegetable intake.

Discussion

This study revealed notable trends for psychosocial exposure determinants, sociodemographic confounder variables and fruit and vegetable consumption. Nine psychosocial exposure variables and six sociodemographic confounder variables were analyzed in this study to determine its effect on fruit and vegetable consumption. Three of these variables; 'Already eat plenty of vegetables', 'Fruit and Vegetables often spoil before I eat them' and 'Don't know how to prepare most fruits and vegetables'; showed significant differences in mothers who met the recommended daily intake of fruits and vegetables compared to mothers who did not. Comparing the dichotomous criteria for children, two variables were reported to have significant differences; 'Already eat plenty of fruits and vegetables' and 'Concerned about money'. In addition to the effects of psychosocial and sociodemographic determinants on fruit and vegetable intake, notable trends were evident among each of these variables. Exploration of psychosocial and sociodemographic trends along with their significant variables reveals important issues regarding perception of diet, food storage and preparation.

Clear trends were reported for the consumption of fruits and vegetables for both women and children. Like previous studies, sociodemographic variables explained little on fruit and vegetable consumption outcome but did display general trends for the overall study population.⁹ Fruit juice consumption was the highest category of fruit and vegetable intake for both women and children. Potato, carrot and green salad consumption were consumed the least out of the six categories. Examination of the categorical breakdown for fruit and vegetable consumption is

important for development of new WIC initiatives focused on fruits and vegetables. Fresh fruits and green leafy vegetables are highly recommended for a healthy diet.²⁵ Fruit juice consumption has been criticized for high sugar content often with sparse nutritional benefits.^{23, 24, 35} Further examination on knowledge of fruit and vegetable consumption will be beneficial to developing education programs and tailoring new WIC initiatives toward healthier diets. As part of the Emory WIC study, a current analysis is being done to examine the impact of the New WIC package on fruit juice consumption.

An analysis on perception of fruit and vegetable intake showed that the majority of mothers in this study believe they 'already consume plenty of fruits and vegetables'. However, only 27.7% of mothers in this study met the recommended daily intake of five servings of fruits and vegetables a day. There was a notable difference in the percentage of mothers who actually met criteria and agreed to this statement and mothers who did not meet criteria and agreed with this statement. The bivariate analysis allowed for a conclusion that the mother's perceived intake of fruits and vegetables has an effect on their actual consumption of fruits and vegetables. Prior studies concur with these results noting that knowledge of number of servings of fruits and vegetables to consume was a determinant for higher intakes of fruits and vegetables.^{9, 36}

Analysis from this study also showed that mothers who did not meet the fruit and vegetable consumption criteria agreed with the statement 'Fruits and Vegetables often spoil before I get the chance to eat them' more than mothers who did meet the fruit and vegetable consumption criteria. The significant difference

among the groups demonstrates a need to address storage and selection of fruits and vegetables for WIC participants in metro-Atlanta. For future research, additional information needs to be gathered regarding fruit and vegetable storage, selection and knowledge of preparation.

Mothers who did not meet fruit and vegetable consumption criteria were more likely to agree to the statement 'Don't know how to prepare fruits and vegetables' compared to mothers who did consume over five servings of fruits and vegetables a day. Evidence of this difference is cited in a previous study done by the University of Maryland which noted that participants of the Maryland WIC claim to spend little time cooking each day, rarely used recipes and prepared larger meals only on weekends.³⁷ In this current study, preparation time was examined through the question 'Fruits and vegetables take too long to prepare;' however, there was not a significant difference among the dichotomous groups on the statement. Additional research needs to be done regarding preparation as an exposure variable to the outcome of fruit and vegetable consumption. In addition, future education and research initiatives should offer cooking classes and focus on teaching participants how to use recipe books.

The general trend for psychosocial exposure variables showed that mothers perceived that they consumed adequate amounts of fruits and vegetables. Mothers also generally disagreed with statements regarding lack of knowledge of fruit and vegetable consumption; such as, knowing how to choose fresh fruits and vegetables and knowledge of seasonal fruits and vegetables. Questions regarding taste, family preference and personal preference also received strong frequencies of

disagreements. The general trend of answers contradicted the results that only 27.7% of mothers consumed an adequate amount of fruits and vegetables daily. The contradicting results can be partly attributed to the subjective wording used in the survey tool. The false perception of adequate consumption of fruits and vegetables by participants needs further examination to determine if the trend is a result of the survey wording or an actual trend of false perception. The findings in this study show that perception of diet and knowledge of storage and preparation for fruits and vegetables are significant exposure variables to the outcome of fruit and vegetable consumption.

Strengths and Weaknesses

The Emory WIC Study contained two main strengths that allowed for great analysis and research on this topic. First, great data specific to the metro-Atlanta low-income population was collected. Second, the study was planned and implemented with great results. The survey tool was thorough in gathering information for analysis in accomplishing the four original goals. The team involved in gathering and entering data completed this task with great emphasis on detail. The well-planned execution of the study allowed for easy access and interpretation for data analysis, eliminating the margin of error.

Weaknesses of this study include sample size, systematic bias of participant answers and participant interpretation for certain questions. Only 248 participants were included in this study. The small sample size resulted in a homogenous population that might not reflect the true demographic population of WIC participants in metro-Atlanta.

The psychosocial questions asked in this survey were subjective in its wording. The subjective nature of the questions allowed for participants to self-interpret the question. Recommendations for future research would include having objective benchmarks to these questions to better assess the psychosocial determinants of the metro-Atlanta WIC population.

Conclusion

This study provided analysis on psychosocial and sociodemographic data for the metro-Atlanta WIC population with the goal of improving diet by increasing fruit and vegetable consumption. The majority of participants in this study did not meet the recommended daily intake of five servings of fruits and vegetables a day. The importance of fruit and vegetable consumption needs to be addressed in future WIC program initiatives to better improve the diet of metro-Atlanta WIC participants. Psychosocial exposure variables concerning food storage and food preparation showed significant outcome effects on fruit and vegetable consumption. Additional research needs to be done regarding knowledge and practice of food storage and food preparation to address their impact on fruit and vegetable consumption. Suggestions for future studies and initiatives include cooking classes and longitudinal studies on the New WIC package. This study indicated that additional emphasis needs to be placed on fruit and vegetable consumption in order to improve the quality of diet for WIC participants in metro-Atlanta.

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Tables

List of Tables

Table 1: Emory WIC Study Group Package Breakdown

Table 2: Mother's Average Fruit and Vegetable Consumption with Categorical Breakdown for Emory WIC Study

Table 3: Oldest Child's Average Fruit and Vegetable Consumption with Categorical Breakdown for Emory WIC Study

Table 4: Psychosocial Variable Frequencies Categorized by Agree, Neutral, Disagree Answer Choices and Dichotomous Fruit and Vegetable Consumption Criteria for Emory WIC Study

Table 5: Sociodemographic Characteristics and Categorized by Dichotomous Fruit and Vegetable Consumption Criteria for Emory WIC Study

Table 6: Bivariate Logistic Analysis for Emory WIC Study Measuring Mother's Fruit and Vegetable Consumption

Table 7: Bivariate Logistic Analysis for Emory WIC Study Measuring Oldest Child's Fruit and Vegetable Consumption

Table 1: Emory WIC Study Group Package Breakdown

Category	Original WIC Package	Farmer's Market Nutrition Program	New WIC Package	Total
Number of Mothers	82	89	77	248
Number of Children	82	89	77	248

Table 2: Mother's Average Fruit and Vegetable Consumption with Categorical Breakdown for Emory WIC Study

Mother's Fruit and Vegetable Consumption Categories (servings per day)	Mean	Standard Deviation
Average Fruit Juice Intake per Day	1.12	1.17
Average Fruit Intake per Day	1.08	1.20
Average Green Salad Intake per Day	0.36	0.48
Average Potato Intake per Day	0.24	0.49
Average Carrot Intake per Day	0.23	0.55
Average Other Vegetable Intake per Day	0.98	1.12
-		
Average Daily Intake of Fruits and Vegetables by Participating Mothers	3.92	2.63
% of Mothers Eating 5 or more Servings of fruits and vegetables a day	27.7%	
Range of Average Daily Consumption of Fruits and Vegetables by Mother	0-18	

Table 3: Oldest Child's Average Fruit and Vegetable Consumption with Categorical Breakdown for Emory WIC Study

Oldest Child's Fruit and Vegetable Consumption Categories (servings per day)	Mean	Standard Deviation
Average Fruit Juice Intake per Day	1.94	1.56
Average Fruit Intake per Day	1.39	1.23
Average Green Salad Intake per Day	0.26	0.46
Average Potato Intake per Day	0.32	0.67
Average Carrot Intake per Day	0.28	0.61
Average Other Vegetable Intake per Day	1.05	0.82
-		
Average Daily Intake of Fruits and Vegetables by Oldest Child	5.25	3.26
% of Oldest Child Eating 5 or more Servings of fruits and vegetables a day	44.2%	
Range of Average Daily Consumption of Fruits and Vegetables by Oldest Child	0-21	

Table 4: Psychosocial Variable Frequencies Categorized by Agree, Neutral, Disagree Answer Choices and Dichotomous Fruit and Vegetable Consumption Criteria for Emory WIC Study

Psychosocial Variable	Agree		Neutral Met	Neutral		Disagree Met	Disagree Not Met
	Agree Met	Not Met		Not Met	Disagree Met		
Didn't Grow Up Eating Many F&V	5.7%	8.9%	7.1%	3.9%	87.1%	87.2%	
Don't Like the Taste of F&V	7.1%	9.5%	4.3%	3.9%	88.6%	86.6%	
Family Doesn't like F&V	2.9%	2.2%	0.0%	1.7%	97.1%	96.1%	
Already Eat Plenty of F&V	78.6%	64.3%	14.3%	21.8%	7.1%	14.0%	
Don't Know How to Choose Quality F&V	7.1%	10.1%	5.7%	8.4%	87.1%	81.6%	
Don't Know Which F&V in Season	17.1%	15.1%	7.1%	8.9%	75.7%	76.0%	
Don't Know How to Store Most F&V	10.0%	12.3%	4.3%	6.2%	85.7%	81.6%	
Difficult to Store Fresh F&V	4.3%	8.9%	2.9%	5.6%	92.9%	85.5%	
F&V Often Spoil Before I Eat Them	14.3%	29.6%	14.3%	13.4%	71.4%	57.0%	
Don't Know How to Prepare Most F&V	2.9%	8.9%	1.4%	6.2%	95.7%	84.9%	
F&V Take Too Much Time to Prepare	2.9%	5.0%	1.4%	1.1%	95.7%	93.9%	
Fresh F&V Cost Too Much	18.6%	16.2%	10.0%	6.2%	71.4%	77.7%	
Fresh F&V Too Big/Bulky to Carry Home	0.0%	3.4%	1.4%	1.7%	98.6%	95.0%	

F&V= Fruit and Vegetable

Table 5: Sociodemographic Characteristics and Categorized by Dichotomous Fruit and Vegetable Consumption Criteria for Emory WIC Study

Characteristic/Scale	Met Criteria (n=69)	Not Met Criteria (n=180)	Total Percentage (n=249)
Categorical Age (years)			
18-24	32.9%	29.6%	30.5%
25-29	30.0%	27.9%	28.5%
30-34	12.9%	22.4%	19.7%
35+	24.3%	20.1%	21.3%
Race			
White	0.0%	0.0%	0.0%
Black	100.0%	99.4%	99.6%
Asian	0.0%	0.0%	0.0%
Native Hawaiian	0.0%	0.0%	0.0%
American Indian	0.0%	0.0%	0.0%
Other/Mixed	0.0%	57.0%	41.0%
Marital Status			
Single	75.7%	76.0%	75.9%
Married/Unmarried Couple	15.7%	15.6%	15.7%
Separated/Divorced/Widowed	8.6%	8.4%	8.4%
Education			
< High School	12.9%	16.3%	13.3%
High School Graduate	51.4%	46.6%	48.0%
Some College	28.6%	31.5%	30.7%
College Graduate	7.1%	5.6%	6.1%
Number of Children in Household			
	2.5	2.4	2.4
Standard Deviation	1.4	1.3	1.3
Number of Adults in Household			
	1.9	1.8	1.2
Standard Deviation	1.0	1.0	1.0
Concerned About Money			
Yes	22.9%	33.7%	30.7%
No	77.1%	66.3%	69.4%

Table 6: Bivariate Logistic Analysis for Emory WIC Study Measuring Mother's Fruit and Vegetable Consumption

Parameter	Estimate	Odds Ratio	Confidence Interval	p-value
Didn't Grow Up Eating Many F&V	0.0894	1.09	(0.66, 1.81)	0.73
Don't Like the Taste of F&V	0.1184	1.13	(0.69, 1.84)	0.64
Already Eat Plenty of F&V	-0.4731	0.62	(0.40, 0.98)	0.04
Don't Know When F&V in Season	-0.0560	0.95	(0.65, 1.37)	0.77
Difficult to Store Fresh F&V	0.4472	1.56	(0.85, 2.87)	0.15
F&V Often Spoil Before I Eat Them	0.4249	1.53	(1.07, 2.19)	0.02
Don't Know How to Prepare Most F&V	0.7697	2.16	(1.02, 4.58)	0.04
Fresh F&V Cost Too Much	-0.1582	0.85	(0.60, 1.22)	0.38
Age	-0.0145	0.99	(0.96, 1.02)	0.34
Race	3.1341	22.97	(0,1000)	0.99
Marital Status	0.0230	1.02	(0.65, 1.60)	0.92
Education	-0.0666	0.94	(0.66, 1.33)	0.71
Number of Children in Household	-0.0360	0.97	(0.78, 1.19)	0.74
Number of Adults in Household	-0.0933	0.91	(0.70, 1.19)	0.49
Concerned About Money	0.5126	1.67	(0.88, 3.17)	0.12

F&V= Fruit and Vegetable

Table 7: Bivariate Logistic Analysis for Emory WIC Study Measuring Oldest Child's Fruit and Vegetable Consumption

Parameter	Estimate	Odds Ratio	Confidence Interval	p-value
Didn't Grow Up Eating Many F&V	-0.0014	1.00	(0.64, 1.55)	1.00
Don't Like the Taste of F&V	0.1363	1.15	(0.74, 1.77)	0.54
Already Eat Plenty of F&V	-0.3877	0.68	(0.47, 0.99)	0.04
Don't Know When F&V in Season	0.1716	1.00	(0.00, 0.27)	0.33
Difficult to Store Fresh F&V	0.3934	1.48	(0.91, 2.41)	0.11
F&V Often Spoil Before I Eat Them	0.1944	1.22	(0.90, 1.63)	0.20
Don't Know How to Prepare Most F&V	0.3563	1.43	(0.88, 2.33)	0.15
Fresh F&V Cost Too Much	0.0582	1.06	(0.76, 1.48)	0.73
Age	0.0264	1.03	(1.00, 1.06)	0.08
Race	3.4984	33.06	(0, 1000)	0.99
Marital Status	0.2487	1.28	(0.85, 1.94)	0.24
Education	-0.1263	0.88	(0.64, 1.21)	0.44
Number of Children in Household	-0.0220	0.98	(0.81, 1.19)	0.82
Number of Adults in Household	-0.2155	0.81	(0.63, 1.03)	0.09
Concerned About Money	0.6896	1.99	(1.13, 3.50)	0.02

F&V= Fruit and Vegetable

Appendices

Table 1: Recruitment, interview and intervention schedule for Emory WIC Study

Interview/ Intervention Schedule	March	April	Farmer Market Begins	May	June
Usual Care				May 1	
Recipient receives normal WIC subsidies and WIC Nutrition Consult Referral to Study Interviewer	X	X			
If agrees to participate, study interviewer obtains consent and conducts Baseline Interviews (in WIC Clinic).	X	X			
Follow- up interview – by Phone. One week after baseline by study interviewer. Incentive mailed to participant.	X	X			
Farmer’s Market Coupon Intervention					
Recipient receives normal WIC subsidies, WIC Nutrition Consult AND Farmer’s Market Coupon Referral to Study Interviewer				X	X
If agrees to participate, study interviewer obtains consent and conducts Baseline Interviews (in WIC Clinic).				X	X
Follow- up interview – by Phone One week after baseline by study interviewer Incentive mailed to participant				X	X

Table 2: Demographic characteristics for WIC recipients in Fulton and DeKalb counties, metro-Atlanta area, 2005³⁸

County	Racial Group			
	White	Black	Hispanic	Other/ Mixed Race
Fulton	1,358 (5%)	16,160 (61%)	5,429 (20%)	3,651 (14%)
DeKalb	1,531 (4%)	22,223 (64%)	9,383 (27%)	1,404 (4%)

Table 3: Inclusion Criteria for Emory WIC Study

Criteria	Description
1	Postpartum woman who is certified for WIC participation OR Parent or guardian of child who is certified for WIC subsidy
2	18 years or older
3	English speaker
4	Receives WIC services at one of the five study WIC agencies
5	Receives at least one month of WIC vouchers (normal package) at time of baseline interview
6	For intervention group - must receive Farmer's Market Coupon