

**Family Influence on Fruit and Vegetable Consumption Among  
Rural, Low-Income, Preschool Children:  
A Preliminary Investigation of Factors Associated with Obesity**

Final Report Presented to  
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# **Family Influence on Fruit and Vegetable Consumption Among Rural, Low-Income, Preschool Children: A Preliminary Investigation of Factors Associated with Obesity**

## **ABSTRACT**

Children raised in families with low incomes and educational levels are at-risk of food insecurity and inadequate dietary intake, particularly consumption of fruits and vegetables which is often associated with increased risk of obesity. *Family Influence on Fruit and Vegetable Consumption Among Rural, Low-Income Preschool Children: A Preliminary Investigation of Factors Associated with Obesity* focused on the influence of both mothers and grandmothers on the food intake of young children—a phenomena not extensively found in nutrition literature yet called for at the April, 2008 NIH Conference on *Decision Making in Eating Behavior: Integrating Perspectives from the Individual, Family, and Environment Meeting*.

This project was designed to provide preliminary data regarding similarities and differences in nutrition-related predictors: socio-economic status, food security, access to food outlets, attitudes and behaviors. Resources, feeding practices, and personal dietary habits of 62 rural low-income mothers and grandmothers were determined. Implications for future research and programmatic initiatives are noted.

This project also tested instrumentation and data collection methodologies for utility in a future, more extensive, study of intergenerational family factors affecting obesity among the targeted population. A grant proposal was submitted to USDA for funds through the National Research Initiative.

## **ORGANIZATION OF REPORT**

The components of this report include:

- 1) Statement of the Problem
- 2) Prior Community-based Research Studies
- 3) Project Goals, Objectives, and Research Questions
- 4) Data Collection and Methodology
- 5) Study Aims and Findings
- 6) Discussion and Conclusions
- 7) Lessons Learned
- 8) Additional Grant Proposal Submitted to USDA National Research Initiative
- 9) Research Dissemination to Date
- 10) Plans for Next Steps
- 11) Selected References





## **STATEMENT OF THE PROBLEM**

Gillespie & Gillespie (2007), writing about family food decision-making, emphasized the need to better understand the interaction of forces internal and external to families that affect decision-making. They provided evidence that nutrition educators need to understand, and incorporate in their programming, influences on decisions to consume or not consume recommended food for the nutritional needs of the children and their families. Those influences include perceptions and preferences of the immediate and extended family members as well as the ability to acquire needed foods.

Gillespie & Gillespie (2007) also determined that both family decision-makers and nutrition educators agreed that, even if individuals are aware of alternatives and conscious of their decisions, constraints such as acquiring food remain as great barriers to incorporating recommended dietary intake. Thus, understanding the contexts in which low-income mothers and their children live, especially their family, neighborhoods, community, and geographic location, and the influence of those systems on food decision-making appears to be a critical and currently incomplete line of investigation.

Based on years of experience with the Extension Food Stamp Nutrition Education (FSNE) and Expanded Food and Nutrition Education Programs (EFNEP), as well as recent experience in evaluating the *Sisters* project, the research team concluded that if gaps in knowledge about the influence of family members, and particularly intergenerational members, were better understood, the findings could be utilized to enhance the effectiveness of these programs in changing family food-related behavior and ultimately reducing childhood overweight (Rolls, Ello-Martin, & Tohill, 2004; Epstein et al, 2001).

The completed project, in collaboration with Maryland's FSNE and EFNEP programs, addressed nutrition-related predictors identified by Davison and Birch (2001): 1) types of fruits and vegetables available in the home; 2) related nutritional knowledge; 3) parental dietary intake of fruits and vegetables; and 4) family roles in food decision-making. Further, it focused on rural families, a population not well documented in the literature.

## **PRIOR COMMUNITY-BASED RESEARCH STUDIES**

Prior to the implementation of this project, the co-investigators in The Department of Family Science at the University of Maryland-College Park had partnered in a community-based research intervention with the Washington County Hospital in Hagerstown, Maryland. That project sought to provide partial answers to intervention research to reduce obesity-risks among the targeted population of rural, low-income, young African-American mothers and their children (Lutfiyya, Garcia, Dankwa, Young, & Lipsky, 2008). That study, *A Community Engagement Model: Sisters Helping Sisters Targeting Obesity in Young Women to Prevent the*

*Development of Type II Diabetes*, was funded by the U.S. Department of Health and Human Services, Office of Women's Health based on the DHHS Public Health Services and NIH program. *Sisters* was an intervention designed to implement strategies to prevent, reduce or eliminate health conditions associated with overweight and obesity among a population of rural, African-American young mothers living in Maryland where the prevalence of these health factors among African-American women is higher than other gender/race groups (34.5% & 30.0% respectively) (Maryland Department of Health and Mental Hygiene, 2005).

The *Sisters* study revealed the need to better understand environmental factors affecting risk—including food insecurity. Based on lessons learned during *Sisters*, the co-investigators decided to investigate further the potential barriers to food security by examining the availability, accessibility and affordability of food in that community (Braun & Anderson, 2008).

The *Sisters* study led to a proposal and award of research funds from the School of Public Health (SPH). As a result of the SPH funds, a community-based research project was conducted from 2006-2008 *to test community and household food security assessment methodologies for their utility in a future, more extensive study of community and family factors affecting obesity among the targeted population*. In general, that study used a modification of the Davison and Birch (2001) and the Glass and McAtee (2005) ecological models as the study framework to examine factors within, or influenced by, the community environment including availability, accessibility, and affordability of food resources.

Also, during these studies, the co-investigators conducted an obesity-related surveillance system that included the tracking of physical and human-made environments affecting food resources. Households were surveyed to determine perceptions about food security. The study started with an exploration of the relationship between neighborhood and community factors that could affect food insecurity within households as a factor associated with obesity. The study served as a prelude to the current study providing better understanding of the various contexts which influence children's food behavior. For both efficiency and effectiveness, tests of the instruments were needed by the research team to position them to better propose instrumentation for future studies and Extension education.

Based on preliminary results from these studies, the co-investigators chose to examine further the obesity-associated health outcomes in rural, low-income families by investigating the intergenerational family influences associated with food availability, accessibility, and affordability among these families. A proposal was submitted to the University of Maryland Agricultural Experiment Stations and Maryland Cooperative Extension in late 2007. Funds were awarded in early 2008. The project was conducted between February, 2008 and February, 2009.

**Preliminary data:** With the SPH funds, the PI, Co-PI, and team pilot-tested instrumentation to assess the relationship between perception and reality of food availability, accessibility, affordability and household food security as factors in the consumption of healthy food, especially fruits and vegetables. The team included Extension Educators and Department of Family Science students. The study was sited in Hagerstown, Maryland, through the Washington County Hospital Community Health Outreach Program. Findings from that study

became available in early 2008 and were considered as instrumentation began for the MAES-MCE project (Anderson & Braun, 2008).

Additionally, another two-year study of fruit and vegetable selection and preference among low-income elementary students, also under the direction of the PI, continued throughout 2008. That study, Project FRESH, funded by FSNE, is exploring the school component of the community for influence of school food service, teachers, peers and parents on child fruit and vegetable preferences and consumption behavior. First year data analysis is emerging. Second year data collection was finalized in late 2008 with analysis beginning in January, 2009. Findings are available from the PI. In general, the FRESH team learned that: 1) half of the children's families were experiencing food insecurity; 2) the social environment impacts consumption; 3) children's fruit and vegetable consumption is influenced by taste preference; 4) taste preference can be enhanced through multiple tastings and that 5) the school is a place where consumption decisions can be influenced through the impact of educational programming and peer influence. Parental modeling of fruit and vegetable intake and inclusion of children in food purchasing and preparation was associated with higher levels of intake (Pollock, Gross, & Braun, in press).

This MAES-MCE project added to the body of knowledge regarding food behaviors, particularly regarding fruit and vegetable consumption, and food security through a focus on the intra-family environment. Each of the described studies has tested instrumentation and data collection methodologies, as well as explored diverse samples and provided preliminary data. Taken together, these small-scale studies provide the project team with data that can be incorporated into a more holistic, comprehensive, multi-systems investigation with additional funding, and that can be utilized to inform FSNE and EFNEP curriculum modification.

### **PROJECT GOALS, OBJECTIVES AND RESEARCH QUESTIONS**

The focus of this current MCE-MAES study was on understanding the contexts in which low-income mothers and their children live, especially their family, neighborhoods, community, and geographic location, and the influence of those systems on food decision-making and childhood obesity. The influence of the grandmothers was of central interest. The study was designed to examine the communities and neighborhoods where rural, low-income, young, mothers reside, especially mothers-of-color and their families.

The integrated research and extension project was also created to reveal both perceptions and realities affecting food security within the social, economic, political and physical environments in which these families are embedded. The intended output of the study was to produce findings with implications for future environmental assessments and ultimately, for relative caregivers, mothers, and their children in preventing or reducing health risk factors. The intended output also included an understanding of the utility of the instruments and their limitations as a basis for future investigations. The overall goal of the MAES-MCE project was to pilot test community and household, or family, food security and other measures in preparation for decisions regarding instrumentation to be proposed in the future funding calls.

The general research question driving the broader research programs associated with this pilot test was: *What are the contextual factors--hindering and helping, perceived and real--related to the occurrence of health conditions associated with obesity among young, rural, low-income mothers and their children?* This MAES-MCE grant permitted an exploratory investigation that examined the more specific question of: *How best to measure intergenerational influences on feeding practices related to obesity-associated health outcomes in preschool-aged children?* Six specific objectives guided the data collection, processing and reporting:

**Objective 1:** Identify the adult family members, including extended family members, who purchase food for, and feed rural low-income preschool children or influence food decision-making behaviors.

**Objective 2:** Measure perceptions of availability, accessibility and affordability of fruits and vegetables and associated barriers to consumption.

**Objective 3:** Assess targeted family members' knowledge of, and ability to prepare meals that include fruits and vegetables.

**Objective 4:** Assess family members' income and sources of any public assistance, adequacy of income for family size, and mother's state of health and education level as variables associated with fruit and vegetable consumption.

**Objective 5:** Determine family members' preferences for, and consumption of fruits and vegetables.

**Objective 6:** Assess the relationship between the level of food security present in the household, fruit and vegetable consumption, income and other demographic data.

Three more specific questions guided this project:

1. Are the questions asked, instruments utilized, and methods of data collection appropriate, cost-effective and efficient for future research studies designed to reduce the impact of overweight and obesity on children of low-income, rural families?
2. What are the findings from this pilot project with regard to the fruit and vegetable consumption of the families in which low-income, preschool, rural children reside?
3. How could the findings be incorporated into the FSNE, EFNEP, and Washington Hospital County Community Health Outreach programs, in the coming programming year?

## DATA COLLECTION AND METHODOLOGY

**Advisory Committee.** The investigation was guided by a joint community-university Stakeholder Advisory Committee. The 2008 community advisory committee served as the core community team and included representatives of the Washington County Hospital. The university advisory committee included faculty in the University of Maryland School of Public Health and College of Agriculture and Natural Resources with expertise in nutrition, obesity, physical activity, community interventions and outreach and research and faculty in Cooperative Extension's Food Stamp Nutrition Education (FSNE) and Expanded Food and Nutrition Education (EFNEP) programs in both county and university-based positions as well as through the University of Maryland-Eastern Shore.

The advisory committees made recommendations regarding sample selection, subject incentives, and utilization of each instrument. They helped to judge the utility of the instruments for future investigations and the potential of the findings to answer key questions and to obtain the test sample.

**Research and Integration Plan.** The project objectives aligned with USDA research objectives to: "improve understanding of the behavioral and environmental factors that influence obesity" by exploring which family members impact the consumption patterns of preschool-aged children and how and why these family members may have a negative impact on the children's eating habits and weight (USDA, 2008, p. 85).

Attaining the objectives positions Maryland Extension faculty, especially those in Family and Consumer Sciences, and other rural-based nutrition programs to translate the research findings, as stated by the USDA to "use ... new information to develop effective intervention strategies for preventing overweight and obesity" in order to modify existing curricula or design new curricula for FSNE and EFNEP and other programs for family members of low-income preschool children living in rural Maryland (USDA, 2008, p. 85).

**Methods:** Three methodologies were used to collect data: 1) on-site face-to-face interviews; 2) telephone interviews and 3) mailed questionnaires. In consultation with the Stakeholder Advisory Committee, the project team matched method to site. The team determined the costs and benefits of each method of data collection for future investigations with this population.

**Sample:** The total sample included 65 respondents: 44 mothers and 21 adult female relatives. A convenience sample of 44 mothers who were eligible for, or receiving food stamps or WIC, and had at least one preschool-aged child living in the home, was recruited through the FSNE office in Garrett county and the EFNEP or FSNE offices in Alleghany, Kent, Queen Anne, Somerset and Washington counties. All mothers resided in one of the six participating counties which are among Maryland's 18 designated rural counties and areas where childhood obesity is a concern. (In Alleghany, Garrett, and Washington counties, 27% of the children were overweight and in Somerset County, only 2.7% of children were at the ideal weight in 2006 (MBRFSS, 2008). The MBRFSS did not have a large enough sample size for reporting in Kent and Queen Anne counties.)

Eighteen grandmothers and three other adult female relatives with whom the preschool child(ren) spent extended time (covering meal and snack times) were also sampled. Among the sample of 65, there were 14 matched pairs of mothers and their mothers (the preschool-aged children’s grandmothers). The matched pairs sample size was too small to run analyses comparing mothers and grandmothers from the same family.

Basic demographic information for the total sample can be found in Table 1. The sample overrepresented the African American population and had a higher level of education than anticipated. Also, the mothers were older than expected (mean age 30) and the grandmothers were younger than anticipated (mean age = 53).

**Table 1: Participant Characteristics**

	Mothers (n=44)	Grandmothers (n=18)
Mean Age (in years)	30	53
Race/ethnicity		
African American	68%	72%
White	23%	29%
Hispanic or Latino	2%	
Biracial/multiracial	7%	
Education Level		
Less than high school	9%	11%
High school	39%	33%
Some college	36%	39%
College	11%	11%
Graduate school	5%	6%
Median Monthly Income*	\$1770	\$2590
Mean Household Size	4 people	3 people
Median Monthly Income per Household Member*	\$470	\$1160
Percent Who Were Above the Federal Poverty Level*	52%	81%
Percent Who Report High or Marginal Food Security	55%	50%

Marital Status		
Single	52%	28%
Married or cohabiting	34%	50%
Divorced, widowed or separated	14%	22%
Percent who reported good, pretty good, or excellent health in the past year	82%	83%

\*mothers, N=42 and grandmothers, N=16 because 4 outliers were removed from the total sample.

**Instrumentation:** Quantitative data were collected using: 1) the USDA standardized assessment of food security; 2) instruments used to measure parental fruit and vegetable preferences and behavior from the FSNE Project FRESH; and 3) instruments used to measure food availability, affordability and accessibility used with the Hagerstown study. The complete instruments are available from the PI. The Stakeholder Advisory Committee was involved in decisions about the items to be included in the final instruments. The instruments are available from the PI.

**Analysis of Data:** Analyses were completed using a sample of 44 mothers and 18 grandmothers (n=62) with three outliers removed--other adult caregivers (n=3). Some analyses were done with the entire sample; some with the mother-grandmother matched pairs.

Descriptive statistics and simple bivariate analyses, such as chi-square and independent samples t-tests, were run to address each of the objectives. Descriptive statistics were used for all project objectives (see below); chi-square analyses to address components of Objective 4; and t-tests to address components of Objective 6. More extensive analyses were not possible because of the small sample size (N = 62). Therefore, the results below should be interpreted with caution.

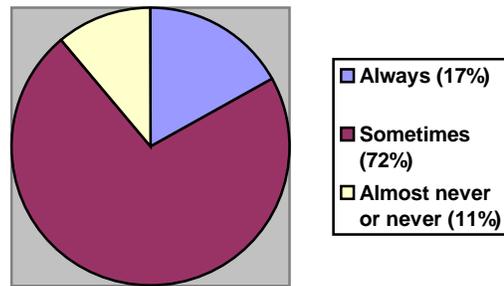


## STUDY AIMS AND FINDINGS

**Objective 1:** Identify the adult family members, including extended family members, who purchase food for, and feed rural low-income preschool children or influence food decision-making behaviors.

The 18 grandmothers in this sample were involved in their grandchildren's lives in several ways. More than 75% of the grandmothers reported caring for their grandchildren occasionally and 83% reported making or buying some or all of the food their grandchildren ate. Sixty-one percent of the grandmothers always or most of the time paid for the food that their grandchildren ate with them. As shown in Figure 1, the majority of grandmothers (72%) reported that they sometimes served their grandchildren an evening meal.

**Figure 1: Frequency with which Grandmothers Serve their Grandchildren the Evening Meal.**



**Objective 2:** Measure perceptions of availability, accessibility and affordability of fruits and vegetables and associated barriers to consumption.

**Availability:**



Most of the mothers and grandmothers in the sample (71%) felt that their neighborhood had everything that they needed to meet their daily grocery shopping needs. When they did report that food was unavailable, they mentioned lower prices and a better selection of grocery stores were necessary. When asked where they did their daily grocery shopping, 50% of respondents said they most often go to a big grocery store such as Food Lion or Acme and 48% of respondents said they most often go to a superstore, such as Wal-Mart with products beyond food and a few household cleaning supplies. These stores were, on average, 10-15 miles from the respondents' homes. For quick errands, 61% of respondents reported frequenting big grocery stores; 18% reported using convenience stores, such as 7-Eleven and CVS, and 11% reported using superstores. These convenience stores were, on average, 5-8 miles from the respondents' homes. Three-fourths of the mothers and grandmothers in the sample had also been to a farmer's market in the past.

**Accessibility:**



Most (77%) of the mothers and grandmothers in the sample obtained their groceries using their own car. Seventy percent of the sample reported that their vehicle was reliable. Participants also obtained groceries by: getting a ride from a friend or family member (34%), using public transportation (10%), walking (5%), and borrowing a car (3%).

**Affordability:**



For this low-income sample of mothers and grandmothers, healthier food was often too expensive to purchase. Thirty percent of the sample reported experiencing difficulty paying for food. Sixty percent indicated that fruits and vegetables were too expensive to purchase at least some of the time.

**Objective 3:** Assess targeted family members' knowledge of, and ability to, prepare meals that include fruits and vegetables.



Over 80% of the sample wanted their children or grandchildren to eat fruits and vegetables every day. Most respondents also reported serving vegetables on a daily basis. Approximately 75% of the sample reported always or almost always serving vegetables for the evening meal. However, only 28% of the sample reported always or almost always serving fruit for the evening meal.

**Objective 4:** Assess family members' income and sources of any public assistance, adequacy of income for family size, and mother's state of health and education level as variables associated with fruit and vegetable consumption.



For the total sample, the median monthly income was \$1,940, the median monthly income per household member was \$776 with 62% of the sample reporting household incomes that placed them above the federal poverty threshold (United States Census Bureau, 2008a). Looking at the mothers and grandmothers separately, the grandmothers had higher incomes than the mothers. See Table 1. The grandmothers' monthly income and monthly income per household member were statistically significantly above the mothers' monthly income ( $t=-1.99$ ,  $p=.060$  and  $t=-2.547$ ,  $p=.022$ , respectively). The grandmothers were also statistically significantly less likely to have a household income that was below the poverty threshold ( $t=-3.037$ ,  $p=.004$ ). It is important to note that these sub-samples were considered independent samples for the purpose of this analysis. In cases where the mothers and their children lived with the grandmothers, the incomes of each may not be distinct.

Most of the respondents' income did not come from public assistance. Very few of the mothers and grandmothers in this sample received SSI or TANF; those who did reported receiving less than \$25 per month. Twenty-five of the participants reported receiving food stamps; on average, they received about \$115 per month. Approximately half of the sample (53%) received assistance from WIC. Of the respondents who received WIC, 85% of them reported receiving vouchers for fruits and vegetables. Among the mothers and grandmothers in this sample, total household income was not statistically significantly correlated with fruit ( $r=1.84$ ,  $p=1.52$ ) or vegetable ( $r=-.075$ ,  $p=.561$ ) consumption.

Overall, the 44 mothers in the sample reported being in good health. Only 20% reported having fair or poor health in the past year. Three-fourths of the mothers had a high school degree (39%) or some college (36%). Self-reported health was not statistically significantly correlated with fruit ( $r=.054$ ,  $p=.729$ ) or vegetable ( $r=.010$ ,  $p=.951$ ) consumption among the mothers in this sample. Education was also not statistically significantly correlated with fruit ( $r = .059$ ,  $p = .703$ ) or vegetable ( $r = .233$ ,  $p = .128$ ) consumption.

**Objective 5:** Determine family members' preferences for, and consumption of fruits and vegetables.



Respondents overwhelmingly (90%) reported liking fruits and vegetables. However, mothers and grandmothers reported eating less than the daily recommended amount of fruits and vegetables. Only 27% of the mothers and grandmothers reported eating fruit more than once per day. Only 45% of the sample reported eating vegetables more than once per day with only 5% reporting eating vegetables three or more times per day. See Table 2 for more information on fruit and vegetable consumption.

**Table 2: Fruit and Vegetable Consumption**

	Full Sample (n=62)	Mothers (n=44)	Grandmothers (n=18)
Mean number of fruits and vegetables in the home (out of 20 pre-identified fruits and vegetables)	12 fruits and vegetables	12 fruits and vegetables	18 fruits and vegetables
Percent who like fruit	97%	98%	94%
Percent who like vegetables	92%	91%	94%
How many servings of fruit do you eat in a typical day?			
Percent who eat none	36%	34%	39%
Percent who eat one	37%	36%	39%
Percent who eat two	24%	25%	22%
Percent who eat three or more	3%	5%	00%
How many servings of vegetables do you eat in a typical day?			
Percent who eat none	11%	16%	44%
Percent who eat one	44%	43%	50%
Percent who eat two	40%	36%	06%
Percent who eat three or more	5%	05%	00%
How many servings of fruit do your children eat in a typical day?			
Percent who eat none	N/A*	07%	N/A*
Percent who eat one	N/A*	23%	N/A*
Percent who eat two	N/A*	34%	N/A*
Percent who eat three or more	N/A*	34%	N/A*

How many servings of vegetables do your children eat in a typical day?			
Percent who eat none	N/A*	05%	N/A*
Percent who eat one	N/A*	30%	N/A*
Percent who eat two	N/A*	55%	N/A*
Percent who eat three or more	N/A*	09%	N/A*

How often do you serve fruits for the evening meal?			
Almost always or always	29%	25%	39%
Sometimes	60%	59%	61%
Almost never or never	11%	19%	00%

How often do you serve vegetables for the evening meal?			
Almost always or always	74%	75%	72%
Sometimes	23%	23%	22%
Almost never or never	3%	02%	06%

\* only asked of mothers

**Objective 6:** Assess the relationship between the level of food security present in the household, fruit and vegetable consumption, income and other demographic data.

A little more than half of the sample of mothers and grandmothers (53%) reported high or marginal food security, and 47% reported low or very low food security (Table 3). T-tests were used to determine if respondents with high or marginal food security were significantly different from respondents with low or very low food security on fruit and vegetable consumption, income, whether or not fruits and vegetables were too expensive to purchase, respondents' health and weight. Food security status was not related to fruit ( $t=.471$ ,  $p=.639$ ) and vegetable ( $t=-.259$ ,  $p=.796$ ) consumption, monthly income ( $t=1.629$ ,  $p=.109$ ), or respondents' health ( $t=.884$ ,  $p=.380$ ) or weight ( $t=-.525$ ,  $p=.601$ ). However, food security status was related to whether or not the mothers and grandmothers thought fruits and vegetables were too expensive to purchase ( $t=3.314$ ,  $p<.01$ ). Those with high or marginal food security reported being able to purchase fruits and vegetables more often than those with low or very low food security.

**Table 3: Food Security Levels**

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<b>High or marginal</b>	<b>53%</b>
<b>Low</b>	<b>42%</b>
<b>Very Low</b>	<b>05%</b>

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## DISCUSSION AND CONCLUSIONS

Research has established that grandparents are important caregivers for preschool-aged children. In fact, 22.9% of children under 5 years old who live with their mothers are cared for by their grandparents (U.S. Census Bureau, 2008b). Additionally, mothers and grandmothers play an important role in determining what preschool-aged children eat and the lifelong eating habits they develop (Cooke, 2007; Lindsay, Sussner, Kim, & Gortmaker, 2006; Savage, Fisher, & Birch, 2007).

**Grandmothers Were Involved.** The results from the current study were consistent with existing research findings and revealed that grandmothers were involved in the purchasing and serving of food to their grandchildren. Given the extensiveness of purchasing food for, and serving, the children, grandparent involvement should be explored in-depth and considered in educational programming.

**Affordability Was a Problem.** While availability and accessibility of food were not reported as problems, affordability was. Paying for food was challenging for the participants. Most were not on public assistance so they were paying for food from earned income. With nearly half of the mothers and grandmothers reporting low or very low food security, clearly their health and that of their children/grandchildren is at-risk. Low levels of income and low levels of food security could have a negative impact on the health of multiple generations though at the time of the study, the majority of the mothers and grandmothers reported good health. A longitudinal study would produce evidence of change on several measures over time.

**Fruit and Vegetable Intake Was Below Recommended Servings.** While the majority of the sample liked fruits and vegetables, reports of eating one serving of each is far below the recommended intake and could influence long-term health. While all Americans eat less than the daily recommended intake of fruits and vegetables, those with lower incomes eat even less. Direct education on ways to better manage food resources to be able to incorporate fruits and vegetables in daily eating and cooking habits may have an effect on increasing consumption. One management tool for reducing the cost of fruits and vegetables is gardening which could be combined with nutrition education.

**Stretching and/or Subsidizing the Family Food Dollar to Increase Affordability.** If cost remains a constraint, and gardening or food resource management do not close the affordability gap, solutions outside of the family unit may be needed to supplement action of the family. One consideration is finding ways to make fruits and vegetables available at lower costs than those at grocery stores, perhaps at farmer's markets, community gardens, through gleaning or other means. These could be addressed collectively through partnerships or collaborations among The University of Maryland Cooperative Extension, the state Departments of Agriculture, Education and Health and Mental Hygiene, non-profits, community groups and agribusiness.

Another means for consideration is government subsidies, such as fruit and vegetable vouchers from WIC. The USDA Economic Research Service released a study in January 2009 examining price and consumption of fruits and vegetables among low-income Americans<sup>1</sup> and concluded that a 10% subsidy of fruits and vegetables at the point-of-purchase would increase consumption by 2-5% or about 1 cup more per day—still not at the recommended levels of intake (Dong & Biing-Hwan, 2009). The subsidies come at a cost to taxpayers of an estimated \$310 million for fruits and \$270 million for vegetables.

Solutions appear to lie within all three systems—family, community and government. Likely, it will take a coordinated, multi-disciplinary, longitudinal, cross-departmental, inter-agency and inter-association initiative to adequately increase fruit and vegetable intake at a reasonable cost for long-term health benefits. The influence of family members on consumption and their resources to purchase, prepare, and preserve looms large with the role of grandparents as a potential line of further investigation and intervention. However, external environmental factors must be attended to in order to adequately address the problem of food dietary deficiencies and diminished health and well-being.

## **RESEARCH QUESTIONS**

### **1. Were the questions asked, instruments utilized, and methods of data collection appropriate, cost-effective and efficient for future research studies designed to reduce the impact of overweight and obesity on children of low-income, rural families?**

Most of the measures were appropriate and efficient. A few of the questions were confusing to the participants. These questions were noted and will be incorporated in revisions when this instrument is used in the future.

The research team recommends using in-person interviews for respondents who live close to the research site because there is a nearly perfect response rate with in-person surveys. Phone interviews should be used if participants live too far from the research site for in-person surveys. Phone interviews as a methodology in public health surveillance are becoming more challenging and costly as people increasingly use cell phones. Use of cell phones may mean the need to reimburse respondents for minutes used. Those costs added to the extensive calling and recalling by researchers make the phone interview a more costly method likely on par with in-person interviews and yet perhaps providing a different response. Mailed surveys should be avoided due to the low response rate and higher potential for missing data.

## **2. What are the findings from this pilot project with regard to the fruit and vegetable consumption of the families in which low-income, preschool, rural children reside?**

**Summarized Findings.** As shown in Table 2, mothers and grandmothers reported having an abundant supply of fruits and vegetables in their home. When asked about the presence of fruits and vegetables in their homes, on average, respondents reported currently having 12 of the 20 identified fruits and vegetables. The overwhelming majority of mothers and grandmothers (90%) also reported liking fruits and vegetables.

However, most of the mothers and grandmothers reported eating less than the daily recommended amount of fruits and vegetables. Only 27% of the sample of mothers and grandmothers reported eating fruit more than once per day. Forty-five percent of the sample reported eating vegetables more than once per day, but only 5% of the sample reported eating vegetables three or more times per day.

The respondents' children/grandchildren also did not consume the daily recommended amount of fruits and vegetables. Seven percent of mothers reported that their children ate vegetables three or more times per day; 24% reported that their children ate fruit three or more times per day. When asked about how often they served vegetables and fruit to their children/grandchildren, respondents reported serving vegetables more often than fruit. Approximately three-fourths of the mothers and grandmothers in the sample reported serving vegetables always or almost always with the evening meal. However, only 28% of the sample of mothers and grandmothers reported serving fruit always or almost always with the evening meal.

**Application of Findings:** The results of this study must be interpreted with caution as the sample size was so small. The findings were from a pilot test of methodology and instrumentation. Future research should replicate this study with a larger sample size and attempt to determine the factors that inhibit and support the purchasing and consumption of fruits and vegetables among rural low-income families. Additional investigation into the nature of the mother-grandmother relationship might provide knowledge useful for designing interventions. A longitudinal study would permit examination of change over time. If interventions are conducted that target mothers and grandmothers, a pre and post-test assessment is recommended.

Mothers and grandmothers had fruits and vegetables in their houses, and their families were eating some fruits and vegetables, but well below the daily recommended amount. Nutrition educators may want to focus their efforts on teaching both mothers and grandmothers about the daily recommended amount of fruits and vegetables; how to prepare and serve them; and how to stretch their food resources to cover the costs. They may want to work with gardening educators to help families learn how to grow their own. Educators may also want to work with community groups, agencies and associations to address fruit and vegetable consumption from a community approach.

### **3. How could the findings be incorporated into the FSNE, EFNEP, and Washington Hospital County Community Health Outreach programs, in the coming programming year?**

Members of the Stakeholder Advisory Committee met with the research team to review findings and discuss implications for incorporation of findings in current or future programming. They concluded that EFNEP and FSNE could target grandmothers. They suggested starting by asking the families how involved grandmothers are in purchasing and serving food as a screening tool and then follow up by asking additional questions related to food behaviors. They noted that in Baltimore County and Prince George's County, nutrition educators see grandmothers raising children; mothers are often out of the picture. When that is the case, the grandmothers are the primary adult decision maker and model for food consumption. The Committee thought that WIC offices may not be the best place to reach people because proxies come to the WIC office, not the people who are actually buying or preparing the family's food.

## **LESSONS LEARNED**

This pilot test of family influence, methods and instruments produced many lessons that will help future investigations. Those include:

### **Recruiting Participants and Conducting Interviews**

- Community partners are vital for access to this population.
- It is important to offer child care when mothers are doing in-person interviews.
- In the future, participants could be recruited at Head Start centers and/or through partnerships with Federal Qualified Health Centers.
- If EFNEP or FSNE participants are included in future studies, the questionnaires, which could be used as a pre and post test, should be administered as part of a nutrition education program or at another time when the nutrition educator is present. It takes a while for the nutrition educators to build a relationship with these participants.
- Privacy is a big issue and concern for these participants and must be respected.
- We may have trouble recruiting large numbers of people from the rural areas for sufficient sample size for a large scale research study.
- It may be useful to provide an extra incentive (\$10) to individuals who refer someone who then participates in the research study.

### **Methodology**

- In-person interviews yielded higher response rates and took less time to complete than the other two kinds of surveys. However, they were more difficult to schedule and required costly travel.
- Some participants were unwilling to do a phone interview because they were concerned about using their cell phone minutes; others may have been uncomfortable giving their personal information over the phone. It may be useful to obtain a 1-800 number so that potential study respondents can contact the team free of charge or subsidize the costs of their minutes.

- There was a lower response rate for mailed interviews than in-person or phone interviews, even with follow-up mailings.
- If participants are willing, it may be helpful to obtain contact information for all respondents so that the research team can keep them updated on the status of the research and/or so the team can follow up with them if they are having difficulty getting through to a referral.
- It would be useful to ask respondents who provide the name of a friend or relative (as someone who may be interested in participating in the study) to provide the team with their name and relationship to that person. Therefore, when contacting the referred individual regarding participation in the study, the team can identify the initial respondent as the person who provided the referral's name and contact information.
- Earned Income Tax Credit (EITC) should be included as a source of income.

### **Data Analysis and Findings**

- When looking at education beyond high school, we should consider differentiating four-year programs from community college and technical school.
- It is important to determine which foods (and how many) are in the home, how participants are serving the foods they have in their home, and if they know how to prepare and store fruits and vegetables.
- It could be useful to determine the relationship between BMI and self-reported health status for this population or alternatively, the use of a waist circumference or hip and waist ratio.
- It would be useful to determine if there are differences between people who are in nutrition education programs and those who are not in terms of consumption and knowledge of fruits and vegetables.
- It is important to understand the role and power of grandmothers in the families we serve. Grandmothers, and even great-grandmothers, have been found to make decisions concerning food. When mothers do not earn enough money to provide for their children, often they must rely on others to provide food and may relinquish some of their control over the food that their children eat.
- It is important to note which mothers and grandmothers live in the same household.
- It would be useful to obtain a larger sample of matched intergenerational pairs so that analyses could determine if differences exist between the generations.
- When drawing conclusions about grandmothers, we have to be careful in extrapolating from one culture to another.
- It would be important to compare mothers/grandmothers' fruit and vegetable consumption with the amount of fruits and vegetables they serve their children/grandchildren.
- It is important to determine the daily eating and cooking habits and find the ways to incorporate fruits and vegetables.

## GRANT SUBMISSION

A \$1.47M grant was developed in collaboration between the University of Maryland-College Park and the University of Maryland-Eastern Shore and submitted to USDA to take this and the previous pilot studies to scale to both collect substantial data and test interventions based on the initial findings. A description follows. In November, the team was informed that the project was not funded. The team will review the comments and consider possible modifications for a future submission. The team is particularly interested in further exploration of the role and influence of the grandparent.

### **Grant Proposal Submitted to USDA National Research Initiative June, 2008**

Proposal submitted to the USDA National Research Initiative, Human Health and Obesity, **\$1.47M** requested (not funded).

**Title:** Nutrition Education For Intergenerational Family Influences On Children's F&V Consumption In Low-Income Families

**PI & CoPIs:** Bonnie Braun & Elaine Anderson, University of Maryland-College Park and Virginie Marie Zoumenou, University of Maryland-Eastern Shore

**Abstract:** The goal is to determine if nutrition and family science integrated, theory and evidence-based nutrition education produces modified dietary behavior and increased consumption of fruits and vegetables among low-income children, their mothers and grandmothers. A key objective is to measure the extent to which participation in EFNEP and FSNE curricula, modified to incorporate family dynamics, results in changed food behaviors.

Plans to accomplish this goal include: 1) An extensive measurement of personal and family environmental food behaviors affecting fruit and vegetable consumption of grandmothers, mothers and young children; 2) Analyses of data to provide a basis for customization of both EFNEP and FSNE curricula; 3) Experimental testing of modified curriculum with mother-only and mother/grandmother groups compared to controls using conventional curricula; and 4) Pre and post-test assessments measuring short and intermediate-term learner-centered family and nutrition outcomes.

The relevance of this integrated project is its contribution to: 1) Increased research understanding of behavioral and environmental factors that influence obesity, distributed through Extension, websites, conferences, and publications; 2) Continued consumption of fruits and vegetables among targeted learners; and 3) Sustained family system-focused nutrition education through modified.

## RESEARCH DISSEMINATION TO DATE

A. A poster was presented on October 17, 2008 at the University of Maryland, School of Public Health Research Interaction Day.

Title of Presentation: **Intergenerational Influence on Fruit and Vegetable Consumption Among Rural Low-Income Families**

Submitting Author: Bonnie Braun

Additional Authors: Elaine Anderson, Virginie Zoumenou, Katherine Speirs, Nicole Finkbeiner

Department: Family Science

Keywords: rural, grandparents, fruit and vegetable consumption, low-income

Specific Community Collaborators/Partners Involved in Project: Funded by the University of Maryland Cooperative Extension & the Agricultural Experiment Station. Project is a direct outgrowth of the SPH 2007 Seed Grant.

Abstract: It is widely recognized that both mothers and grandmothers are influential in the feeding of young children. However, what we do not know is whether they differ in their attitudes and behaviors associated with feeding those children. This poster will present preliminary results from an ongoing study of the similarities and differences between resources, feeding practices, and personal dietary habits of 45 rural low-income mothers and 20 grandmothers. Implications for future research and programmatic initiatives also will be presented.

B. A proposal was submitted to the National Council on Family Relations for presentation of the findings at the November, 2009 annual meeting.

Title of Proposed Presentation: **Grandmothers: Key to Increasing Children's Consumption of Fruits and Vegetables?**

Submitting Author: Bonnie Braun

Additional Authors: Kate Speirs, Nicole Finkbeiner, Elaine Anderson, Virginie Zoumenou.

Departments: University of Maryland—CP, Family Science; University of Maryland-ES, Extension Nutrition.

Abstract: This pilot study of a matched set of rural, low-income mothers and grandmothers addressed three research questions:

1. How are grandparents involved in purchasing food for or feeding their preschool-aged grandchildren?
2. What resources do mothers and grandmothers have to purchase fruits and vegetables?

3. Do mothers' and grandmothers' consume fruits and vegetables and understand the importance of fruits and vegetables?

The presentation will focus on preliminary findings and suggest additional research. Implications for educational programming will be included.

### **PLANS FOR NEXT STEPS**

1. Regarding future research, the team is considering other sources of funding for all or part of the NRI proposal.
2. A research brief will be posted in early 2009 on the Maryland Family Health Impact Seminar and will be linked to the Cooperative Extension website for dissemination through Extension outlets as a basis for improved programming in nutrition and food systems and through the Center for Health Literacy for others interested in the current study's findings as a basis for increasing health literacy.
3. Findings will likely be presented at future FSNE and EFNEP conferences and for other MCE faculty and administrators to alert them to the findings and potential application to programming.
4. An article is being written and will be submitted to *Family and Community Health* in spring, 2009.

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