



RIDGE Project Summaries, 2007

Food Assistance and Nutrition Research Innovation and Development Grants in Economics Program

T. Alexander Majchrowicz
Editor



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RIDGE Project Summaries, 2007

Food Assistance and Nutrition Research Innovation and Development Grants in Economics Program

T. Alexander Majchrowicz, editor

Abstract

This report summarizes research findings from the Food Assistance and Nutrition Research Innovation and Development Grants in Economics Program (RIDGE), formerly known as the Small Grants Program. The Economic Research Service created the program in 1998 to stimulate new and innovative research on food and nutrition assistance issues and to broaden the network of social scientists that collaborate in investigating the food and nutrition challenges that exist across communities, regions, and States. The report includes summaries of the research findings of projects that were awarded 1-year grants in summer and fall 2006. The results of these research projects were presented at the RIDGE conference in October 2007. The projects include analyses of the influence of WIC on children's health at birth, impacts of Food Stamp Program participation on weight gained by expectant mothers, community influence on food assistance and dietary choices, and economic effects of a policy to provide government-subsidized price discounts for the purchase of fruits and vegetables by food stamp recipients. Several of the projects focus on specific populations such as immigrants, Native Americans, or people living in the rural South.

Keywords: Food assistance, nutrition, food security, food insecurity, obesity, childhood obesity, food assistance, food spending, Food Stamp Program, food stamps, WIC, Food Assistance and Nutrition Research Program, RIDGE Program.



Food Assistance
& Nutrition
Research Program

The studies summarized herein were conducted under research grants originating with the Economic Research Service. The views expressed are those of the authors and not necessarily those of ERS or USDA.

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Introduction

Federal food and nutrition assistance programs form a crucial component of the social safety net in the United States. Unlike a number of other social programs, the major food assistance programs provide benefits and have eligibility requirements that are essentially uniform nationwide. The Food Stamp Program—the largest Federal food assistance program—is, with few exceptions, available to all Americans whose income and assets fall below certain levels. The other food assistance programs are generally targeted to specific demographic groups. Altogether, the 15 Federal food assistance programs collectively reach an estimated one in five Americans at some point each year. The U.S. Department of Agriculture (USDA), the Federal department charged with administering nearly all of the Federal food and nutrition assistance programs, has a particular interest in monitoring program effectiveness and contributing to the policy goal of a healthy, well-nourished population.

Research Innovation and Development Grants in Economics Program

The USDA Economic Research Service's (ERS) Food Assistance and Nutrition Research Innovation and Development Grants in Economics (RIDGE) Program, formerly called the Small Grants Program, offers grants to social science scholars to stimulate new and innovative research on food and nutrition assistance issues. Moreover, the RIDGE Program seeks to broaden and strengthen the network of university-based researchers who collaborate in tackling the unique food and nutrition challenges existing across communities, regions, and States. Building pockets of expertise across the United States is a vital part of ensuring that food assistance policies and programs meet the needs of families and communities across a variety of special circumstances.

RIDGE researchers are drawn from an array of disciplines and include economists, sociologists, nutritionists, anthropologists, and public health professionals. The researchers employ a variety of approaches in their studies, such as using statistical models to analyze individual and household response to policy changes. Others conduct exploratory research that uses ethnographic methods to examine underlying factors that influence program participation and outcomes. Still others use descriptive statistics to characterize the populations of interest. All the research methods contribute to a growing body of literature on the food needs, coping behaviors, and food program outcomes of low-income families and individuals. The work supported by the RIDGE Program often inspires the development of new theories or research methodologies, elements that become the basis for securing expanded funding from other public or private sources to further develop these promising innovations.

This report presents summaries of the research findings from the ninth set of RIDGE awards, which were granted in summer and fall 2006. Preliminary findings were presented at a conference at ERS in Washington, DC, on October 11 and 12, 2007, and the research projects were completed in December 2007.

RIDGE Program Partners

ERS created partnerships with five academic institutions and research institutes to administer the RIDGE Program and to competitively award grants for 1-year research projects. Most grants are for \$20,000 to \$40,000. Partner institutions have the advantage of being closer to the particular regional and State environments that influence program delivery and outcomes. Each partner institution provides a different emphasis on food and nutrition assistance research.

ERS chose two of the five partner institutions for their experience in conducting policy-relevant poverty research at the national level. One of these is the Institute for Research on Poverty (IRP) at the University of Wisconsin-Madison. IRP has a history of research and policy evaluation, including previous involvement in administering small research grants funded by USDA's Food and Nutrition Service. The second partner is the Irving B. Harris Graduate School of Public Policy Studies at the University of Chicago. The Harris Graduate School of Public Policy, a part of the Joint Center for Poverty Research from 1996 to 2002, has a strong history in conducting and supporting research on what it means to be poor in America.

ERS chose the remaining three of the five partner institutions for their ability to direct research of policy interest to USDA, either on a particular subset of food assistance and nutrition issues or on a particular subpopulation of those eligible for food and nutrition assistance. Among these, the Department of Nutrition at the University of California, Davis brought to the RIDGE Program its expertise in nutrition education design and evaluation. A core faculty group focuses their research efforts on identifying meaningful approaches to the design and evaluation of nutrition education for ethnically diverse, low-income families served by a variety of food assistance programs. They view multidisciplinary research as critical to effectively monitoring the outcomes of nutrition programs.

The Southern Rural Development Center (SRDC) at Mississippi State University was chosen to administer the RIDGE awards for its ability and commitment to conduct research on the problems of the rural poor in the South and its particular commitment to study the effects of welfare reform on this population. USDA has special ties to the SRDC because of its close working relationship with the region's 29 land-grant universities. The South is also of particular interest to USDA because of the large proportion of rural poor and rural African-Americans who reside in the region.

American Indian families living on reservations are a significant component of the low-income rural population in many of the Western and Plains States. ERS chose The University of Arizona's American Indian Studies Program (AISP) to administer RIDGE awards for research on the food assistance and nutrition needs and problems of American Indians. AISP is the home of the only doctoral program in American Indian Studies in the country. The program maintains close ties to the tribal colleges, which were given land-grant status by Congress in 1994. AISP also reaches out to Native American scholars in a variety of academic settings.

More information about the RIDGE partners and many of the completed research papers can be found on the Websites of the administering institutions, listed below:

Institute for Research on Poverty, University of Wisconsin-Madison

Judi Bartfeld, RIDGE Program Center Director

Focus: The effects of food assistance programs on food security, income security, and other indicators of well-being among low-income individuals and families.

Web address: <http://www.irp.wisc.edu/initiatives/funding/usdasgp.htm>

Irving B. Harris School of Public Policy Studies, University of Chicago

Robert LaLonde, RIDGE Program Center Director

Focus: Interactions between food assistance programs and other welfare programs and the effects of the macroeconomy on the need for food assistance, the level of participation, and costs of food assistance programs.

Web address: <http://harrisschool.uchicago.edu/Research/funding.asp>

The American Indian Studies Program, The University of Arizona

Jay Stauss, RIDGE Program Center Director

Focus: The relationship between food assistance programs on reservations and family poverty.

Web address: <http://www.nptao.arizona.edu/research.html>

The Department of Nutrition at the University of California, Davis

Lucia Kaiser, RIDGE Program Center Director

Focus: The impact of food assistance programs on nutritional risk indicators (anthropometric, biochemical, clinical, and dietary), food purchasing practices, and food insecurity.

Web address: <http://nutrition.ucdavis.edu/USDAERS/>

Southern Rural Development Center, Mississippi State University

Lionel J. "Bo" Beaulieu, RIDGE Program Center Director

Focus: Food assistance research issues impacting vulnerable rural people, families, and communities in the South.

Web address: <http://srdc.msstate.edu/focusareas/health/fa/food.htm>

Project Summaries

Grants Awarded by the Southern Rural Development Center, Mississippi State University

Examining Relationships Among Obesity, Food Insecurity, Stress, and Emotional Eating in Low-Income Caregivers of Head Start Children

Kristi Lofton and Carol Connell, University of Southern Mississippi

Background and Methodology

Amidst a food environment that is perceived as highly accessible and affordable, research indicates that food insecurity and obesity occur paradoxically. Socioeconomic similarities exist between food insecurity and obesity, such as the highest prevalence occurring among women and ethnic minorities and a higher prevalence of food insecurity and obesity among people of low socioeconomic status. Food insecurity and obesity have also been reported to occur simultaneously in the same individuals as well as in members within the same household. However, other studies have found no association between food insecurity and obesity when other factors, such as income, education, ethnicity, and so forth, are controlled or when food insecurity is persistent or severe. This result suggests that other factors, in conjunction with food insecurity, may be playing a role in the food-insecurity-obesity paradox.

The food insecurity/obesity relationship may be explained by food insecurity experiences associated with stress and, in turn, the impact of stress on eating behavior. These stress-related food insecurity experiences may prompt individuals to develop food-related behaviors, such as emotional eating, when food is in adequate supply that contribute directly or indirectly to overweight and obesity. It is theoretically plausible that, in situations of low food security when low-cost energy-dense food is available, emotional eating occurs in response to the stress of uncertain resources.

Because the literature suggests that stress or other psychosocial factors influence eating behaviors associated with obesity, and stress has been related to food insecurity, investigating whether obesity, stress, and food insecurity are linked is important. Therefore, the primary objective of this study was to examine relationships among food insecurity, stress, emotional eating, and obesity by using a moderation analysis model. Likewise, the literature indicates that the food-insecurity-obesity relationship exists primarily among women, so two sets of analyses were conducted. The first set examined the research questions among an entire sample of caregivers of Head Start children, whereas the second set of analyses examined the research questions among the females in the sample. A secondary purpose of the study was to assess low-income women's perceptions of their own weight status compared with measured weight status to inform educational efforts of Federal food assistance programs.

The survey instrument used in this cross-sectional study consisted of previously validated instruments to measure household food security, perceived stress, and three components of emotional eating: anger/frustration, anxiety, and depression. The study surveyed 690 participants with children attending two area Head Start agencies or with children receiving benefits from the

Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) or food stamps were surveyed and measured the children's heights and weights. Initial analyses consisted of 634 participants with complete data for the dependent and independent variables, and the final analyses of the women's data consisted of 627 participants with complete data. Due to the very low number of men in the sample, only the women's data are reported in this study.

The majority of the participants were African-American (83.7 percent) and living without a partner (62.8 percent). Over 75 percent of the women were overweight or obese. Using the traditional U.S. Department of Agriculture definition of food security based on the number of affirmative responses to the food security items, only 64 percent of the respondents were food secure. Another 26 percent were classified as low food secure and 9.6 percent were classified as very low food secure. These rates were twice as high as national prevalence rates for households with children under the age of 6. Only 39 percent of this population participated in the Food Stamp Program.

Findings

Results revealed no statistically significant differences in body mass index (BMI, a measure of weight status) based on the food security status of the household in this group of low-income women. This result is likely due to the high rates of overweight/obesity across all levels of food security attenuating any differences that may have existed. The study revealed that perceived stress increased from food secure to marginally food secure to low food secure. However, perceived stress scores of the women in the low food secure and very low food secure groups showed no difference. Mean scores for the emotional eating subscales at various levels of food security did not increase in a linear fashion. The emotional eating scores were not different between the fully food secure and marginally food secure groups. The very low food secure group was not different from the marginally food secure group on these three subscales (anger/frustration, anxiety, depression). The low food secure group was different from the fully food secure group on all emotional eating subscales, but this finding was not a consistent when comparing the two groups with the other two food security groups and is probably due to large standard deviations around mean scores among these groups.

Likewise, regression analysis did not reveal an association between BMI and food security status when marginally food secure, low food secure, and very low food secure (represented by dummy variables) were used as predictors of BMI. Furthermore, the moderation analysis revealed no association among stress or emotional eating subscales or their interaction with each other and BMI. Due to the high rates of overweight/obesity already present in these adult women, further research of a longitudinal design is needed to clarify whether the development of eating habits in response to food security could contribute to development of overweight and obesity in adulthood.

Finally, over 75 percent of the women who were obese misclassified themselves as overweight, and 45 percent of overweight women misclassified themselves as normal weight. It is possible that the term "obese" has such negative connotations that few women would classify themselves as such.

Also, cultural perceptions of acceptable body weights among African-American women may vary from those of the majority population resulting in acceptance of larger body sizes as the norm. Directors of agencies involved in providing nutrition or health education, such as WIC, Head Start, or the Family Nutrition Program, need to be aware of these factors in order to provide culturally appropriate and sensitive weight management programs.

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Food Security and Feeding Strategies

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Background and Methodology

An extensive literature shows that psychosocial factors, low income levels, being Black, being a single head of household, and having children are the strongest predictors of household food insecurity. In a previous study of pregnant women in central North Carolina, those from food-insecure households had significantly lower income levels and less education and were more likely to be single and Black and to report higher perceived stress, anxiety, and depressive symptoms and lower self-esteem and mastery than women from food-secure households.

African-Americans experience household food insecurity at three times the rate of non-Hispanic Whites. Thirty percent of all African-American children and 40 percent of all low-income children live in food-insecure households. North Carolina is one of 10 States where household food insecurity is significantly higher (13.8 percent) than the national average (11 percent) and is one of 14 States that has had a significant increase in food insecurity since 1999. Concurrent with the North Carolina food insecurity statistics, almost 15 percent of North Carolina infants 0-2 years of age were overweight, defined as greater than the 85th percentile weight-for-height, in 2004.

The residual effect of the household experiencing food insecurity at a young age might influence eating behaviors, dietary intake, and weight status over time. For example, one study found that more adults who experienced past food insecurity tended to hoard food and be overweight compared with adults who did not. African-American first time mothers who are low-income are at a disproportionate risk of experiencing food insecurity. These mothers are also more likely to enter pregnancy at increased weight, gain excessive gestational weight, have gestational diabetes mellitus, and deliver an infant that is either under- or overweight for its gestational age.

This analysis was conducted as part of the Infant Care prospective cohort study that focused on risk factors of infant overweight born to first-time African-American mothers from low-income households in central North Carolina. Between 2003 and 2006, the Infant Care study enrolled 217 African-American mother/infant dyads. First-time mothers ages 18-35 and their 3-month-old infants were recruited mostly through local WIC clinics (Special Supplemental Nutrition Program for Women, Infants, and Children). Among the data collected at each time point were demographic data (household and caregiver), maternal and infant diet intake, maternal and infant anthropometric measurements, infant feeding styles, maternal depression, maternal self-esteem, neighborhood safety, and the six-item food security scale. Multinomial logistic regression was used to estimate the association between selected maternal/household characteristics and household food security status (food secure, marginally food secure, and food insecure).

Findings

The study found 53 percent of the women were from households characterized as food secure, 34 percent marginally food insecure, and 13 percent food insecure. The proportion of single mothers appears to decrease with increasing food insecurity, with food-insecure households having the lowest proportion of single mothers. Food-insecure households were more likely to have fathers in the household but were less likely to have a grandmother in the household. Very few households had both the baby's father and maternal grandmother living together (8 percent). Also, none of the married women in the sample had grandmothers living in the household. Food-insecure households were more likely to be nuclear households and have smaller household sizes. Women from food-insecure households scored significantly higher on the depression scale, averaging 16 points, which corresponds to signs of clinical depression. Food-secure households had the highest mean self-esteem score compared with the other groups.

Multinomial logistic regression results showed that, compared with food-secure households, living with the child's grandmother decreased the risk of food insecurity but living with the father and being depressed increased risk. Compared with food-secure households, having a college degree appeared to be protective against marginal food insecurity.

The study assessed the degree to which household food security status was associated with the infant outcomes: ever breastfed, ever put cereal in the bottle, ever giving juice before 3 months, mean calories per day, and infant weight and length at 3 months. The study found no association between marginal food security and any infant outcome. The study also found no association with food insecurity and inappropriate weaning practices (cereal in the bottle or juice before 3 months) or with infant weight at 3 months compared with food security. Results showed a significant association between food insecurity and ever breastfed, decreased mean calories per day, decreased infant length, controlling for maternal age, grandmother and father in the household, household size, education, ever worked, and depression score.

Findings from this study suggest that young low-income African-American families with their first child are particularly susceptible to experiencing household food insecurity. Having a grandmother in the household was protective against experiencing household food insecurity, while having the baby's father in the household, as well as depressive symptoms, was associated with household food insecurity. Household food insecurity (but not marginal food security) was associated with having breastfed, decreased mean infant caloric intake, and infant length. Further longitudinal assessment of the effects of food insecurity on infant dietary intake and growth will help elucidate the role food insecurity has on weight over time.

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Impact of Local Food Prices on the Relationship Between Food Stamp Program Participation and Bodyweight Status of Adults in the South

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Background and Methodology

The Food Stamp Program (FSP) is the principal food assistance program in the United States. It is designed to provide a nutritional safety net via benefits paid to households or individuals with low socioeconomic status (SES). Recent studies suggest that FSP participation affects individuals' dietary intake and increases the risk of obesity. In addition, lower prices for unhealthy food are positively related to a higher prevalence of obesity. However, little is known about the interaction between food prices and FSP participation and how both of these factors jointly affect the body weight status of low-income individuals. While the obesity epidemic affects all U.S. racial/ethnic groups and social classes, populations with low socioeconomic status bear a disproportionate burden. Identification of the economic mechanisms that promote weight gain among low-income Americans will enable policymakers to design and implement effective policy instruments, which will help address the obesity epidemic in the United States.

Two national datasets, the National Longitudinal Survey of Youth 1979 (NLSY79) cohort data and the American Chamber of Commerce Researchers' Association (ACCRA) price data, were merged using geographic identifiers to provide complete information on long-term FSP participation, body weight status, and local food prices. NLSY79 was a survey of 12,686 males and females ages 14-22 in 1979. Follow-up surveys were conducted each year between 1979 until 1994, and then biennially from 1994 to 2002. These data provided complete information on personal financial information, including income, assets, poverty status, and public assistance support sources. Self-reported height and weight were available in each wave of the surveys. The NLSY79 data also included geographic identifiers, such as respondents' State, county, and metropolitan area of residence in each survey year. The Metropolitan Statistical Area (MSA), county, and State codes were used as linking variables to the ACCRA data. ACCRA data collected quarterly prices of consumer goods in approximately 225 metropolitan and rural areas in the United States. The data included the prices of 21 foods, typically consumed at home, and three foods typically consumed away from home.

Body mass index (BMI) and obesity (BMI greater than or equal to 30) were the outcome variables in the study. The respondent was defined as an FSP participant if any FSP benefits were received in the previous year. The eligibility of FSP participants was determined as having an annual family income of less than 130 percent of the poverty threshold for a given household size. Weighted food price indexes were calculated by using the expenditure weight provided in the ACCRA data based on the Consumer Expenditure Survey (CES). Due to the strong colinearity between healthy and unhealthy food price indexes, only unhealthy food price indexes were used in the analyses. The respondent's age, gender, race/ethnicity, marital status, family sizes, household income, highest degree completed, urban/rural residence, and regions were all controlled. "South" was defined as the following 13 States:

Alabama, Arkansas, Florida, Georgia, Kentucky, Louisiana, Mississippi, North Carolina, Oklahoma, South Carolina, Tennessee, Texas, and Virginia.

The interactive term between FSP participation and unhealthy food prices was added in the regression models. The logistic regression model was used with obesity as the outcome variable. The fixed effects model took advantage of the longitudinal dataset and examined the long-term causation effect of unhealthy food prices and FSP participation on body weight status.

Findings

No significant FSP effect on BMI or obesity was observed among men. Among women, FSP participation contributed to a higher BMI ($\beta=0.26$, $p=0.02$). The unhealthy food prices had a negative effect on BMI ($\beta=-0.27$, $p=0.001$). The interaction term between unhealthy food prices and FSP participation had a negative effect on BMI ($\beta=-0.26$, $p=0.01$). The results indicated that higher unhealthy food prices could partially offset the positive effect of FSP participation on BMI. When the outcome was obesity, FSP participation was associated with a greater chance of being obese (odds ratio=1.37, $p=0.09$), whereas the unhealthy food prices were strongly related to a decreased chance of being obese (odds ratio=0.60, $p=0.001$). However, the interaction term was no longer significant (odds ratio=1.04, $p=0.86$). Therefore, the impact of higher unhealthy food prices was not significant enough to change the likelihood of being obese among FSP participants. In addition, the interaction between FSP and South was tested in the models and was not significant. Therefore, there was no significant disparity of FSP effects across regions.

The analyses of NLSY79 panel data and ACCRA price data indicated that the FSP effect on body weight status was not isolated, but was affected by other economic factors, such as food prices. The study found an additional economic mechanism that contributed to body weight gain among low-income populations. The FSP effects on BMI may have been more severe in regions with lower prices for unhealthy food, which helps explain the dramatic geographic variation in the prevalence of obesity in the United States. This study also suggested potential benefits of taxing unhealthy food. Compared with middle- or high-income groups, low-income populations were more sensitive to unhealthy food taxes. The tax may partially offset the positive impact of FSP participation on BMI. Besides the education of FSP participants, the tax may be another policy instrument that reduces the body weight disparity between FSP participants and nonparticipants.

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Exploring Health Literacy as a Factor Contributing to Adoption of the 2005 Dietary Guidelines Among Adults in the Mississippi Delta

Jamie Zoellner, Wendy Bounds, and Carol Connell,
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Background and Methodology

Nutrition literacy may be defined as “the capacity to obtain, process, and understand basic nutrition information needed to make appropriate dietary decisions.” Although education, health, and nutrition disparities are well documented in the Lower Mississippi Delta (Delta) region, no known published research has examined the health or nutrition literacy status of residents in the Delta. With the recent release of the *2005 Dietary Guidelines for Americans* and MyPyramid Food Guidance System (MyPyramid), little is understood about the public’s exposure and perception of these new recommendations. This study utilized a quantitative phase and qualitative phase to explore nutrition literacy as a factor contributing or inhibiting adoption of the 2005 Dietary Guidelines among adult Mississippi Delta residents.

The objective of this cross-sectional study was to describe the nutrition literacy status among adults in the Lower Mississippi Delta region. Trained Community Health Advisors recruited participants and collected data. A proportional quota sample based on educational achievement was used. Participants included 177 adults, primarily African-Americans (81 percent). Survey instruments included a modified version of National Cancer Institutes Health Information National Trends Survey (HINTS) to assess capacity to obtain nutrition information and the Newest Vital Sign (NVS) to assess the capacity to process and understand nutrition information. Descriptive statistics, Chi-square, and ANOVA tests were used to examine survey data.

In the qualitative phase, in-depth structured-interviews were used to explore cultural perceptions of the MyPyramid key messages and identify factors that may impact adoption of these recommendations. Twenty-three adults, primarily African-American females, residing in the Lower Mississippi Delta participated in the interviews. Interview tapes were transcribed and systematic content analysis was used to evaluate the transcripts.

Findings

Of the 177 participants, 24 percent had a high likelihood of limited nutrition literacy skills, 28 percent had a possibility of limited nutrition literacy skills, and 48 percent had adequate nutrition literacy skills. Overall, the Internet was the least trusted and least used source for seeking nutrition information. Participants in lower nutrition literacy categories identified more barriers and less confidence in seeking information about nutrition compared with those in higher nutrition literacy categories. Only 12 percent of participants correctly identified the 2005 MyPyramid graphic, and the majority (78 percent) rated their dietary knowledge as poor or fair. Rates of limited health literacy among Delta adults were high compared with other national surveys. Relying on the Internet as a central mode of health communication may only be widening the health disparity gap among impoverished rural regions similar to the Delta. If researchers and educators intend to reduce the burden of nutrition-related

chronic diseases and communicate scientifically-based nutrition information to rural, disadvantaged communities, they must understand the causes and consequences of limited nutrition literacy.

When asked to identify good reasons to follow the MyPyramid key messages, nonspecific references to improved health were most prevalent (n=130). However, participants also acknowledged the importance of getting vitamins and nutrients (n=81), and the impact food choices have on health conditions (n=77) and organ systems (n=65). Individual level factors (n=211), such as dislike for foods and tradition or customs, far outnumbered environmental level factors (n=48), such as cost and availability as perceived reasons preventing community members from adhering to the key messages. The most frequently mentioned suggestion for helping community members eat according to the MyPyramid were to raise awareness (n=93), provide information (n=65), and improve the taste of or provide opportunity to taste (n=49).

The qualitative nature of this study helped capture the cultural and social application of the MyPyramid among the Delta population and provided valuable information on factors promoting and inhibiting adoption of the key messages. The overall thematic responses regarding issues preventing compliance with the MyPyramid and factors for helping community members eat according to the MyPyramid indicate that both social marketing campaigns and intervention efforts focused on individual level factors are needed to promote the MyPyramid in this disadvantaged Delta region.

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Grants Awarded by the Institute for Research on Poverty, University of Wisconsin-Madison

The Effects of Food Stamp Benefits on Weight Gained by Expectant Mothers

Charles L. Baum II, Middle Tennessee State University

Background and Methodology

The Food Stamp Program (FSP) seems to have been successful at increasing the food consumption and nutrient intake of recipients. Consequently, the FSP may have also resulted in weight gain among its low-income recipients, which would be a concern because many Americans are already overweight and obese. The effects of food stamp benefits (FSBs) on weight of pregnant women are likely different because weight gain is not necessarily a detrimental, unintended side-effect for them. Instead, this subgroup, perhaps unlike any other, is encouraged to gain at least some weight while pregnant. The FSP may facilitate recommended weight gain for low-income pregnant women by providing additional resources for food consumption and nutrition. A portion of these women might otherwise be unable to achieve desired pregnancy weight-gain goals due to financial constraints.

This study examines the effects of the FSP on the amount of weight gained by expectant mothers during their pregnancy using 1979-cohort National Longitudinal Survey of Youth data. The analysis is focused on a relatively homogeneous sample of low-income expectant mothers and controls for possible omitted variable bias using a discrete factor random effects estimator. Also estimated are a set of models examining whether expectant mothers gain an ideal amount of weight while pregnant, more weight than recommended, or less weight than recommended based on pre-pregnancy body mass index (BMI). This is important because expectant mothers who are underweight pre-pregnancy are recommended to gain more weight while pregnant than those who are overweight pre-pregnancy. The project includes supplemental sets of models that (1) control for gestation length, (2) separately examine first-time expectant mothers, (3) simultaneously examine participation in the Special Supplemental Program for Women, Infants, and Children (WIC), (4) control for other pregnancy behaviors, (5) control for receipt of FSBs pre-pregnancy, and (6) examine the effects of food stamp receipt for each trimester.

Examining the effects of FSBs on pregnancy weight gain is important because medical researchers have found evidence that poor infant health (proxied by low birth weight, preterm delivery, and infant mortality) is more likely when an insufficient amount of weight is gained during the pregnancy. Further, health at birth has been found to influence later health and development. Perhaps as a consequence, Healthy People 2010, through which the U.S. Department of Health and Human Services specifies the Nation's health objectives, calls for decreasing the prevalence of low birth weight to a maximum of 5 percent from a current estimate of roughly 7.5 percent. Additionally, examining the effects of FSBs on pregnancy weight gain is important because researchers have found evidence that mothers who gain too much weight while pregnant are more likely to be overweight or obese postpartum.

Findings

Results indicate that FSBs have a marginally significant positive effect on pregnancy weight gain and significantly decrease the likelihood that low-income expectant mothers gain an insufficient amount of weight while pregnant. Further, FSBs appear to do nothing to exacerbate excessive weight gain. Providing FSBs to low-income expectant mothers during each month of their pregnancy is predicted to decrease the probability of gaining an insufficient amount of weight by an average of about 4 percentage points. To put this impact in perspective, suppose the Centers for Disease Control and Prevention's estimates for the prevalence of low birth weight are relevant for this project's sample of low-income expectant mothers—13.5 percent of expectant mothers who gain too little weight while pregnant have low birth weight babies, whereas only 6.2 percent of expectant mothers who gain a sufficient amount of weight do. If roughly 32 percent of low-income women gain an insufficient amount of weight and the rest gain a sufficient amount of weight, then it is expected that about 8.5 percent of this sample's births will be of low birth weight. However, if FSBs were provided to the expectant mothers in this sample, then the results presented in this paper predict that the prevalence of insufficient pregnancy weight gain would decrease to about 28 percent. Now, a bit less than 8.25 percent of this sample's births would be predicted to be of low birth weight. Thus, FSBs could potentially decrease the prevalence of low birth weight among low-income women by about a fourth of a percentage point. This would achieve among low-income women about 10 percent of the reduction in low birth weight called for by Healthy People 2010.

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Food Stamp Program and Consumption Choices

Neeraj Kaushal, Columbia University and National Bureau of Economic Research, and Qin Gao, Fordham University

Background and Methodology

This study uses Federal and State social policy changes in the United States since the mid-1990s that caused sharp fluctuations in Food Stamp Program (FSP) participation to study the effect of food stamps on quality and quantity of food consumption in low-income families. The 1996 Federal welfare reform denied food stamps to illegal immigrants and imposed work requirements on able-bodied adults without dependents as a condition to participate in the FSP. More importantly, because State welfare agencies also administer the FSP, the decline in welfare caseloads (number of participants) triggered by State and Federal welfare reforms during the mid-1990s increased the transaction cost of obtaining food stamps for welfare leavers and, in turn, reduced the food stamp caseload. Partly in response, several State governments took initiatives to ease access to the FSP, such as the introduction of electronic benefit transfer cards (EBT) in place of paper food stamp cards and simplified certification (or recertification) procedures for food stamp eligibility.

This research investigates whether changes in the FSP caseload resulting from social policy changes had any influence on the quality and quantity of food consumption in low-income families, using the Consumer Expenditure Surveys for 1994 to 2004. Further, the study examines the manner in which changes in policies that affected incentives for participation in the FSP—that is, introduction of EBT cards—simplified certification and affected food consumption patterns in low-income families.

Findings

The analysis suggests that the number of participants in the FSP (or the food stamp caseload) does not have any statistically significant association with expenditure on food. It finds that State and Federal welfare reforms during the 1990s lowered the food stamp caseload by approximately 18 percent and the introduction of the EBT cards and simplified reporting procedures for recertification of food stamps increased participation by about 7 percent. However, the study does not find any evidence that these policies had any effect on total food expenditure, nor does it find any consistent evidence that the policies affected expenditures on specific food items.

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The Effect of Participation in the School Breakfast Program on Breakfast Consumption

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Background and Methodology

In 1966, the School Breakfast Program (SBP) was established to provide a nutritious breakfast to children who may otherwise not receive one. However, research on the SBP has been inconclusive regarding whether this program actually increases the likelihood of eating breakfast for participating children. Results vary according to the definition of “breakfast” with positive results only when “breakfast” is defined more strictly. Analyses of the nutritional impact of the program also suggest that provision of breakfasts in school has a positive impact on the nutritional quality of children’s diets.

While it is reassuring that the SBP may improve the quality of breakfast for participants who eat breakfast, the apparent lack of a program effect on its basic goal of providing breakfast for those who may otherwise not get one is disappointing, especially given the associations between breakfast eating and cognitive outcomes, short-term school performance, and even obesity. The nonresult may be driven by unobserved differences between program participants and nonparticipants that are also correlated with eating patterns. Such endogeneity can bias estimated program effects in cross-sectional studies. Recently, there have been efforts to adopt a universal free breakfast program in school to include all children, regardless of family income. Data on whether the SBP meets its basic goal of promoting breakfast consumption would be helpful in this context.

This study analyses the effect of participation in the SBP on breakfast consumption by using time diary data from the Child Development Supplement of the Panel Study of Income Dynamics. To control for unobserved differences between program participants and nonparticipants that may be related to their food intake, participation effects are identified by comparing differences in breakfast patterns between weekdays (when children are in school) and weekends (when they are not) for program participants versus nonparticipants. Thus, the two days’ of diary data on each child are used to control for unobserved differences between program participants and nonparticipants that may be related to their food intake.

Findings

Results show that stated “participation” in the SBP reduces the likelihood of breakfast consumption. The results are robust to alternative definitions of “breakfast,” and checks for the quality of the time-diary data. The strongest negative effects appear for children with family incomes between 135 percent and 185 percent of the Federal poverty line. A plausible interpretation of this counterintuitive result is that, contrary to parents’ expectations, children claiming to participate in the SBP may not actually be eating the meals provided at school (and consequently skipping breakfast entirely). This interpretation is consistent with observational studies of SBP participants that find a significant difference between parent reports of program participation and the child’s actual breakfast consumption. The results may indicate

that the current delivery of school breakfasts needs improvement, supporting the case for such innovations as classroom provision, grab-and-go breakfasts, and other methods to promote school breakfast consumption among program participants.

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Grants Awarded by the American Indian Studies Program, The University of Arizona

Measuring Food Purchases, Community Needs, and Tribal Policy for Healthy Foods in Local Grocery Stores on or Near a Northern Plains Indian Reservation

Blakely Brown, University of Montana, and Tracy Burns,
Rocky Boy Health Board

Background and Methodology

The contemporary American Indian diet is high in refined carbohydrates, fat, and sodium and low in fruits and vegetables. Proliferation of fast food restaurants and convenience stores on or near reservations encourages consumption of high-fat, high-sugar foods and, coupled with poverty in Indian populations, limits access to a healthy food supply. Research shows that if community members eat fresh, healthful foods, diet-related diseases such as type-2 diabetes, heart disease, and obesity will be reduced. Access to foods is complicated by the geographic isolation of many reservations. Long distances to adequately stocked stores and lack of public transportation often mean that reservation residents have poor access to sources of high-quality food. Small, reservation-based stores frequently do not stock a full range of food, instead providing snack and convenience foods. Healthier low-calorie, nutrient-dense foods are usually among the more expensive items in small grocery stores on Indian reservations. Tribal governments can impact local food environments by undertaking initiatives that increase community access to healthy foods. One of the first steps to policy and food environment change is to conduct community assessments that can provide information on methods to best support healthy food strategies within the existing food systems and environments.

The study used quantitative and qualitative instrument tools to assess community needs and perceptions of food resources and the food environment in three small grocery stores on or near the Rocky Boy Reservation located in north central Montana. The project assessed tribal member ideas for culturally-specific and community-based strategies for increasing purchases and use of healthier foods in the local grocery stores. Qualitative interviews were conducted with tribal government and health officials to determine the likelihood of adopting a local tribal policy that increases the availability of healthy foods in the local grocery stores and supports consumer demand for these food items. The data were collected over a 10-month period, November 2006 through August 2007. All surveys, interview questions, and food-item measurement tools were approved by the University of Montana Institutional Review Board.

Findings

A convenience sample of 300 people that shopped at the reservation convenience stores completed a 69-item self-administered survey that assessed their shopping habits, ideas for strategies to improve local grocery store environments, barriers to accessing healthy foods, ideas about food assistance programs, and traditional food systems that exist in the community. Most (89 percent) of the survey respondents participated in an additional survey that

was administered by the on-site project staff that asked 29 additional questions assessing customer interest in having specific, healthy foods at the local grocery stores.

Demographic data showed that 96 percent of the respondents were American Indian/Alaskan Native ethnicity (94 percent were Chippewa-Cree tribal members). Sixty-one percent of the respondents reported an annual income of less than \$20,000 per year, 25 percent earned \$20-\$40,000 per year, and 14 percent earned more than \$40,000 per year. The 69-item survey data found the main reasons for shopping at reservation stores were convenience (66.4 percent) compared with food selection (15 percent) or price (0.5 percent). The respondents rated the quality, selection, and affordability of fresh fruits and vegetables at the stores as “good” (57.9, 47.2, and 51.4 percent, respectively) compared with a rating of “poor” (33.2, 47.7, and 42.1 percent respectively). A rating of “excellent” in all three categories was less than 8 percent.

Grocery shopper survey data showed that community members are highly reliant on grocery stores, food stamps, convenience stores, and the Food Distribution Program on Indian Reservations (Commodity) for food procurement. Trading/bartering, food coop, and school garden/farm scored the lowest for degree of reliance, but this may be because these food resources are almost nonexistent in this reservation community. Hunting/gathering scored moderately high for degree of reliance (46.7 percent having a very important degree of reliance and 34.1 percent having a somewhat important degree of reliance on this community food resource). Fresh fruits, fresh produce and vegetables, lean meats, dairy products, oranges, deer meat, tripe, seasonings, traditional foods, melons, and “healthy foods” scored highest for food items most difficult to obtain on the reservation. Survey data showed tribal government and council as the main agency/individual responsible for solving food problems in the community compared with Federal or State health agencies/staff, State Cooperative Extension and/or schools and universities, or religious groups.

Survey data rating resources and strategies for improving healthy food intake on the reservation reported the need for (1) tips on getting the most for one’s money at the grocery store, (2) information on nutrition and healthful eating and cooking, (3) explanations of eligibility criteria for government food assistance programs, (4) recipes and instructions for preparing traditional foods, (5) information in native language, and (6) in-store (point-of-purchase) information about the healthy and unhealthy foods offered. Data reporting ways to get young people interested in food traditions included: (1) teach youth at an early age, (2) have more school programs in this area, (3) take youth hunting, fishing, picking berries, and (4) conduct workshops and get young people’s families and community elders more involved.

Analysis of common themes and data from Tribal Council and Health Board member interviews showed 70 percent of the interviewees (n=7) supported endorsing a local food policy for purchase and consumption of healthy foods on the reservation. Less than half of those interviewed supported eliminating (banning) the sale of all sugared soda and candy in the stores. However, all the interviewees thought the method to decrease sales of these high-sugar foods was to provide more nutrition education, perhaps posted in stores and presented to the community at health fairs, about the harmful effects of consumption of these products.

A principal benefit of the study is that reservation community members identified the strategies that might increase healthy foods in local grocery stores. This approach increases the likelihood that community members will be more interested in the healthy foods information and feel some sense of ownership as many of these strategies are being implemented in the local stores during 2008. Some of these strategies include providing information at the store on nutrition and healthful eating and cooking, tips on getting the most for one's money at the local grocery store, or providing tribal vouchers and/or community incentives for trying new healthy foods. Tribal council has agreed to continued participation in the study to develop a local food policy supporting the sale of healthy foods in these stores. A long-term goal of the project is to implement these strategies in subsequent years and translate these findings to other American Indian reservations interested in improving local food environments, specifically reservation grocery store environments.

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Small-Scale Backyard Integrated Aquabioponics Food Production System and Training Program for Native Hawaiian Working Families in Hawaii

Aecio D`Silva, University of Arizona, and Robert Howerton, University of Hawaii

Background and Methodology

Hawaii has one of the highest costs of living in the United States with a significant amount of household expenses spent on food purchases. Moreover, a substantial number of Native Hawaiian working families live close to or under the poverty level. A small-scale family food production system could reduce household expenses and increase nutritional input for poor working families.

In year one of this study, five Native Hawaiian families were recruited and trained in producing food, including fish and vegetables, in small-scale aquabioponics systems (SAAR). These low-cost integrated aquaculture-agriculture systems can be set up in backyards and supplement healthful foods that may be too expensive for low-income families to purchase in sufficient quantities. The food items produced by this system, fresh fish and vegetables, were the traditional dietary components of Native Hawaiians. After initial success in year one, the project was expanded to include five additional settings.

After being awarded funding for year two of the project, advertising for participants took place in local working class communities and newsletters and by word of mouth. Four families and a local educational institution, Kamehameha School, were chosen for participation in the Aquabioponics project. All participants verbally committed to the project for a minimum of 3 years and also agreed to help at least one additional family to set up a SAAR system. All participants were trained in a week-long “hands on” workshop and subsequently five additional SAAR systems were built and put into operation.

The study used quantitative and qualitative instrument tools to assess individual families’ production of fish and vegetables as well as competitive food prices in three commercial supermarkets in Maui.

Findings

The overall cost for materials and supplies to build a SAAR system is approximately \$1,000, which does not include labor, fish feed, or utilities (water and electricity). It is evident from the amount of production from one growth cycle (1-1½ years) that these monies can be recouped from the sale of the commodities produced or the savings from not having to purchase these items. For example, 270 pounds of lettuce produced at Kamehameha School is valued at \$900. An additional 190 pounds of tomatoes at \$3/pound is worth \$570. Conservatively, the system can produce approximately 70-80 pounds of fish per growth cycle. If sold wholesale at \$5/pound, an additional \$350-\$400 could be realized. One growth cycle could generate between \$1,500 and \$2,000 in sales or savings on total food expenses, a considerable amount of money for poor, Hawaiian working families. As this study was the first exposure to aquabioponics for all the participants, the project design was very conservative in setting initial fish-stocking densities, which allowed

all participants to obtain some success with the first trial and encouraged continued participation. This research has determined that stocking densities can be increased by at least a fourth to a third (100-120 fish).

None of the participants noted a significant increase in utility expenses, which is an important consideration because Maui County has one of the highest electricity rates in the Nation. Water and electric expenses to operate SAAR were estimated, on average, at \$3-\$10 per month.

SAAR has proven to be a valid method for improving Native Hawaiians' food consumption lifestyle—enhancing and improving their diets with the production of their own organic food while providing an additional source of income. The SAAR objective is not just to study and identify the challenges facing Native Hawaiians but to deliver a practical solution by helping them to grow high-quality organic food in their own backyards.

Projects of this nature are vital to help ease Native communities from the dependency of assistance programs that may serve to cause greater harm by keeping these communities entrenched in the idea that government is obligated to care for their needs rather than to help themselves. During the implementation of this project, one of the biggest challenges was the availability of concurrent food stamp programs. When low-income families were approached and SAAR explained, the initial response from a majority of the families was to question the need to grow food because commodities were provided at no cost through assistance programs. This idea was predominant among many low-income families interviewed.

This viewpoint was one of the big obstacles that needed to be overcome. The project endeavored to show the families that SAAR places a workable and accessible solution to change and improve their life conditions in a sustainable and environmentally friendly way. SAAR proposed a radically different way to make families healthier and wealthier and to improve their self-esteem and purpose through their own food production. The SAAR families eventually understood the potential benefits of the system and developed a different approach to life. As a result, these SAAR projects continue to produce healthy food and additional income for all participants.

The SAAR projects have provided the basis for the development of an organic, sustainable, healthy, self-grown food supply to these families. It has also provided an excellent opportunity to train students and working families in natural food production systems. The project fulfilled its main objective to allow families to produce their own food and to increase consumption of natural, organic-raised food in their diets as well as selling production not consumed as an additional sustainable income source.

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The Cost and Availability of Healthier Foods for the Pascua Yaqui Pueblo and the Old Nogales Highway Colonia: Community Baselines and Benefits of Mobile Markets

George Frisvold and Anita Fonte, University of Arizona

Background and Methodology

The Community Food Bank in Tucson, AZ, operates its own grocery store, the Value Foods Store (VFS), which sells food items at a substantial discount from regular grocery stores. The Food Bank also operates mobile markets in Pima County, AZ, that provide items from the VFS to low-income areas with less access to grocery stores. This study uses market basket analysis to first assess the costs and availability of basic food items at local stores as well as the costs and availability of healthier versions of those items. Healthier versions may have lower fat, sodium, or sugar or higher dietary fiber. Next, market basket analysis was used to assess the impacts of mobile markets on the availability and affordability of food on the outskirts of Tucson. The two communities examined in this study were the Old Nogales Highway Colonia and the New Pascua Yaqui Pueblo, 13 and 15 miles south of downtown Tucson.

First, in-person interviews of mobile market patrons at the study sites were conducted. Basic information was collected about patron food shopping behavior and changes in behavior in response to mobile market participation. Interviews were carried out in either English or Spanish. From these interviews, a list of the grocery stores where mobile market patrons regularly shopped was obtained. These stores were surveyed to calculate the cost of purchasing the Thrifty Food Plan (TFP). The TFP is a market basket of items designed to meet basic nutritional requirements at minimal cost. The cost of purchasing the TFP (based on 1999 market basket revisions) was compared with a “healthier” basket, the items of which were lower in sodium, sugar, and fat and higher in dietary fiber than the TFP.

Prices of items in both market baskets were collected for mobile markets as well. Stores and mobile markets were surveyed in the same week to account for seasonal volatility in food prices. The costs of the two base market baskets (TFP and healthier) were calculated first. Next, mobile market prices were substituted into the two market baskets for items that were (1) available at the mobile market in that week and (2) at a lower price than at the comparison stores. This measures the maximum potential reduction in the cost of the market basket through substituting mobile market purchases for regular store purchases.

Many items sold at the mobile markets were not part of either the TFP or the healthier basket. Therefore, actual community cost savings differ from changes in market basket costs. To account for this, analysis was reversed. First, data on the number of items and their purchase prices were collected at the mobile markets. Next, local food stores were surveyed to estimate the cost if items purchased at the mobile markets were instead purchased at local grocery stores. This approach allows one to calculate total community cost savings per mobile market visit.

Findings

One-third of mobile market patrons responding to surveys reported that mobile market participation reduced their total number of shopping trips. Respondent travel time to mobile markets was less than to grocery stores, which suggests that reduced spending on gasoline is a modest benefit of mobile market participation. Based on previous discussions with nutrition educators in Tucson, there was uncertainty about whether lower income households used store discount cards. All respondents were found to use such cards at stores that offered them. Also, among respondents, there was more strong agreement that mobile market participation lowered their food costs than changed their dietary behavior. Fifteen percent of respondents purchased milk at least once per week at a convenience store, while 11 percent purchased bread and 6 percent purchased orange juice at least once per week at convenience stores.

For stores in the survey area, the healthier basket cost 12 percent more than the TFP. Based on nonparametric tests, the difference in the costs of the two baskets was statistically significant at the 0.1 percent level even with a small sample size. Whole grain products and low-fat cheeses were items most likely to be missing in surveyed stores. By substituting mobile market purchases for regular supermarket purchases, a family of four could reduce the cost of purchasing the TFP by 11 percent and the cost of the healthier basket by 8 percent. Again, using nonparametric tests to account for small sample size, the cost reductions were statistically significant at the 0.1 percent level.

Looking at actual purchases rather than hypothetical market baskets, the price discounts are larger. Results suggest that if items purchased at the Pascua Yaqui mobile market were purchased at local grocery stores, they would have cost 47-85 percent more. On average, the community saved 61 cents for every dollar spent at the mobile markets.

The absolute dollar gains to mobile market participation are limited by low total sales volumes, however. Total sales per mobile market visit are typically less than \$160. Total cost savings to the community ranged from \$54-\$99 per mobile market visit. Direct wage costs of mobile markets were roughly \$135 per visit. Other expenses (materials, gasoline) would add to costs per visit. These are primarily costs per visit rather than costs per item sold, so the cost effectiveness of the program could be greatly improved by increasing per visit sales volumes.

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Understanding Traditional Food Security of Hopi Single-Parent, Female-Headed Households: Outreach to the Hopi Community and its Organizations

Matthew R. Livingston, University of Arizona Cooperative Extension, and Cornelia Butler Flora, Iowa State University

Background and Methodology

The Hopi Reservation has a large number of female-headed households. This study of Hopi agriculture reinforced the key role that local production has on the availability of traditional food and also revealed that production is primarily a male activity on female-owned land. Because traditional food in many tribal settings has been related to increased health and well-being, men's control of production and the small number of nuclear families led to concern about food security in terms of female-headed households' access to and use of traditional food. After interviewing single mothers, the study found a complex exchange system that allowed female-headed households to gain access to traditional food. Focus groups were then conducted to further understand the social and cultural dynamics around this unexpected access to traditional food.

The approach to the study is participatory action research, collaborating closely with members of the Hopi tribe representing the various mesas. The goal of this participatory action research was to leave tribal members with the tools not only to gather data, but to design the research and analyze the data as well. Appreciative Inquiry framed the study not only to set a positive tone to gather information but also to improve the health status of members of female-headed households. After analyzing the survey data, the study used participatory methods to involve a broad segment of the community to design a structure conversation to be conducted with focus groups of women across the reservation to learn the manner in which access and use of traditional foods were related to more healthful eating.

Findings

The study found that family ties were critical in imparting embedded knowledge regarding methods to grow, process, prepare, and serve traditional foods. Further, each stage was necessary for the previous and following stages, with ceremonies tying them together to give each action meaning. Agriculture is not an economic activity but a cultural one that provides for the continuity of each village and clan. Thus, the production, processing, preparation, and consumption of traditional food cannot be evaluated in economic terms but in terms of cultural survival and inclusion.

Boarding schools tended to separate the women from those embedded practices. Many women were required to cook in school kitchens but needed to grab hamburgers from fast food stands to avoid eating the food prepared. Despite this cultural and physical separation, a number of women who went through the boarding school process were seeking out the wisdom of their elders and recreating that knowledge. Traditional food is consumed within the household and at ceremonial occasions and participation in these occasions is a critical way to re-embed knowledge of traditional foods sought by young women.

Older women were concerned about passing the knowledge on to their female relatives, yet many learned from their male relatives as well. The current drought, a plague infecting rabbits, and incorrect harvesting of widely used native plants has further complicated providing the ingredients for traditional foods.

Study respondents were very aware of the superior characteristics of traditional foods in building six of the seven community capitals—natural, cultural, human, social, financial, and built. However, the seeming separation of traditional food from political capital caused respondents difficulty in turning their ideas on increasing access to and use of traditional foods into concrete programs. A number of the groups suggested strategies for increasing use of traditional foods, such as inclusion in the school cafeterias; village cooking classes; schemes to give women better access to labor and machinery to grow corn, squash, and beans; and an illustrated cookbook to help young people learn to properly gather wild plants and to prepare traditional dishes, including hybrid dishes using purchased and self-provisioned ingredients.

Conventions theory helps in understanding the roles of food and agriculture in Hopi society. The domestic convention, with nonmonetary value chains, explains access to and use of traditional Hopi food. Thus, even unemployed female heads of household responsible for numerous children, often not only their own but also those of relatives, can, by participating in the preparation of ceremonial foods, have access to the many types of corn and other cultivated and wild plants that provide healthy food that satisfies both their bodies and their spirits.

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Grants Awarded by the Harris School of Public Policy, University of Chicago

Estimating Relationships Between Food Insecurity and Child Health Outcomes

Craig Gundersen and Brent Kreider, Iowa State University

Background and Methodology

Relationships between food insecurity and negative health outcomes for children have been widely documented. Previous research, spanning numerous academic studies, has found that children in households suffering from food insecurity are more likely to suffer from diminished psychosocial functioning, frequent stomachaches and headaches, worse health outcomes, increased odds of being hospitalized, higher levels of hyperactivity, greater propensities to have seen a psychologist, behavior problems, worse developmental outcomes, and higher levels of iron deficiency with anemia. These consistently negative health findings emerge from a variety of data sources, employ a variety of statistical techniques, and appear to be robust to different measures of food insecurity.

The previous work has made the implicit assumption that food insecurity is measured without error. In reality, however, this variable is imperfectly measured and patterns of measurement error are unlikely to conform with the classical assumptions. This study examines what can be learned about relationships between health outcomes and food insecurity status when the latter is subject to nonrandom classification error. In particular, the nonparametric framework allows the study of partial identification under corrupt samples given minimal assumptions on the error-generating process. Within this environment, the study estimates sharp worst-case bounds on conditional health outcomes that exploit all available information under the maintained assumptions.

To isolate the identification problem associated with potentially misreported food insecurity status, the study begins by assuming that food insecurity is reported without error. This is the implicit assumption that is imposed in all previous work on this topic. The study then estimates sharp bounds that impose no assumptions on the patterns of classification errors in a binary conditioning variable. Next, it estimates narrower sets of bounds for certain benchmark cases that impose structure on the reporting error process. In one case, the study considers the identifying power of an assumption that food insecurity misreporting arises independently of true food insecurity status. In another case, it considers the identifying power of an assumption that food insecurity is potentially underreported but households do not falsely claim to be food insecure.

For these analyses, the study uses data from the 1999-2002 National Health and Nutrition Examination Survey (NHANES), a survey designed to assess the health and nutritional status of adults and children in the United States. In contradistinction to other surveys that rely exclusively on interviews, the NHANES contains both interviews and physical examinations. Since food insecurity is rare among households above 200 percent of the poverty line, the study limits the sample to households with incomes below this threshold.

Findings

The examination of differences in the health status between food-secure and food-insecure children under the assumption of fully accurate reporting of food security status yields results similar to those found previously in the literature. For the examination of what occurs when food insecurity is potentially misreported, the study concentrates on two health outcomes—childhood overweight (children in food-insecure households are less likely to be overweight than those in food-secure households) and reports of very good or excellent health versus reports of good, fair, or poor health (children in food-insecure households are much less likely to be in the former category compared with children in food-secure households).

The study finds that claims regarding these statistically significant associations between food insecurity and negative health outcomes for children rely heavily on assumptions about the accurate reporting of food insecurity status. In the case of childhood overweight, the study finds that if about 2 percent of households potentially misreport food insecurity status, one can no longer assume that children in food-insecure households are less likely to be overweight. In the case of general health, the breakdown is not as sudden. But, even under the least restrictive assumption of no false positives, if more than 10 percent of households misreport food insecurity status, one can no longer say that children in food-insecure households are more likely to be in poor health.

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Accounting for Children's Food Insecurity in Immigrant Households

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Background and Methodology

Children of immigrants are the fastest growing component of the U.S. child population. Although immigrants make up only 11 percent of the total population, children of immigrants make up 22 percent of children younger than 6 in the United States. In light of immigrant families' more limited use of government assistance programs (in addition to their higher levels of participation in the low-wage labor market and lesser likelihood of full-time, year-round work), it is not surprising that these families are poorer and suffer more material hardships than their native counterparts. In particular, children of immigrant noncitizens experienced more persistent and higher levels of food insecurity than the children of citizens, especially following welfare reform, which is worrisome because higher rates of food insecurity are associated with poorer outcomes in terms of young children's health and well-being. Differences in rates of food insecurity have been linked in part to noncitizens' lesser use of health and public assistance programs. However, little is known about other factors that may explain different rates of child food insecurity in the different populations. In immigrant populations, additional factors may account for higher levels of food insecurity, including parents' citizenship status and parents' integration into the community. Immigrant noncitizens are less likely to be aware of community programs and health services compared with their native and naturalized citizen counterparts. Immigrant parents are also more likely than their native counterparts to be Limited English Proficient (LEP). This lack of social and linguistic integration could result in higher rates of food insecurity if families are unable to make use of community resources that could ease material hardships.

This study draws data from the second wave of the public use version of the Early Childhood Longitudinal Study-Kindergarten Cohort (ECLS-K), a nationally representative sample of approximately 22,000 children enrolled in about 1,000 kindergartens during the 1998-99 school years. The children were on average 75 months old at the second wave. The sample is restricted to those families below 200 percent of the poverty threshold in wave 2 (based on household income and size). The final sample size is 6,794. The analysis relies on the eight-item Children's Food Security Scale. Households that affirm two or more of the child-referenced items—typically reflecting that parents, due to financial difficulties, were forced to rely on a few kinds of low-cost foods to feed children and that they could not afford to feed the children a balanced meal—are coded as experiencing children's food insecurity.

The analysis estimates separately the effects of the child's birthplace, the parental birthplaces, and parental citizenship statuses on children's food insecurity. It also uses as predictor variables measures of demographic characteristics (education, employment, and family size), family income and program participation (including health insurance), maternal depression and parenting, language use, perceived neighborhood safety and community support, urbanicity, and proportion of years in the United States.

The analysis relies on probit regression to account for the binary nature of the dependent variable. Model 1 regresses children's food insecurity on the demographic variables. Model 2 adds income and program participation variables. Model

3 includes the measures of mothers' depression and parental behavior. Finally, Model 4 adds the measures of social integration and the set of residential location variables. To correct for the clustered nature of the data a robust standard error estimator is used. The analysis also applies the Wave 2 survey sampling weight.

Findings

Analyses show that foreign-born children and those with noncitizen parents are at substantially greater risk of food insecurity than their counterparts with native parents. In contrast, low-income children whose parents are foreign-born but are citizens have similar rates of food insecurity compared with those with native parents. Specifically, the rate of children's food insecurity in the total sample is 10 percent. Among low-income children in the sample with a native-born mother, the rate of food insecurity is 8 percent. However, foreign-born children and those with foreign-born noncitizen mothers have significantly higher rates of food insecurity (19 percent). In contrast, the difference between children with foreign-born citizen mothers and children with native mothers is not significant. Comparison of children's food insecurity rates by fathers' status yields similar results. For example, children with foreign-born citizen fathers have a rate of food insecurity comparable with children of native fathers, whereas those with noncitizen fathers experience levels of food insecurity on a par as those with noncitizen mothers.

Demographic characteristics (race, maternal employment and education, and household structure) account for all of the difference in rates of food insecurity between children with native and noncitizen fathers and about half of the difference between children with native and noncitizen mothers. Remaining differences based on mothers' status are not accounted for by differences in family income, program participation, or maternal mental health and behaviors, although these variables are associated with children's food insecurity in expected ways. In contrast, measures reflecting social integration, including mothers' length of stay in the United States and their perceptions of the safety of their communities, account for the rest of the gap between children with native and noncitizen mothers.

Mothers who have arrived in the United States relatively more recently may be at a higher risk of alienation from systems of informal social support that are available to low-income and vulnerable populations in the United States. More recently arrived mothers may also have stronger economic ties to their countries of origin (for example, a greater likelihood of sending remittances home, which are unobservable in these data) that may account for their higher degree of economic hardship. To the extent that differences in children's experiences of food insecurity are associated, ultimately, with differences in children's health and well-being, it will be critical to develop programs and other mechanisms to help all families receive assistance to meet their needs and ensure their children's economic security and healthy development.

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Reporting Bias in Studies of the Food Stamp Program

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Background and Methodology

Comparing a food stamp receipt as reported in surveys with administrative data on receipt indicates that receipt is underreported substantially in surveys. For example, more than 40 percent of months of food stamp receipt were not reported in the Current Population Survey (CPS) in 2004. This underreporting is evident in several large national surveys and, in some of these surveys, the extent of underreporting has grown over time. An important consequence of underreporting is that it may lead to significant bias in studies that examine the determinants of participation in the Food Stamp Program (FSP) or the distributional consequences of the program. Underreporting could also bias regressions with food stamp receipt as an explanatory variable, and instrumental variable methods may not be valid if the measurement errors are correlated with common explanatory variables, as is suggested by this study.

This study presents a new econometric method for estimating the determinants of reporting that uses two data sources with information on the same demographic characteristics but with samples of different individuals rather than matched individuals. This method compares the characteristics of those who report receipt in a survey with the characteristics of recipients in administrative data to determine the influence of those characteristics on reporting. To implement this procedure for the FSP, the study uses administrative microdata from the Food Stamp Program Quality Control (FSPQC) Database and survey data from the CPS.

Findings

Results from the two-sample estimation procedure used in this study indicate that observable characteristics, including education, gender, and region, are significantly related to underreporting. The study then demonstrates how these two-sample estimates can be used to adjust for reporting bias in studies of the FSP. A number of studies have examined how participation in the FSP is related to observable characteristics. Underreporting that varies by characteristic will bias estimates in such studies. The two-sample estimates described above can be used to correct for underreporting bias. Using estimates from a simple participation model, this study shows that the bias can be substantial. For example, adjusted estimates for the relationship between education and participation are about 30 percent larger than the unadjusted estimates.

Underreporting will also bias studies of the distributional consequences of the FSP. Studies that examine the extent to which food stamps increase the resources of poor families will understate the impact of the FSP due to underreporting of food stamps. This study shows how to correct for underreporting bias in such studies by using estimates from the two-sample procedure.

A better understanding of underreporting and how it may bias various studies of food stamps has important implications for both policymakers and researchers. Policymakers have long been concerned with low participation rates in the FSP and have recently taken steps to increase participation. In

addition, a more accurate estimate of program take up provides better information about who is benefiting from the FSP, why families choose not to participate in the program, or how individual characteristics affect participation. Such information could be used to increase take up and better target the program. In addition, correcting for underreporting bias will yield better measures of the well-being of the disadvantaged and provide a clearer picture of the distributional consequences of the FSP. Lastly, the methods presented in this study could be used to analyze underreporting for other transfer programs that collect administrative microdata.

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Women, Infants, and Children (WIC): Effect on Infant Feeding Practices and Children's Health and Well-Being

Kathleen M. Ziol-Guest, Harvard University, and Daphne C. Hernandez, Pennsylvania State University

Background and Methodology

The Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) serves an important function. It safeguards the health of low-income women, infants, and children up to age 5 who are at nutritional risk by providing nutritious foods to supplement diets, information on healthy eating, referrals to health care, and breastfeeding promotion and counseling. However, despite the aim of addressing the nutritional and health needs of the low-income population, the impact on infant children's health and nutrition remain poorly understood.

Existing research suggests that WIC is successful, namely that prenatal WIC participation improves birth outcomes, including reducing the incidence of low birth weight, increasing mean gestational age, and reducing prematurity and mortality. Overall findings indicate that prenatal WIC participants have better pregnancy and birth outcomes compared with low-income nonparticipant mothers. Additionally, empirical research suggests that the relationship between WIC participation and breastfeeding is negative. Very little empirical research examines the timing of prenatal WIC participation and whether it is WIC participation or when a mother begins receiving WIC that influences children's health and feeding practices.

This study examined the association between WIC participation during the prenatal period and infant feeding practices and children's health and well-being. It further examined the extent that timing of WIC participation (first, second, or third trimester entry) differentially impacted these outcomes.

Data for this study are drawn from the Early Childhood Longitudinal Study, Birth Cohort (ECLS-B), a nationally representative cohort of children born in 2001 (children are sampled via registered births) who are followed from birth through kindergarten entry. The goal of the ECLS-B is to provide a comprehensive and reliable set of data to better understand children's early development; their health care, nutrition, and physical well-being; their preparation for school; key transitions during the early childhood years; their experiences in early care and education programs plus kindergarten entry; and the manner in which their early experiences relate to their later development, learning, and experiences in school. The study, sponsored by the U.S. Department of Education National Center for Education Statistics, includes an oversampling of Asian/Pacific Islanders and American Indians, low-birth-weight infants, and twins. The sample is limited to children considered most likely to be WIC-eligible, namely those with annual reported household incomes less than 250 percent of the poverty threshold at the 9-month interview or those mothers who reported that Medicaid paid for all or some of their prenatal care.

The study examined two sets of outcomes: (1) infant feeding practices, including initiation of breastfeeding, duration of breastfeeding lasting longer than 4 months, and introduction of cow's milk prior to 6 months of age; and

(2) fetal growth, including extremely low birth weight, very low birth weight, low birth weight, high birth weight, term low birth weight, small for gestational age, and low 5-minute APGAR score.

Multivariate regression analysis and instrumental variable approaches were used to test the association between WIC participation and the outcomes. These models were constructed to account for the endogeneity of WIC participation.

Findings

Results from the analysis and infant feeding practices suggest that WIC participation is negatively associated with initiation of breastfeeding, with a mother who participated in WIC prenatally 5 percentage points less likely to initiate breastfeeding compared with a low-income mother who did not participate. WIC participation is also negatively associated with breastfeeding for at least 4 months. Further, WIC participants are 35 percent less likely to introduce cow's milk to the infant's diet prior to 6 months of age compared with WIC nonparticipants. In terms of when mothers entered the WIC program while pregnant, mothers who entered WIC during their first trimester are 6 percentage points less likely to initiate breastfeeding compared with those who did not use WIC during pregnancy. Further, mothers who began receiving WIC during their second trimester were 4 percentage points less likely to initiate breastfeeding than nonparticipants. Mothers who began WIC in their first trimester are also less likely than those who did not use WIC prenatally to breastfeed for at least 4 months. Finally, mothers who began receiving WIC during their second trimester were less likely to feed their child cow's milk prior to 6 months of age compared with those mothers who never participated in WIC.

Findings from the analysis on fetal growth suggest that WIC participation is associated with a lower likelihood that the child was born with a very low birth weight. Specifically, those who participate are 26 percent less likely to be very low birth weight. Results examining the timing of WIC entry indicate that mothers who entered the WIC program in the third trimester are less likely to have children with lower birth weights.

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The Direct Economic Effects of a Policy To Provide Government-Subsidized Price Discounts for the Purchase of Fruits and Vegetables by Food Stamp Recipients

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Background and Methodology

The purpose of this study is to evaluate the direct benefits and costs to consumers and producers from changes in prices, consumption, and production of a policy to offer government price discounts on fresh fruits and vegetables to food stamp recipients. Increased consumption of fruits and vegetables has been linked to a decrease in dietary-related chronic diseases, such as heart disease, diabetes, and some cancers. Low socioeconomic status (SES) is strongly associated with higher rates of obesity and high rates of the leading causes of illness and death. Diet may play an important mediating role in explaining socioeconomic disparities in health status. Consequently, developing cost-effective policies that lead to higher consumption of fruits and vegetables may have a significant impact on the incidence of chronic disease among persistent food stamp recipients.

Targeted assistance has been shown to be more efficient at bringing about dietary changes than more general assistance programs. Therefore, a targeted food assistance program, such as price discounts on fruits and vegetables may provide substantial benefits to low-income consumers. Providing a price discount of 25 percent also directly benefits food stamp consumers through lowering the prices that they pay for fruits and vegetables. However, a price discount may cause equilibrium market prices to rise for fruits and vegetables, benefiting growers but making other consumers worse off.

The analysis uses a model of the U.S. fruit and vegetable industry to determine changes in market prices and quantities in response to a shock to the system, such as a price discount for one group of consumers. The model lays out a series of demand and supply equations in log-differential form. The demand side of the model contains equations for four different consumer groupings: fruit and vegetable home consumption by food stamp recipients, away from home consumption by food stamp recipients, consumption by other low-income consumers who are below 130 percent of the poverty level but not on food stamps, and all other higher income consumers. Consumption by food stamp recipients is done separately for food consumed at home as it is assumed that consumers would most likely use food stamps to purchase food from grocery stores for home consumption.

The supply side of the model contains equations for net U.S. trade (U.S. imports minus U.S. exports), market quantity supplied from the agricultural marketing sector (processors and handlers), and production supplied to the marketing sector from growers in California and the rest of the United States (RUS). The result is a model that links supply and demand in the final market to supply and demand in the marketing sector and ultimately to growers' production decisions. The solution to the system of equations is the percentage change in retail and grower prices, final quantity demanded by each consumer group in

the study, imports and exports, and production by growers in each region. The percentage changes in prices were used to estimate the changes in economic surplus for growers in California and the RUS, marketing sector, consumers, and the taxpayer cost of the program. The model was estimated for 38 commodities. The commodities included in the study were those for which a complete data set was available.

Findings

Current consumption of all fruits and vegetables is 18.1 cups for food stamp recipients, 16.2 cups for people living below 1.3 of the poverty ratio but who are not receiving food stamps, and 18.5 cups for people living above 1.3 of the poverty ratio. While the consumption of fruits and vegetables is similar between food stamp and higher income consumers, both groups are falling below the 24.5 minimum recommended servings for adults in the *2005 Dietary Guidelines for Americans*.

Current consumption of fruits and vegetables for the 38 commodities examined in this study is 13.71 cups for food stamp consumers, 13.35 cups for other low-income consumers, and 15.25 cups for higher income consumers. The price discount will increase home consumption of fruits and vegetables by food stamp recipients by 8.15 percent to 9.46 cups but will decrease away-from-home consumption by 0.034 percent due to higher market prices. The net result is an increase in total consumption of fruits and vegetables by 5.19 percent. Because other low-income consumers and higher income consumers are affected by higher market prices, their consumption falls slightly by about 0.038 percent. The price discount increases consumer surplus for food stamp recipients but lowers it for the other two groups.

Changes in consumption and estimates of benefits and costs for each group

Group	Weekly consumption			Change in consumption	Costs and benefits
	Current total	Current total for 38 items	New total for 38 items		
	-----Cup equivalents-----			<i>Percent</i>	<i>\$ millions</i>
Food stamp	18.1	13.7130	14.4242	5.19	653
Home consumption	—	8.7430	9.4559	8.15	654
Away from home consumption	—	4.9700	4.9683	-0.0340	-0.9
Income:					
Low	16.2	13.3525	13.3474	-0.0382	-5
Higher	18.5	15.2565	15.2507	-0.0378	-49
Taxpayer costs	—	—	—	—	681
Growers:					
California	—	—	—	—	23
Rest of United States	—	—	—	—	26
Marketing sector	—	—	—	—	13

— = Not applicable.

The 5.19-percent increase in fruit and vegetable consumption by food stamp recipients will increase Food Stamp Program costs by \$681 million. Producer surplus increases for California growers by \$23 million, for growers in the RUS by \$26 million, and for suppliers of marketing inputs by \$13 million. These benefits notably exclude the benefits of increased health status, which is the subject of future research.

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A Longitudinal Study of Food Insecurity on Overweight in Preschool Children

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Background and Methodology

Childhood overweight and household food insecurity (HFI) represent urgent public health problems in the United States. Food insecurity is the lack of access to enough food for an active healthy life that results from the limited or uncertain access to nutritionally adequate and safe foods in socially acceptable ways. Low-income households are more likely to be food insecure, and paradoxically, low-income adults, specifically women, are more likely to be overweight. In children, however, studies of this association have yielded conflicting results, perhaps because study designs (cross-sectional versus longitudinal) and populations (ages and income levels) have varied. Additionally, most of the prior work did not examine this association in the most relevant population—that is, low-income households.

The Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) serves low-income women and children at high nutritional risk. Anthropometric, sociodemographic, and other health-related data are routinely collected. The purpose of this research is to (1) examine the effect of WIC participation on household food security status in women and children and (2) assess the relationship between HFI with/without hunger in infancy and later childhood weight status in 2- to 5-year-old WIC participants. Strengths of this study lie in the use of the large and diverse WIC population on which longitudinal anthropometric and food security data are available.

This longitudinal study includes data collected from 2001-06 on children and their mothers who participated in Massachusetts WIC. WIC data are collected every 6 months and prepared for submission to the Centers for Disease Control and Prevention (CDC) for inclusion in the Pregnancy and Pediatric Surveillance Systems. The addition of household food security measures to the WIC management information system was undertaken as part of a previously CDC-funded cooperative agreement granted to the Massachusetts Department of Public Health (1996-2000). Inclusion of the full-length food security module was not feasible due to time constraints. For this study, a subscale to measure food security status was used. It addressed the following areas: (1) not having enough money to buy food for a balanced meal, (2) adults cutting the size of or skipping meals, (3) frequency of cutting meal size or skipping meals, and (4) adults not eating for a whole day. Household food security status was defined by the number of positive (“yes”) responses to the questions: food security = 0 positive responses; HFI without hunger = 1–2 positive responses; and HFI with hunger = 3–4 positive responses.

Household food security status at both time points were combined to create a dynamic food security variable that comprised the following categories: persistently food insecure, food insecure at first visit and secure at the second, food secure at the first visit and insecure at the second, and persistently food secure (referent). The age- and sex-specific body mass index (BMI) percentile

and z-score of children was based on their directly measured height and weight relative to the CDC growth reference. At-risk for overweight and overweight were defined, as recommended, as sex-specific BMI-for-age of greater than or equal to (1) 85th percentile and (2) 95th percentile, respectively.

Multinomial logistic regression was used to assess the relationship between duration of WIC participation and household food security status (for example, food secure, HFI without hunger, and HFI with hunger) at the last visit for women (n=21,863) and children (n=57,377), adjusting for race, maternal education, household size, and initial household food security status. Both general linear model and logistic regression techniques were used to examine the relationship between household food security status at the first and last visit and child weight status. Children meeting the following criteria were included (n=25,186): (1) first-visit data available, (2) first WIC visit within first 12 months of age, (3) at least four-WIC-visits data available, (4) complete data on household food security status at first and last visit and on covariates (birth weight, age, sex, race/ethnicity, maternal education, household size, and maternal weight status), (5) child of non-Hispanic White, Hispanic, Black non-Hispanic, or Asian race/ethnicity, (6) complete anthropometric data at both time points and ages 24-60 months, and (7) birth weight of the child available.

Findings

The association between duration of WIC participation and household food security status depends on household food security status at the initial visit. For both women and children from initially (that is, at first WIC visit) food-secure households, WIC duration had no effect on later household food security status. On the other hand, among women who were from households that were initially food insecure with hunger, early prenatal certification into WIC produced the greatest improvement in household food security status by the postpartum period. Among children who were from initially food insecure households (with or without hunger), longer WIC participation was associated with the greatest improvements in their households' food security status.

Preliminary results suggest that the relationship between household food security status and children's weight status depends on other factors. Significant effect modification ($p < 0.05$) in the fully adjusted model was noted for the dynamic HFI variable and maternal education, maternal pre-pregnancy weight status, and child's birth weight. Thus, analyses were adjusted or stratified by each of these variables. Stratification of the analyses by birth weight, using a median split for this sample (3,291.5 grams), yielded a significant association between household food security status and weight status among children whose birth weight was less than the median (but not those greater than or equal to the median). Persistent HFI was associated with a 27 percent higher odds ($p < 0.01$) of attaining a BMI-for-age greater than or equal to the 85th percentile and a 31 percent greater odds ($p < 0.01$) of becoming overweight by the time they were 2-5 years old compared with children whose households were persistently food secure. Among children whose mother's pre-pregnancy weight classified them as overweight or obese (BMI > 25), persistent HFI was associated a 22 percent higher odds ($p < 0.01$) of their children attaining a BMI-for-age greater than or equal to the

85th percentile and a 19 percent greater odds ($p < 0.05$) of 2- to 5-year-old children becoming overweight compared with those whose households were persistently food secure. No association was found among those children whose mother's pre-pregnancy weight was normal.

From a policy perspective, these findings suggest that enrolling mothers in WIC earlier in pregnancy could reduce later risk of overweight among their children by improving household food security status once their children are born. The results also imply that certain subgroups of children are particularly vulnerable to the adverse effects of household food insecurity on overweight risk, thus targeting these groups may be necessary.

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Food Insecurity Is Not Associated With Lower Energy Intakes

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Background and Methodology

Findings from the Current Population Survey indicate that 11 percent of U.S. households were food insecure (FI) in 2006. Food insecurity has been associated with obesity, heart disease, diabetes, high blood pressure, and food allergies. Despite this vulnerability, very little attention has been given to the diet of FI individuals. This study was undertaken to further the understanding of the dietary behaviors of FI individuals. Specifically, this study determined the number of daily snacks and meals consumed by men and women in different levels of food security. In addition, the energy contribution, the energy density, and the food group sources of those snacks and meals were calculated.

The National Center for Health Statistics' National Health and Nutrition Examination Study (NHANES) for 1999-2000 provides information about people's consumption of foods and nutrients, as well as extensive health-related data and information about Americans' demographic and socioeconomic characteristics. The NHANES 1999-2002 contains the 18-item Food Security Survey Module (FSSM), which has been shown to be a stable, robust, and reliable measurement tool. The NHANES 1999-2002 Food Security data are released in four categories: food secure (FS), marginally food secure (MFS), food insecure without hunger (FIWOH), and food insecure with hunger (FIWH). Because adults were the focus of this analysis, the adult measure rather than the household measure was used.

For the 1999-2002 NHANES, individuals' dietary intakes were collected through an interviewer-administered 24-hour dietary recall method. Energy intakes used for this analysis were obtained from the NHANES dataset. The number of meal occasions and snacking occasions were calculated over the entire 24 hours for each individual. The energy contributions per snack and per meal, and the total energy contributions of snacks and meals, were calculated. In addition, the relative caloric contributions of food groups were calculated. Because of the differences in the treatment of beverages, it has been recommended that energy density values be calculated using only food items. Although beverages were included in all previous calculations, they were excluded from measurements of energy density. For this analysis, the energy density of food items alone was calculated by dividing the total energy from foods (kilocalories) by the weight (grams) of the foods.

The analytical sample for this work is the subset of individuals from whom the adult-level FSSM was collected. Individuals were screened into the FSSM using the U.S. Department of Agriculture food adequacy indicator and/or income. Women who were pregnant and/or breastfeeding were excluded. Again adults were the focus of this research, so those individuals 18 years of age and older were examined. To avoid including older individuals, many of whom have low energy intakes, respondents more than 60 years old were excluded. Because prior research has found differences in obesity patterns among food-insecure men and women, men and women were examined separately (women, n=2707, and men,

n=2933). Multivariate linear regression analyses were used to examine the relationship between food security status and dietary outcomes while controlling for age, race-ethnicity, education, and income. In all models, food-secure individuals were the comparison group. To account for characteristics of the NHANES dataset, STATA (Version 10, College Station, TX) was used.

Findings

Daily total energy intakes were not different for FI individuals, but there were considerable differences regarding their meal and snack behaviors. FIWOH and FIWH women had significantly fewer meals than FS women. The mean energy contribution of each meal and the total energy contributed from snacking were both significantly greater for FIWOH women than for FS women. Among men, the daily number of meals was significantly decreased whereas the daily number of snacks and the total energy from snacking were significantly higher for FIWOH men than for FS men. Among both men and women, the energy density of meal foods was not significantly different. Among women, the energy density of snack foods was also not different. However, men that were FIWOH consumed snack foods that had a significantly lower energy density than men that were FS.

The major sources of energy during meal occasions were similarly ranked for women and men. For men and women, the grain group was the predominate source, followed by meat, poultry, fish, egg and mixtures. The third largest source was the sugars, sweets and beverages group for men and women. Among women, the sugars, sweets, and beverages contribution ranged from 14 percent in both the MFS and FIWH to 16 percent in the FIWOH. Among men, the sugars, sweets, and beverages relative contribution to meal energy was 16, 19, 18, and 21 percent for FS, MFS, FIWOH, and FIWH, respectively. Conversely, the major source of energy for snacking was the sugar, sweets, and beverages for both men and women. Among women, sugar, sweets, and beverages contributed 34, 39, 36 and 37 percent to snacking energy among FS, MFS, FIWOH, and FIWH, respectively. Among FIWH men, the sugar, sweets, and beverages group contributed more than half of their snacking energy. Grain products and dairy products are the next largest sources of energy during snacking for both men and women.

This study provides evidence that skipping meals can be associated with diets that are adequate and possibly more than adequate in energy. An increase in meal size and the energy obtained by snacking appears to compensate for a reduced meal frequency. Thus, focusing solely on total energy intake would miss important consequences of food insecurity. Nutrition interventions aimed at FI audiences should target snack behaviors. For example, dairy products were a leading source of snacking energy and, therefore, messages could emphasize the benefits of low-fat dairy products. For men, who consume a large portion of their snacking energy from sugars, messages could emphasize the sweetness of fruits.

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