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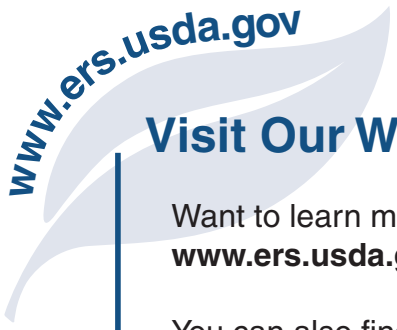
RIDGE Project Summaries, 2008

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

T. Alexander Majchrowicz
Editor

Food Assistance and Nutrition Research Program



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A Report from the Economic Research Service

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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 who 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 2007. The results of these research projects were presented at the RIDGE conference in October 2008. The projects include analyses of vendor access and fruit and vegetable availability in the Special Supplemental Nutrition Program for Women, Infants, and Children; effects of food insecurity on the development of infants and toddlers; administrative data to evaluate the Child and Adult Care Food Program in family child care homes; the economics of the Thrifty Food Plan; and food stamp use among the elderly. 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, Supplemental Nutrition Assistance Program, SNAP, 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.

Contents

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 Supplemental Nutrition Assistance Program (formerly 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 tenth set of RIDGE awards, which were granted in summer and fall 2007. Preliminary findings were presented at a conference at ERS in Washington, DC, on October 16 and 17, 2008, and the research projects were completed in December 2008.

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.as*p

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/usda.cfm*

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

Nutrition, Food Security, and Obesity Among Low-Income Residents of the South

Patricia Duffy, Claire Zizza, and Henry Kinnucan, Auburn University

Background and Methodology

While the strong upward trend in rates of obesity and overweight is a national phenomenon, the South appears to have been more affected than other regions. Prevalence estimates of obesity, collected through the Centers for Disease Control and Prevention's (CDC) Behavioral Risk Factor Surveillance System (BRFSS), show that in the year 2005, all three States with obesity rates (defined as body mass index (BMI) > 30) above 30 percent were in the South: Louisiana, Mississippi, and West Virginia. All other Southern States, with the exception of Delaware, Florida, Maryland, and Virginia, had rates of obesity in the range of 25 to 29 percent. No Southern States had obesity rates below 20 percent.

High levels of poverty, relative to national averages, characterize many States in the South. In 2004, when the national poverty rate was 12.7 percent, Alabama, Kentucky, Texas, and West Virginia reported rates over 16 percent while poverty rates in Mississippi and Louisiana exceeded 19 percent. Data from the 2005 CDC BRFSS show that most Southern States report rates of recommended fruit and vegetable consumption below the national average (which in itself was not high). In addition, many Southern States report a percentage of current smokers above the national average. The objective of this project was to test regional differences in BMI, diet quality, and the probability of being obese, with a focus on the South. A major question of interest was whether differences in BMI across regions and the probability of being obese can be explained by the demographic characteristics of the region or whether, even when these factors are controlled, there still is a statistically significant increase in probability that those living in the South will be obese. The link between BMI and diet quality was also explored.

The National Center for Health Statistics' National Health and Nutrition Examination Study (NHANES) for 1999-2002 provides information about individuals' consumption of foods and nutrients, as well as body measurements (height, weight, and BMI) and information about 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. Following guidelines and sample statistical code provided by USDA's Center for

Nutrition Policy and Promotion, the information in the dietary recall can be used to construct the Healthy Eating Index-2005 (HEI-2005), a measure of diet quality.

Geographic variables, such as State or census region, are not released in the public NHANES data. The CDC does allow researchers access to unreleased data for valid research purposes, however, and access to confidential geographic variables (census region and State) was provided for this project following approval of a proposal for such access.

The analytical sample for this work is the subset of individuals who participated in the Mobile Examination Center (MEC). Nonelderly adults who were not pregnant or lactating were the focus of this research, so those individuals 18-60 years of age were included. Because prior research has found differences in obesity patterns among men and women, they were examined separately (women, n=3,424; men, n=3,052). Multivariate linear regression analyses were used to examine the relationships between geographic region and BMI, obesity, and diet quality while controlling for age, race-ethnicity, education, income, and other possible covariates, such as food security status, self-reported activity level, smoking status, and alcohol consumption patterns. To account for survey design, survey procedures in Statistical Analysis Software (SAS) were used.

Findings

When data were analyzed across the four census regions, no significant differences in BMI or obesity were found for either women or men. Women in the South had a significantly lower diet quality than women in either the West or Northeast. Men in both the South and the Midwest had a significantly worse diet quality than men in the West. Lack of significant difference for the South in terms of obesity and BMI was not expected, given the results from the BRFSS reports. Two possible explanations for the lack of significance were explored. The BRFSS data are self-reported. Hence, respondents in the Southern region may have reported relatively heavier weights (or shorter heights) than did respondents in the other census regions compared with their actual heights and weights. As the NHANES data include self-reported heights and weights, to test the possibility of different regional biases in self-reports, the self-reported heights and weights were used to construct a BMI measure. No significant difference in self-reporting bias was found across regions.

Another possibility for the difference between these results and the BRFSS reports is that the census region of the South includes a number of States, such as Florida and Virginia, that do not have higher-than-average rates of obesity. Accordingly, the South was split into two regions, the Deep South (Alabama, Arkansas, Georgia, Mississippi, South Carolina, and Tennessee) and the "other South." For the Deep South, mean BMI for women was 29.2 when no covariates were considered, which was significantly higher than the "other South" and the West, with similar results for obesity. For men, there were no significant differences in BMI or the probability of obesity for the Deep South compared with other regions. When demographic covariates were included in regression analyses, the difference in BMI and obesity for women in the Deep South disappeared. Low-income women and Black women were

found to have higher BMI than higher income women and White women. The South is a region with lower-than-average income and higher-than-average minority population; therefore, these factors most likely contribute to the reportedly higher-than-average rates of obesity for many Deep South States. Although HEI-2005 was found to be inversely related to BMI and the probability of obesity for both men and women, the effect was small. The lower-than-average diet quality in the South would thus not appear to make a large contribution to the region's obesity rates. Food insecurity levels did not relate strongly to obesity or BMI for women. Men who are FIWOH were found to have a lower BMI than fully food-secure men.

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Prevalence of Accurately Reconstituted Infant Formula in the WIC Population and in the Non-WIC-Eligible Population: Exploring Maternal Knowledge, Attitudes, and Practices of Infant Formula Preparation

Katherine Kavanagh, University of Tennessee, Knoxville

Background and Methodology

Childhood overweight affects approximately 17 percent of U.S. children and is increasing. Effective interventions performed at critical time points are likely crucial to the prevention of overweight. The first few months of life may present such a critical time point. Infant feeding practices are thought to be a major contributor to early rapid weight gain, and this gain may increase risk of childhood overweight. Significant differences have been well-established between exclusively breastfed and formula-fed infants in terms of growth and intake during the first year of life, with formula-fed infants taking in more energy and growing at a faster rate than breastfed infants. Formula-fed infants are more likely to be overfed than breastfed infants and may be less able to self-regulate energy intake than breastfed infants.

Although factors driving these differences are likely to include biological factors present in breastmilk and absent in formula, behaviors inherent to bottle feeding also influence these differences. One such behavior is infant formula preparation. Properly reconstituted powdered formula should provide 20 kilocalories (kcal) per ounce. Twenty-two kcal per ounce is used to produce "catch-up" growth in preterm infants and, therefore, small differences in reconstitution can have a biologically meaningful impact. Previous work has indicated that, in spot samples collected from mothers in a Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) population, more than two-thirds were overdiluted (<18 kcal/ounce). Should infants habitually receive overdiluted infant formula, they could conceivably increase hunger cues and mothers could interpret these cues as readiness for other foods or fluids. Early introduction of solid food is a risk factor for later childhood overweight. Conversely, an infant habitually exposed to a high-energy infant formula would be expected to gain weight if unable to self-regulate intake. Developing methodology to identify mothers at risk for these behaviors, and subsequently intervening, may have an impact on long-term child weight outcomes.

Nearly half of the infants in the United States are served by the WIC program, which has recently reduced the amount of formula in some versions of the WIC food package. Although the intention of these changes is to equalize the value of the formula feeding and the breastfeeding food packages, the unintentional result may be an increase in overdilution of powdered or from-concentrate formula as caregivers anticipate a decreasing supply. This policy change, paired with the current national economic crisis and recent media reports of "watering down" infant formula, makes this project especially timely. The formula samples collected for this project were collected prior to implementation of the changes in the WIC food package and therefore establish baseline data, which will be useful in detecting any future change.

The study was a cross-sectional, observational design with two groups of formula-feeding mothers: an income-eligible WIC-participant group and a non-WIC-income-eligible group (income > 185 percent of Federal poverty level). Mothers of healthy, term, formula-fed infants up to 6 months of age were recruited from the WIC program and from a university-housed birth registry. Via telephone survey, mothers responded to a series of questions about formula preparation and infant feeding. Mothers who qualified for this larger study and who also (1) had infants up to 4 months of age and (2) were exclusively offering reconstituted powdered infant formula (no current breastfeeding or other foods or fluids) were invited to participate in a substudy. This subset of mothers recorded infant intake for 24 hours and collected a 15-milliliter sample of infant formula from each bottle offered prior to offering the bottle to the infant. Upon collection of the samples, these mothers were asked the same series of questions and their infants were weighed and measured. Samples were stored at -20° centigrade until analyzed using the loss-on-drying method.

Findings

The average age of the 40 mothers completing the telephone interview was 30.5 years, with infants averaging 4.1 months. Eighteen mothers were WIC-income-eligible, and the remaining 22 were above this income cutoff. Twenty one of the infants were male, and 19 were female. Mothers were read several statements regarding formula preparation and asked to respond in the following manner: Disagree (1), Slightly Disagree (2), Neutral (3), Slightly Agree (4), and Agree (5). There were no differences by income level to the statements (see table). However, there was a trend in differences between infant sex and disagreement with the statement regarding "over-strong" formula, with mothers of males tending to disagree more strongly (p=0.09). Maternal age appeared to be a potential factor in formula-preparation opinions, with older mothers tending to disagree more with the statement regarding thin formula being okay (r=-0.532: p=0.0768).

Responses by formula-feeding mothers to statements regarding formula preparation (n=40)

Statement	Mean (standard deviation)	Range
I think it is important to be very careful when mixing up formula	4.8 (0.65)	2-5
I think formula that is a little over-strong is okay for my baby	1.2 (0.70)	1-4
I think formula that is a little thin is okay for my baby	1.5 (1.15)	1-5
I think parents learn how much formula should be added to water and don't have to measure exactly	1.5 (1.18)	1-5

Eighteen mothers provided a 24-hour sample of prepared formula for their infants (average age of 3.1 months). "Normal" energy density was defined as 18-22 kcal/ounce. Results indicate that, although the average kcal/ounce was 18.5, 26 percent of the mothers were consistently overdiluting the infant formula (<18 kcal/ounce); the overall average range was 14.5-23.0 kcal/ounce. There were no differences by income level. In addition, results of the questions regarding infant formula preparation indicate that behaviors may be both intentional and unintentional. Although the sample size was small, overdilution appears to be a potential issue in this formula-feeding population, regardless of income level. Further research could include investigating these behaviors and their potential impact on infant anthropometry.

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Understanding Nutrition Challenges Faced by Older Americans in Rural Areas: The Role of the Food Environment and Neighborhood Characteristics

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Background and Methodology

The economic burden posed by nutrition-related chronic health conditions, such as obesity, cardiovascular disease, cancer, and diabetes, is tremendous. Good nutrition (that is, healthy eating) is now recognized as one modifiable determinant of preventing and managing chronic diseases. However, as life expectancy increases, the burden of chronic health conditions, functional decline, and diminished independence place an unprecedented strain on individuals, families, caregivers, communities, the health care system, and service providers.

Older adults in rural areas disproportionately grapple with problems that affect functional decline and loss of independence: high levels of chronic conditions, low levels of available health support, limited personal and community resources, geographic isolation, and poor nutritional health, among others. Healthy dietary patterns—eating fruits, vegetables, low-fat dairy products, and diets low in total and saturated fat, cholesterol, and sodium—are part of a lifestyle that promotes good health and reduces incidence of chronic disease. Personal, structural, and neighborhood characteristics influence differential access to health care, serving either as barriers or enhancements to lifestyle behaviors, such as physical activity or healthy eating.

Residents of rural and poor areas face the greatest structural and neighborhood disadvantages, with older adults in these regions being particularly challenged to make or maintain lifestyle changes that are critical for preventing or managing disease. Access to grocery stores and availability of healthy foods undoubtedly influence dietary choices. Without access to a foodstore, such as a supermarket, individuals have difficulty obtaining the food needed for a healthy diet, especially for a vulnerable population like older adults. Accessibility to an available source of affordable healthy foods affects food assistance and nutrition needs, especially in rural areas.

Thus, the goals of this study were to (1) identify and assess the availability of fruits and vegetables through direct observation in a large rural area of six counties in Texas, (2) examine the characteristics of perceived access to foodstores by 645 seniors who participated in the Brazos Valley Health Assessment (BVHA), and (3) evaluate the associations among neighborhood characteristics, perceived and objective measures of food access, and nutrition-related outcomes of the BVHA seniors.

The 6-county study area included 101 census block groups, a rural land area of approximately 4,500 square miles, and a population of more than 119,650 people. Three databases were linked: Brazos Valley Food Environment Project (BVFEP), BVHA, and the 2000 U.S. Census. BVFEP data included

the onsite identification and geocoding of all supermarkets or supercenters, grocery stores, convenience stores, dollar stores, mass merchandisers, and pharmacies, as well as completion of an observational survey of the availability and variety of fresh and processed (canned, frozen, and juice) fruits and vegetables in 185 foodstores. The BVHA, which was conducted by a professional survey company for the Brazos Valley Health Partnership and the Center for Community Health Development, included a randomly recruited sample of 695 adults who were 60 years of age or older. Nutrition-related survey questions included the following areas: obesity (self-reported height and weight), food security, food behaviors, perceptions of community food resources, perceptions of the store at which they purchase most groceries, and access to affordable, healthful food. Additional BVHA data included sample sociodemographic characteristics and neighborhood activity. Census block group level socioeconomic characteristics were extracted from the U.S. Census Summary File 3.

Availability and variety for fresh and processed fruits and vegetables were calculated for each foodstore from the BVFEP data. Network distance (along road network) was calculated from the residence of each BVHA senior participant to the nearest supermarket, nearest foodstore with a good variety of fresh fruits or vegetables, and to the nearest foodstore with a good variety of fresh and processed fruits or vegetables. Unadjusted and adjusted models were estimated for the relationship of perceived and objective measures with nutrition-related outcomes. Maps were created to show the spatial distribution of foodstores and BVHA participants.

Findings

This study examined the fruit and vegetable availability and variety data from 185 supermarkets/supercenters, grocery stores, convenience stores, dollar stores, mass merchandisers, and pharmacies. In the 27 neighborhoods with the largest concentration of senior residents, the average distance to the nearest supermarket was 14.0 miles, with a range of 0.25-33.6 miles; the nearest senior meal site was 8.9 miles (median = 9.6 miles), with a range of 0.6-20.6 miles. In a multiple variable regression model, an increase in neighborhood percentage of seniors was associated with greater distance to the nearest supermarket/supercenter ($p < 0.01$), and an increase in population density and socioeconomic deprivation were associated with shorter distance to the nearest supermarket/supercenter ($p < 0.001$).

Good selection of fruits or vegetables could be found in all types of foodstores, with the exception of convenience stores. In the 33 neighborhoods that were at least 10 miles from the nearest foodstore for fresh fruit, seniors were 21.4 percent of the population. BVHA data revealed that 35 percent of the 645 seniors reported a household income below 200 percent of the Federal poverty level. Sixty percent of the BVHA seniors had few grocery stores or supermarkets in their communities, 32.7 percent of seniors had little variety in foods, and food prices were high for more than 80 percent of seniors. Many seniors had problems with variety, freshness, or price of fruits and vegetables in the stores where most of their groceries were purchased. More than 36 percent of the sample resided at least 10 miles from the nearest senior congregate meal site, and almost 45 percent were at least 10 miles

from the nearest supermarket. About a fourth of the sample was within 1 mile of a good selection of fresh fruits or vegetables. The share increased to at least a third of BVHA seniors within 1 mile of a good selection of fresh or processed fruits or vegetables. At the other extreme, at least a fourth were at least 10 miles from fresh fruits or vegetables.

This study is the first step in understanding the spatial challenges to nutrition health faced by seniors in a large rural area that also lacks public transportation. This study goes beyond prior studies by simultaneously examining neighborhood and individual access to foodstores, senior congregate meal sites, and availability and variety of fresh and processed fruits and vegetables. Indeed, initiating or maintaining healthful eating habits is difficult without access to healthful foods.

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Sociodemographic Factors, Supplemental Nutrition Assistance Program Participation, and Health: The Case of Low-Income Individuals in Tennessee

Steven T. Yen, Donald J. Bruce, and Lisa Jahns, University of Tennessee

Background and Methodology

There is continued interest in the effects of food assistance programs on consumer welfare. The outcome variables of interest include food expenditures, nutrient intakes, and direct and indirect measures of health. This study addresses the effects of participation by individuals in the Supplemental Nutrition Assistance Program (SNAP) on self-assessed health (SAH) status—a widely used indicator of health-related quality of life. SNAP participation can affect health outcomes in many ways. First, to the extent that SNAP benefits represent effective income increases, the additional purchasing power can allow individuals to consume more and better health care. SNAP participation can improve health outcomes in other ways—for instance, by reducing the severity of food insecurity—which in turn can lead to better health. The role of SNAP participation in health has largely been investigated with national datasets. This study focuses on the South by using survey data for a sample of low-income individuals in Tennessee.

The primary data source is the Family Assistance Longitudinal Study (FALS), a collaborative effort of the Tennessee Department of Human Services and research organizations at the University of Tennessee and the University of Memphis. The FALS collected data from a large random sample of individuals from Tennessee who participated in Families First as of January 2001. Included in the survey are questions regarding food stamp participation and SAH outcomes, as well as sociodemographic characteristics of the survey participants. The study sample was drawn from the 9th and 10th waves of the survey collected in 2007 and 2008, respectively. While nearly all respondents are SNAP eligible, the FALS data were supplemented with administrative records from the Admiral database to enhance the accuracy of eligibility determination.

An ordered probability model with binary regime switching was developed to accommodate endogeneity of the SNAP participation variable and discrete (ordinal) nature of the SAH variable. The model is an extension of conventional switching regression models in that the primary outcome equation is an ordered probability model versus a continuous regression model. Further, in contrast to conventional models based largely on the bivariate normal distribution of the error terms, the error distribution was specified as a non-Gaussian distribution using the copula approach. Specifically, the marginal distributions of error terms in both the participation and SAH equations are specified as the generalized log-Burr distribution, which nests the extreme value and the logistic distributions. These marginal distributions are linked by the copula function to produce a bivariate distribution, which accommodates both skewness in and correlation between the two error terms. Three alternative copula functions (Gaussian, Frank, and Clayton) are considered along with two marginal distributions (Gaussian and generalized log-Burr).

Findings

The Clayton-Burr model was selected as the preferred specification based on nonnested specification tests. The Gaussian-Gaussian model, used extensively in models with sample selection, is rejected at the 1-percent level of significance, favoring the Clayton-Gaussian model. Endogeneity of regime switching was found, as was skewness in the error distribution, suggesting that conventional statistical models based on the Gaussian distribution or ones not accommodating such endogeneity would have produced biased and misleading effects of SNAP participation and sociodemographic variables on SAH.

Two sets of marginal effects are calculated, which allow further examination of the roles of explanatory variables in SNAP participation and SAH. Echoing findings reported in the literature, the number of children in the household contributes to SNAP participation. Previous-year income and current employment have negative effects on SNAP participation, whereas health insurance coverage contributes to SNAP participation.

Differentiated effects on SAH are found for many variables between SNAP participants and nonparticipants. Participants who are White and employed are more likely to be in the good, very good, and excellent SAH categories, whereas having a child with a health condition(s), being in the younger age (30-44) category, and having been hungry have the opposite effects. None of these variables has a significant effect on health among SNAP nonparticipants. Among both SNAP participants and nonparticipants, being divorced, separated or widowed, having an adult with a health condition(s), and being in the older age (45-64) category all have positive effects on the probabilities of poor or fair health and negative effects on the probabilities of good to excellent health, whereas the number of children have the opposite effects. The effects of age are substantial. For instance, SNAP participants ages 45-64 are 10.36 percent more likely to have poor health, 10.71 percent more likely to have fair health, and 5.05 percent, 9.18 percent, and 6.84 percent less likely to be in the good, very good, and excellent health categories, respectively, than are their younger (age < 45) counterparts. The effect of age on SAH is also very notable among the nonparticipants.

The calculated average treatment effects (ATEs) suggest that the effect of SNAP participation on health is negative overall. Specifically, participation in SNAP increases the probabilities of being in the low (poor or fair) SAH categories and decreases the probabilities of being in the higher (very good and excellent) categories. On a 1-5 scale, participation in SNAP decreases SAH level by 0.97. In sum, differentiated effects of sociodemographic variables on SAH are found between SNAP participants and nonparticipants, and SNAP participation has a negative effect on SAH. Given our use of survey data for a sample of current and former participants in Tennessee's welfare program, we view these negative effects of SNAP on SAH as suggesting that the neediest families (such as those with the lowest SAH) might be more likely to participate in SNAP. Alternatively, those on (or recently on) Families First but not participating in SNAP are likely to be the least needy families. This

inverse relationship between SNAP participation and SAH reveals that, while SNAP does not necessarily lead to improved SAH, the SNAP program is appropriately targeted to the neediest families in the State of Tennessee.

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

Assessing the Effect of Increasing Housing Costs on Food Insecurity

Jason M. Fletcher and Susan H. Busch, Yale University, School of Public Health, and Tatiana Andreyeva, Yale University, Rudd Center for Food Policy and Obesity

Background and Methodology

Household food insecurity is a large and growing problem facing families living near or below the poverty level. Research has shown that food insecurity is associated with several shortrun and longrun consequences for children and adults, including poor nutritional outcomes, mental health problems, child behavioral problems, distress, negative family and social interaction, and diminished school performance. Economic factors, such as lack of savings, unemployment, and income variability, are also associated with food insecurity. Researchers have also begun to examine the individual- and community-level determinants of food insecurity status, including State economic and social characteristics. One potential determinant of household transitions into and out of food insecurity status that has so far received few scholarly inquiries is expenditure shocks. This study focuses on price fluctuations in the residential housing market to estimate the effect of one type of expenditure shock on food insecurity. While significant increases in housing costs are not predicted in the near future, this information provides insight about the effect of other expenditure shocks.

Housing costs are a significant share of household budgets, particularly among low-income families. Research has indicated that individuals residing in areas with relatively high housing costs are more likely to report food insecurity. However, the impact of changes in housing costs in the United States on the food security of individual families has yet to be studied. This paper extends prior literature by pursuing two intertwined research questions. First, the study assesses whether recent changes in housing costs have increased food insecurity among low-income households with young children. Second, the study explores whether this effect differs for important subgroups (individuals receiving housing assistance or food stamp recipients).

In order to address these research questions, this study uses nationally representative data from the Early Childhood Longitudinal Study, Birth Cohort (ECLS-B). These data include detailed longitudinal information on demographics, social program participation, and the Household Food Security Scale recommended by USDA. Geographic identifiers allow us to append important county- and State-level characteristics, such as housing costs. To control for individual-level heterogeneity, this study uses household fixed effect models to examine the effect of changes in housing costs on changes in household food security. To assess whether social programs mitigate the effect of housing costs on food-insecurity status of at-risk families, the study uses information on family transitions onto food stamp and housing subsidy programs, as well as State-level information regarding program participation. This assessment provides evidence on whether expansions of these social programs in times of housing cost increases may promote the food security of at-risk families.

Findings

Overall, the study found considerable evidence that increases in rental costs lead to higher rates of food insecurity for low-income households. The results show these effects only for renters and find no effects for homeowners, which is an important test of the robustness of the reported findings. The results suggest that a $1,000 increase in annual rental costs is associated with a 5.4-percentage-point increase in household food insecurity (a 20-percent increase). In addition, the findings included evidence that households participating in social programs, such as food stamps and housing subsidies, are less able to weather these expenditure shocks, suggesting that these households may require additional social problem benefits in order to retain their food security.

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The Influence of Persistent and Transitional Adult Food Insecurity on Toddler Development

Alison Jacknowitz, American University, and Daphne Hernandez, Pennsylvania State University

Background and Methodology

A substantial body of literature suggests that residing in a household with a child and/or adult experiencing food insecurity has a negative effect on the developmental outcomes of school-age children. Research on the relationship between household food insecurity and socioemotional behavior consistently suggests that household food insecurity is associated with a decrease in positive behaviors, impaired social skills, and an increase in internalizing and externalizing behavior problems. While significant attention has been paid to the influence of food insecurity on school-age children, toddlers have received little attention in the food insecurity literature and no studies exist that focus on the influence of the persistence of food insecurity on toddler development. This research examines (1) characteristics associated with experiencing persistent and transitional adult food insecurity and (2) how persistent and transitional adult food insecurity influences toddler cognitive and motor development, along with toddler's weight and health status.

The study contributes to the literature in several ways. First, this study focuses on the developmental outcomes of toddlers because there is a dearth of literature on the effects of food insecurity on this age group. Focusing on the developmental outcomes of toddlers is important because scholarly research suggests that nutritional deficiencies during infancy may lead to poor brain development, resulting in cognitive and behavioral difficulties in school-age children and adolescents. Second, with most of the literature on food insecurity and child development measuring food insecurity using a point-in-time measure, the analysis captures food insecurity at two points in time and focuses on various prevalence patterns (that is, persistent and transitional episodes) of food insecurity. By focusing on the prevalence patterns of adult food insecurity, the study attempts to gain a clear picture of the likelihood of experiencing adult persistent and transitional food insecurity and how these prevalence patterns influence a broad set of toddler developmental outcomes. Third, because methodological concerns have been raised concerning food insecurity measured at the household level, the study focuses on food insecurity measured at the adult level.

The analyses use data from the Early Childhood Longitudinal Study, Birth Cohort (ECLS-B), a longitudinal data set collected by the National Center for Education Statistics. The ECLS-B is designed to be nationally representative of children born in 2001 with an oversample of Asian and American Indian children, twins, and low- and very low-birth-weight children. To investigate the influence of food insecurity on toddler development, the first two waves of survey data are used when the child is 9 months of age and 2 years of age. Four mutually exclusive variables capturing the prevalence patterns of food insecurity were created. Adults who experienced food insecurity at both waves of data were classified as persistently food insecure, while adults who only experienced food insecurity at one wave were divided into two groups: those who experienced food insecurity only at the 9-month interview and

those who experienced food insecurity only at the 24-month interview. Adults who never experienced food insecurity were classified as never food insecure. The four outcome variables are toddler cognitive and motor development, weight-for-age z-scores, and health status as reported by a parent. Control variables include child, maternal, household, and State characteristics. Further, the 9-month values for the dependent variables are included. Logistic regression models estimated the likelihood of being persistently food insecure, while ordinary least squares (OLS) regression models estimated how persistent and transitional adult food insecurity influence toddler development.

Findings

Logistic regression results suggest that disadvantaged families are more likely to be persistently food insecure compared with families who are not persistently food insecure. These differences are smaller and less likely to be statistically significant when toddlers in persistently food-insecure households are compared with those in transient food-insecure households. OLS regression models suggest that toddler development is not influenced by adults experiencing persistent food insecurity. Instead, findings suggest that toddlers residing with an adult who is food insecure have immediate, but small, negative impacts on their development. For example, toddlers in households with an adult who was food insecure at wave 2 only scored 1.5 points (1 percent) lower on cognitive scores and 0.17 points lower (4 percent) on health status. These results are robust to changes in the definition of food insecurity, changing the analysis sample to exclude the nonpoor and excluding the dependent variable at 9 months. Results do not vary by gender.

Given that toddlers residing in households with an adult who is experiencing persistent food insecurity are similar to toddlers in households with an adult who is experiencing transitional food insecurity, outreach efforts do not need to vary by duration of food insecurity. The findings suggest that temporary food insecurity has greater negative outcomes for toddlers than persistent food insecurity, which is counterintuitive. Those who experience persistent food insecurity could have developed coping strategies to address the situation. For example, they may know how to maneuver within the social service system. Hence, providing assistance and information to food-insecure families through family clinics, pediatrician offices, food banks, and early intervention programs may lessen the immediate effect of food insecurity on toddler development.

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The Impact of Food Stamp Program Participation on Household Food Insecurity

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Background and Methodology

The overwhelming objective of the Food Stamp Program, the largest government food assistance program, with annual expenditures of over $32 billion, is to decrease food insecurity among low-income households. Yet, many U.S. households continue to report food insecurity and hunger. USDA estimates that in 2005, 12.6 million households, composing 11 percent of all U.S. households, reported being food insecure with over a third of food-insecure households (4.4 million) experiencing severe food insecurity.

In recent years, considerable attention has been devoted to measuring the impact of food stamp use on food insecurity, but most studies find either no significant relationship between food stamp use and food insecurity or, in some cases, a paradoxical positive correlation. Identifying the effect of food stamp participation on the severity of food insecurity with nonexperimental data has proven particularly difficult, as households with higher severity of food insecurity are often more likely to choose to participate in the Food Stamp Program.

This study uses an instrumental variable model to estimate the causal effect of food stamp participation on food insecurity. State-level food stamp policy variables are used as instruments. The study also explicitly examines the impact that important and often previously omitted factors, like income variability and inelastic expenditures on addictive substances, have on food insecurity. Nationally representative data from the Panel Study of Income Dynamics (PSID) are used for the analysis.

Findings

The study finds that food stamp participation is associated with a 27-percent reduction in the severity of food insecurity for the average low-income food-insecure household. Several different model specifications produce estimates of the Food Stamp Program impact that range between a 22-percent and a 29-percent reduction in the severity of food insecurity. The study also finds evidence that smoking habits increase food stamp participation significantly. Income volatility increases food insecurity in moderate-income households but not low-income households. Accumulated wealth, current income, and average income reduce household food insecurity, as do education and age of the household head. Households headed by Blacks show higher food insecurity, as do households that experienced unemployment.

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The Long-Term Economic Outcomes of Younger Mothers Who Are Food Stamp Program Participants

Thomas P. Vartanian, Bryn Mawr College, and Joseph Harkness, Johns Hopkins University

Background and Methodology

A considerable body of research has examined the associations between participation in the Food Stamp Program and a range of economic and nutritional outcomes, including labor supply, food spending, nutrient availability, dietary quality, and food security. More recent studies have extended the set of outcomes to include consumption stabilization and other indicators of family and child well-being.

Virtually all of this research focuses on current Food Stamp Program participation. What happens to food stamp recipients after they leave the program or over the long run is largely unknown. Two studies have looked at factors associated with returns to participation after exits, tracking individuals up to 30 months after they left the program, but no research has examined other or longer term outcomes. The research reported here extends the body of work on the economic effects of the Food Stamp Program by examining young mother food stamp recipients for a period after they have their first child and again over a 5- to 15-year period after they reach age 26. This information will be able to distinguish between the shortrun and longrun effects of receiving food stamps.

Such information is critical to understanding the full range of program effects. For example, presumably underlying the Food Stamp Program's immediate task of achieving a sufficient diet among those at risk of undernutrition is the broader goal of helping people lead healthier and more productive lives. Its success in achieving this goal can be assessed only by examining the longer term outcomes of program participants. Such information may also address the concerns of many who believe that policies intended to alleviate poverty instead intensify economic problems for the poor by making the poor less self-reliant.

In this study, the Panel Study of Income Dynamics (PSID) is used to examine young mothers when they first become mothers for a 4-year period before age 25 and to examine them over 5-year periods after age 25 until they are age 40. For a second sample, the same criteria as the first are used, but the initial period is increased to age 30, with outcome periods from ages 31 to 35 and 36 to 40. Because many of the young mothers also received Aid to Families with Dependent Children (AFDC) or Temporary Assistance for Needy Families (TANF), these programs are examined as well. However, food stamp participation thresholds were/are typically higher than welfare eligibility thresholds. Thus, while the overlap in program participation is substantial, it is not total, which allows an estimation of food stamp effects apart from AFDC effects. The percentage of time spent using food stamps is then examined with no AFDC (food stamps alone group), AFDC with no food stamps, food stamps and AFDC, below 150 percent of the Federal poverty line (FPL) with no food stamps or AFDC, and all others. The reference group included mothers below 150 percent of the FPL with no food stamps

or AFDC. This study was mainly concerned with the effects of receiving food stamps alone relative to being in poverty without receiving food stamps.

Four dependent variables are used for the economic outcomes. These include the mother's family income-to-needs, the percentage of time with income at or below 150 percent of the FPL; the maximum hours of work for either the head of household or the wife; and AFDC, food stamp, and other welfare income (which the study will refer to as transfer income), all measured after the ending period.

For two of the dependent variables, the log of family income-to-needs and hours of work, ordinary least squares regression analysis with robust standard errors is used, clustered by family status for the women while they were growing up. For the percentage of time with income below 150 percent of the FPL and income from food stamps, AFDC, and other welfare income, Tobit models with robust standard errors are used. For all four of these dependent variables, sister fixed-effect (FE) models are also used.

Findings

The results indicate that if one were to look at only the entire 10- and 15-year outcome periods, one might conclude that the effects of government assistance are adverse and far reaching. Study data indicate that this conclusion may well be faulty and premature. By looking at 5-year periods after the initial young parenting period, one finds that only the immediately subsequent 5-year period that generally is affected by time on food stamps. If other longer periods after the initial period showed any effects at all, these effects generally diminished as time passed. The results hold when using either standard regression models or sister FE models.

The study was also able to clarify the differences of the effects of assistance to married versus single mothers. While some differences between the two groups were found (such as younger single mothers were more negatively affected by time receiving food stamps than were younger married mothers), the differences were not great for the effects of food stamps alone. Thus, overall, the analysis found that time on food stamps alone had some negative effects on short-term outcomes but found little evidence that time on food stamps had long-term negative consequences relative to time with low income without either food stamps or AFDC.

These results support the notion that food stamps negatively affect some outcomes, but these effects are generally short lived. More specifically, the evidence presented for hours of work shows strong negative effects for joint participation over the course of the outcome period but little evidence that this is the case for time with food stamp participation alone. Other outcomes, such as income-to-needs, time at or below 150 percent of the FPL, and government assistance income, generally show that the effects of using food stamp income alone last only a short time. Further, the study's FE models show some evidence that this is the case for joint participation as well. For older married mothers, the FE models show some negative income consequences for all outcome periods.

In general, the study does not find that time receiving food stamps improves the economic situation of participants relative to those with low income without transfer assistance. However, because of the generally short-lived nature of the effects of food stamps, the study finds that the long-term impact of time on food stamps is neither positive nor negative for the economic outcomes examined relative to time with low income without government assistance. Thus, if the use of food stamps is leading to positive outcomes in other or noneconomic areas, such as nutrition, consumption stabilization, or physical and emotional well-being, these alone may well justify continued support of the Food Stamp Program.

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Implementing Strategies That Increase Healthy Food Consumption in Local Grocery Stores on a Northern Plains Indian Reservation

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Background and Methodology

The contemporary American Indian diet is high in refined carbohydrate, 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. Research shows that, if tribal members were to eat healthier foods, diet-related diseases, such as type 2 diabetes, heart disease, and obesity, may decrease. Small reservation stores frequently do not stock a full range of food (especially fresh fruits and vegetables), providing instead snack and convenience foods. Having community members identify strategies to improve the food environment of reservation stores can be the first step in implementing healthier food purchases and intakes in tribal members living on rural reservations.

This project implements the community-based strategies identified in a previous study. These strategies are being implemented in a local grocery store on a Northern Plains Indian reservation for the purpose of increasing tribal member awareness and purchase of healthy foods that are now available in the store. Approval from the University of Montana Institution Review Board (IRB) was obtained for the study to (1) survey and interview adolescents and adults living on or near the reservation who shop at the local grocery store and (2) measure the acceptance and purchase of healthy foods that are now available in the store.

The targeted population in the project included adolescents and adults (≥10 years old) living on or near the Northern Plains Indian reservation. The participants were recruited for the study while they were shopping at the local grocery store. The survey respondents were asked questions about their age, education level, annual salary, gender, and ethnicity and participated in food taste tests and cooking demonstrations. They answered survey questions regarding (1) promoted foods they would likely purchase or not purchase and (2) how much they like, or dislike, the Healthy Stores point-of-purchase labels and educational materials (for example, posters, recipe cards, and flyers) that were created for the project. Approximately 98 percent of the subjects were American Indians.

All survey measurements were taken at the local grocery store. Seven survey instruments were used for the project, including the following:

Customer Demographic Survey: Project staff approached and asked in-store shoppers to complete a seven-item survey and invited them to participate in taste testing promoted food items. The demographic survey asked customers to provide anonymous information for their age, gender, ethnicity, tribal affiliation, education, and income levels. After completing the survey, the shopper could participate in a food item taste test.

Customer Evaluation Taste Test Survey: This self-administered, three-item survey was completed by the grocery store customers participating in cooking demonstrations and/or taste tests of various promoted food items. Taste test participants were asked to rate how much they liked the food they tasted, whether or not they would buy the food, and an open-ended question requesting suggestions to improve the cooking demonstration and taste test. Incentives, such as chip-clips and recipe card packs, were given to the taste test participants after they filled out the customer evaluation form. At the end of the project, 200 people completed the taste test surveys. Preliminary data show that 92 percent of the taste test participants reported liking the food or liking the food very much. About 82 percent of those surveyed were either considering purchasing or would definitely buy the promoted food item.

Process Evaluation Taste Test Survey: The process evaluation survey was completed several times during the intervention by the onsite project staff. This survey instrument assessed the reach and fidelity of the healthy food strategies. Preliminary data showed that 71 percent of the shoppers had seen the Healthy Stores shelf labels, 43 percent had purchased the food because they saw the shelf label, and 26 percent purchased the food "often" or "almost always" because they saw the shelf label. For specific food items for which shoppers stated they read the shelf label, 52 percent of shoppers purchased baked versus fried chips, 45 percent purchased 100-percent whole wheat bread versus white bread, 31 percent purchased lean (10 percent or less fat) ground hamburger versus regular hamburger, and 37 percent purchased 1-percent milk versus regular milk.

Intervention Exposure Evaluation Survey: This survey assessed the reach and fidelity of the Healthy Store project from the perspective of the grocery store customer. The project staff administered this survey to randomly selected grocery store customers throughout the intervention. The survey asked the customers if they had (1) participated in the taste tests, (2) seen the Healthy Store Project point-of-purchase labels and poster information, (3) heard the radio ads for the project, and (4) received any project incentives and how they liked, or did not like, the Healthy Stores Project. Preliminary data for the intervention exposures showed that 47 percent of the shoppers had read the nutritional information about the promoted foods on the Healthy Stores poster located in the store and 55 percent had heard the radio ads promoting the Healthy Stores project and foods.

Mass Media Process Evaluation Survey: This survey evaluated the fidelity of the intervention audio and visual communication materials as well as the level of these materials provided to the community. The mass media log was completed once per each intervention phase (n=9).

Evaluation of Store Environment Survey: This pre- and post-test survey evaluated the availability of specific food items and shelf labels.

N**utrition Environment Measures Survey:** This pre- and post-test survey determined changes in the food environment of the reservation store.

Findings

The preliminary findings show the Healthy Stores project has been well received by tribal community members. Although the project did not assess dietary intake in the grocery store shoppers participating in the taste tests and other surveys, data indicate that shoppers like the taste of the healthy foods and are purchasing them. Future studies could assess dietary intake of local shoppers or implement a Healthy Stores project that targets increased intake and sales of food assistance program foods, such as those in the Special Supplemental Nutrition Program for Women, Infants, and Children (WIC).

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Understanding the Impact of Food Assistance Program Usage on Diet Among American Indians

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Background and Methodology

Food assistance programs, including the Food Distribution Program on Indian Reservations (FDPIR), aim to ensure low-income American Indian households an adequate, nutritious food supply. Many low-income American Indian households on reservations rely primarily on food assistance to meet their nutritional needs. However, limited accessibility, availability, and affordability of healthy foods on American Indian reservations may constrain food purchasing and consumption patterns of low-income American Indian households. While food assistance programs help promote food security and increase food purchasing power of low-income households, its impact on food behaviors and diet quality of low-income American Indian households is unclear.

This study examined the relationships between participation in different types of food assistance programs, psychosocial factors, and food purchasing behaviors among American Indian households on the White Mountain and San Carlos Apache Reservations. Specifically, three research questions were addressed: (1) what are the patterns of food assistance program use in American Indian households, (2) what are differences in food purchasing behaviors among households participating in different types of food assistance programs, and (3) how do psychological determinants of food purchasing behaviors mediate the relationships between food purchasing behaviors and participation in different types of food assistance programs? Finally, this information was used to develop components of the Apache Healthy Foods Program, a foodstore-based nutrition program on the White Mountain and San Carlos Apache Reservations that would be directed at improving the diets and reducing chronic disease risk for those using food assistance programs.

Findings

Analyses were based on two waves of data from the Apache Healthy Foods Program. The first wave of data was collected in 2003 as part of a baseline evaluation for the Apache Healthy Stores Program. The second wave of data was collected in 2007 as part of a followup study. Study participants were main household food preparers or food shoppers (n=270 at first wave, n=72 at second wave). A survey questionnaire was used to collect information about basic demographics, participation in different types of food assistance programs (Food Stamp Program, Special Supplemental Nutrition Program for Women, Infants, and Children (WIC), and FDPIR), food-related knowledge, self-efficacy and behavioral intentions, food-getting frequency, food preparation, and prepared food purchasing. The survey was conducted on randomly selected households without overlap between the two waves of household samples.

Additive scales were developed for food knowledge (alpha=0.61), self-efficacy (alpha=0.81), intention (0.71), food-getting frequency, food preparation (alpha=0.50), prepared food purchasing (alpha=0.61), and material style of life (a proximal measure for social economic status) (alpha=0.82). The food-getting frequency score consists of three subscales: unhealthy food-getting

score (an additive scale of 11 commonly consumed foods that are high in fat/sugar, low in fiber), healthy food-getting score (an additive scale of 17 healthy alternatives that are lower in fat/sugar, higher in fiber), and a fruit- and vegetable-getting score (an additive scale of 23 commonly consumed fruits and vegetables). Primary dependent variables are aforementioned food behaviors and psychosocial determinants of food behaviors. Primary independent variables are participation in different types of food assistance programs (Food Stamp Program only, FDPIR only, WIC only, and Food Stamp Program plus WIC). No food assistance program participation was used as a reference group for many of the analyses. Multivariate regression models were used, adjusting for basic demographics (age, education, household size, employment, material style of life, and data collection wave).

This research project is continuing in 2009.

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Wa-dooch Pinx-gi: Ho Chunk for Really Good Eating

Brigid Quinn Laquer, Charlene Earth, and Crystal Dawn Snowball,
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Background and Methodology

According to Nebraska Health and Human Services, American Indians in Nebraska are more likely to die from diabetes-related causes than are all other racial and ethnic groups. Emulating the 2002-03 USDA Fruit and Vegetable Pilot Program model, the Wa-dooch Pinx-gi (Really Good Eating) Fresh Fruit and Vegetable Intervention Project was designed to (1) study and address the awareness and behavior associated with an unhealthy diet and (2) seek strategies and solutions to positively change Little Priest Tribal College (LPTC) students' unhealthy eating behaviors. These goals were met through the implementation of a two-semester multifaceted food distribution program and complemented by a series of nutrition education programs. The programs assisted students who are current and former recipients of food assistance to make the transition to healthy eating for themselves and their families through education, participant feedback, and introduction of healthy fruits and vegetables into their daily diets.

Over the course of the study, two experimental programs, the Really Good Eating Program and the Dinner Program, and four participant surveys were conducted. In November 2007, a baseline survey was conducted to determine students' eating habits prior to participation in the healthy eating program. In that survey, participants were asked to identify (1) their typical eating habits, including the frequency of eating breakfast, lunch, and dinner, (2) types and amounts of snacks consumed daily, (3) the principal person who shops and prepares most of the meals in their home, and (4) the frequency that fresh fruits and vegetables were served in their home.

In April 2008, a followup survey was conducted to determine the impacts of student participation in the healthy eating program on their food choices and behaviors. Questions asked of students included the following:

- How often did they eat the fresh fruits made available by the Really Good Eating program?
- Had participation in the program changed their eating habits?
- Had they tried new and different items as a result of the program?
- Were they serving more fresh fruits and vegetables at home?
- Did the students note any changes physically and mentally due to their participation in the Really Good Eating program?

As a result of the positive response to the Really Good Eating Program, an experimental dinner program was started in fall 2008. The Dinner Program hypothesized that a simple, nutritious dinner for the students would result in lower evening class tardiness, improved focus in class, and a measurable decrease in the evening class attrition rates.

Findings

The results of the Really Good Eating Program showed that 55 percent of the participants (n=33) reported eating more fruits and vegetables than before the program started. Forty-five percent reported that the fruits and vegetables eaten came only from the program, while 47 percent reported that the fresh fruits and vegetables came from the program as well as from other sources. Thirty-nine percent said that they were eating healthier foods since the program began. Almost all (97 percent) of the respondents reported that their participation in the program resulted in their serving more fresh fruits and vegetables at home. A third of the respondents (34 percent) reported that fresh fruits and vegetables were served on a regular basis. The most encouraging result from the survey was that 84 percent of the respondents reported a positive change in their physical well-being, with almost half stating that they had more energy. When asked about concentration and study skills, 55 percent reported a noticeable increase in these abilities.

An initial survey of Dinner Program participants (n=55) was conducted in September 2008. About 40 percent of participants reported always eating dinner, while another 24 percent reported eating dinner most of the time, prior to attending classes. Almost 90 percent reported never missing class even if they had to miss dinner. Of the top reasons given for coming to class without dinner, 65 percent of participants cited the lack of time and another 22 percent stated the need to provide dinner and/or care for their children.

A followup survey (n=45) of Dinner Program participants was conducted in October 2008. The primary goal of this survey was to determine if the Dinner Program was being used by the students. Eighty-two percent of the students had participated in the program, and the majority of them did so regularly. All of the participants wanted to see the Dinner Program continue.

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Healthy Native Foods in a Rural Convenience Store Setting

Susan Secakuku, Suzanne Jamison, and Isaura Andaluz, Sipaulovi Development Corporation, Hopi Sipaulovi Village

Background and Methodology

The Sipaulovi Development Corporation (SDC) is a nonprofit, tax-exempt corporation of Hopi Sipaulovi Village, an autonomous Village of the Hopi Tribe. SDC developed a model to demonstrate that convenience stores with fast food components can profitably source, offer, and promote a range of healthy food choices that are based in traditional Hopi foods and culture. Moreover, this project determined the best avenues for incorporating locally sourced ingredients into these tradition-based foods that can be offered in a "fast food" setting. The project targeted the health and nutrition issues faced by the working poor who have limited access to healthy foods and limited food dollars to spend. The model included real-world sourcing, pricing, and educational and outreach ideas to help develop a sustainable project that would benefit the community.

The methods used to determine the information in this study were a strategic planning session, interviews, a qualitative questionnaire, and documentation of many meetings with project partners.

Findings

Defining the terms "food" and "healthy food" provided a scope within which to work. The project defined "food" as nourishment for the body. "Healthy food" was determined to have the following qualities: not processed, natural, organically grown, positively impacts the environment, locally produced, and the source or traceability of the ingredients or products are known. Cooking methods also were used to define "healthy food." Healthy cooking methods include baking, boiling, steaming, roasting, or drying.

Rationale for determining which of the many traditional Hopi foods that would be part of the study included seasonality of Hopi food within the parameters of the definition of "healthy food," existing foods that are familiar but not necessarily made too often, and those foods not yet found on a menu in an existing Hopi restaurant.

The study resulted in the development of recipes of five traditional Hopi foods. Recipes were created for Sakwaviqaviki (blue corn tortilla), Sakwats'tsilsomiviki (blue corn tamale), Pivlak'kutuki (roasted piiki), S omiviki (sweet blue corn bread), and Hohoysi (wild herbal tea).

Taste testing of these Hopi foods by individuals who reside in the local, projected market helped the study gauge the authenticity of the taste of the recipes. Local citizens also provided opinions of possible cost factors and offered existing assumptions or attitudes of health factors associated with these foods, such as Hopi foods were considered healthy because they were made with natural or local ingredients (51 percent), not processed (25 percent), and not fried or contain fat (16 percent). Additionally, 89 percent of the respondents stated that the "availability of product was the primary determinant in purchasing traditional foods" and that they would purchase the foods if available in a convenience store.

The study identified existing sources that could supply large amounts of ingredients needed to produce a high volume of these healthy food products. Websites were researched to determine existing suppliers, the amount of ingredients available for sale, and the cost of the products.

Several recent, major studies of the food and health of the Hopi community have provided very informative and relevant information, some of which has led to community-based healthy initiatives. Data from those studies have helped to direct the educational campaign of this study, which will be part of the future inhouse marketing and outreach plan for the Hopi Marketplace. Input from the Health Promotion and Disease Prevention Program of the Hopi Health Care Center and the Hopi Tribe Diabetes Program will also impact the scope of the educational campaign. Several ideas relevant to a convenience store setting have been determined with regard to eating habits and purchasing habits.

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Evaluating CACFP in Family Child Care Homes: How Far Can Administrative Data Take Us?

David Alexander and Marcia Stoll, Illinois Action for Children

Background and Methodology

Evaluating the outcomes of food assistance programs comes with high costs, especially if program settings are geographically dispersed, as they are in home settings. If program administrative data are of sufficient scope and quality, they will support some types of evaluations. In other cases, low-cost ways of supplementing administrative data may exist. The latter better describes the case of evaluating the USDA Food and Nutrition Service's Child and Adult Care Food Program (CACFP). This paper examines the efficacy and limitations of using administrative data to evaluate CACFP as it applies to family child care homes.

CACFP reimburses child care providers for serving meals and snacks to a daily average of 2.9 million children. About 850,000 of these children receive care in the homes of child care providers, often called family child care homes (FCCs). CACFP payments to FCCs can be substantial. In Illinois, they can equal as much as 39 percent of the State's reimbursement for full-time child care under Illinois's child care subsidy program.

FCCs participate in CACFP through local sponsor organizations that have an agreement with the State authority responsible for administering CACFP. Sponsors recruit, train, monitor, and authorize payments to FCCs. Monitoring by sponsors consists of reviewing menus and making three visits to each FCC annually, including unannounced visits.

CACFP has the potential to grow substantially. Some 6.5 million children under the age of 6 receive care in FCCs. Of these, 39 percent have incomes below 200 percent of the Federal poverty level. Among school-age children, at least 1.5 million (and as many as 10 times that number) receive regular care in FCCs.

CACFP home provider participation largely consists of licensed FCCs regulated by State agencies. Yet the majority of FCCs in the United States are home providers who are not licensed and of whom, as a group, little is known. Families with lower incomes are more likely to use this license-exempt child care. Only some States reimburse license-exempt FCCs under CACFP. Little is known about the outcomes.

After describing FCCs in the United States, reviewing basic features of CACFP, and discussing the role of CACFP in FCCs, the study presents the administrative data that an evaluator might use for various outcome evaluations. It summarizes several evaluation questions and discusses possible research designs appropriate to measuring program outcomes, including nutrition, nutrition knowledge, food behaviors, FCC and parent food expenditures, and the cost of complying with monitoring. It discusses to what extent

evaluators can rely on administrative data for this research and identifies what additional data evaluators would need to collect.

Data sources include administrative forms used by CACFP sponsors and interviews with program staff and specialists.

Findings

Basic administrative data in CACFP, including menus, allow evaluators to conduct descriptive studies, such as geographic coverage of FCCs by CACFP or basic foods served. The study discusses administrative data storage and data quality differences across CACFP sponsors and other limitations of administrative data.

Several lower cost ways of supplementing administrative data exist, including two in particular. First, supplementing CACFP administrative data with other data sets, such as census data and administrative data from other programs that subsidize, license, or train FCC providers, make more sophisticated evaluations possible. For example, they make possible the analysis of differences in takeup rates by types of providers across geographies, including those with identifiable income, racial, or ethnic characteristics.

Second, it might be possible to train the FCC home-visit staff of CACFP sponsors to collect observational or survey data during their normal visits extended by a few minutes. The cost of this form of data collection with the case of a Chicago sponsor paying for extending each of three annual FCC visits by 15 minutes was estimated at $32.64.

Collecting pretreatment data or data for a control group of FCCs will typically cost an evaluator substantially higher amounts. (Exceptions include less typical evaluations where both treatment and control groups can be drawn from among CACFP participants or where administrative data contain sufficient pretreatment data.) Continuing with the example of using sponsors' FCC home-visit monitoring staff to collect these data, the study concludes that collecting pretreatment data from the treatment group will typically require at least making an additional home visit and possibly several visits. Similarly, collecting comparable data from a control group will generally require additional home visits. The study estimates that collecting data during each additional visit will cost 2.5 times the cost of extending the duration of three annual home visits (approximately $80 in Chicago).

Additional costs include the costs of using specialists or special materials and equipment. Other substantial costs of making additional home visits include inconveniencing the child care provider, an inconvenience that might need to be compensated to avoid nonparticipation or attrition.

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Child Care Centers in the Mississippi Delta: Does CACFP Participation Influence Food Choices?

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Background and Methodology

Mississippi has the highest obesity rate in the Nation, with adults averaging a body mass index (BMI) of 32 (30 or greater indicates obesity). In the Mississippi Delta, even higher rates of obesity exist. Residents of this region, with its high poverty level and limited access to grocery stores, are especially vulnerable to improper nutrition, which can lead to obesity. The high poverty rate is especially evident among children under age 18. In 2005, 12 of the 13 Mississippi counties with poverty rates of 45 percent or more were located in the Delta. One way to make an impact on these health and poverty issues is to ensure that children in this region have access to nutritious foods. The primary purpose of this study was to examine the role of the Child and Adult Care Food Program (CACFP) in the food environments of licensed child care centers in the Mississippi Delta.

This study began by first engaging in a deeper understanding of how the CACFP program operates in Mississippi. An initial assessment of program administration included examining web-based data, interviewing the Mississippi CACFP State director, and reviewing the procedures of administration and operations of the Mississippi CACFP program as they pertain to licensed child care centers. Interviews with 21 child care center directors in one Delta county allowed for indepth analysis about their experiences with CACFP, as well as the food environments of their child care centers. Surveys with the parents of children enrolled in these centers generated data on their perceptions of the food environments in the child care centers and at home. Finally, height and weight measurements were collected for a subsample of 4-year-old children in order to calculate body mass indices.

Findings

The interviews conducted with the Mississippi CACFP director revealed important details about program administration in Mississippi. The only data collected by the State program are the administrative data required by USDA. Further, no actual database exists. Although forms are completed online, the forms and records are kept as hard copies for just 3 years as required by USDA. Without a database and additional information beyond the aggregation of administration data, the impact and effectiveness of the CACFP in providing nutritious meals for children in child care centers cannot be determined, but can only be surmised.

Child care center directors stated that CACFP assists them in serving nutritious meals. Center directors reported that participation in CACFP influences the food choices at their child care centers. The majority of directors reported that 75 percent or more of their food budget comes from CACFP. Without CACFP resources, they believe their centers would no longer be able to operate, let alone be able to offer nutritious meals and snacks. However, while most menus submitted to the Mississippi State Department of Health met

State guidelines, opportunities exist to improve the nutritional quality of the food that is served. Detailed data on how foods are prepared would reveal the true nutritional content of the meals as well.

Among the subsample of children whose BMIs were calculated, 3.1 percent were underweight, 58.5 percent were of average weight, 21.5 percent were at risk of being overweight, and 16.9 percent were overweight. Of particular concern, 4.4 percent of parents surveyed about their child's weight felt that their child was overweight and 3.8 percent reported that a doctor told them that their child was at risk for being overweight or was currently overweight. The outcomes for parents were similar. Among 429 respondents who self-reported their height and weight, 38.3 percent had BMIs in the obese range, which is higher than the average rate in Mississippi. Once again, 3.8 percent reported that they are obese and 20.9 percent reported that a doctor talked to them about being overweight.

Effective policies targeting nutrition and healthy food access are required in order to substantially reduce the obesity rate in the Mississippi Delta and the Nation as a whole. Evaluating the CACFP in terms of its ability to provide nutritious food to children from low-income households could help in targeting effective policies. The Mississippi CACFP does not currently collect sufficient data to allow for appropriate evaluation of the program; the only data collected are administrative data that are required by USDA. Information on whether the CACFP influences food choices in child care centers in the Mississippi Delta cannot be answered based on the structure of this administrative data. For instance, the Mississippi CACFP requires no information on menu choices from participating centers. Furthermore, State-level differences in administrative data make it difficult to evaluate the program performance in Mississippi relative to that in other States. Development of a nationwide standardized database would facilitate analysis and allow for accurate evaluation of the CACFP.

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Food Stamp Use Among the Elderly: Evidence From Panel Data

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Background and Methodology

About half of all households that are eligible for food stamps but do not use them include an elderly member. Takeup of food stamps is much lower among the elderly than among younger adults and children; only about 30 percent of the elderly who are eligible take up benefits compared with an overall takeup rate of 59 percent among all eligible individuals. Previous research has found that failure to take up benefits by the elderly cannot be explained by behavioral factors, such as differences in expected benefits or obstacles to enrollment (for example, functional limitations). Thus, low takeup among the elderly, both in absolute terms and relative to younger individuals, remains a puzzle.

Understanding food stamp dynamics among elderly individuals is a high priority for at least three reasons. First, many of the elderly will be at risk of needing benefits at some point. Although the poverty rate among the elderly at any point in time is now only about 10 percent, 40 percent of individuals will experience a spell of poverty between the ages of 60 and 90. This fraction is considerably higher for subgroups, including Blacks and individuals with low education levels. Thus, the program has the potential to benefit a significant number of elderly individuals—if they participate. Second, low takeup may be a warning flag that even those who receive benefits face obstacles to signing up, and the program could be more efficient if these obstacles were eliminated. Third, as the Baby Boomers age and the size of the elderly population increases significantly, accurate projections of food stamp spending require that we understand whether the low takeup rates among the current elderly are likely to continue. If relatively low takeup among today's elderly is due to differences across cohorts rather than to age, food stamp expenditures for the elderly may increase dramatically once the Baby Boomers, rather than the children of the Depression, are deciding whether or not to sign up for the program.

This study uses panel data from the 1992 through 2006 waves of the Health and Retirement Study (HRS) to analyze patterns of food stamp use and takeup (that is, use conditional on eligibility) over time and across cohorts, as well as the longitudinal predictors of food stamp use and takeup in multivariate models. The HRS is a nationally representative longitudinal study that collects information every 2 years on income, labor supply, program use, health, and other characteristics of individuals over the age of 50. This study uses HRS data on approximately 20,000 individuals born between 1923 and 1953 who are observed for as many as eight survey waves. The data are used to construct age-specific rates of food stamp use and takeup for four birth cohorts: the Children of the Depression (born 1923 to 1930), the original HRS cohort (born 1931 through 1941), the War Babies (born 1942 through 1947), and the Early Baby Boomers (born 1948 through 1953). About 13,000 of these individuals are observed for at least three consecutive waves, and data on this subset of individuals are used to analyze transitions over time between program use and program nonuse, including periods when individuals are eligible for benefits but not receiving them. Finally, multivariate models are used to estimate the determinants of food stamp use, poverty, and food stamp takeup. These models include as covariates age, race, education, marital status, health status (presence of serious health conditions and

functional ability as measured by Activities of Daily Living and Instrumental Activities of Daily Living), work status, and household composition. Results are compared for models with and without an individual "fixed effect" that controls for the presence of unobservable time-invariant characteristics.

Findings

The analysis finds no real differences across birth cohorts in the use or takeup of food stamps in old age for those born between 1923 and 1953. In particular, the Early Baby Boomers (born between 1948 and 1953) are no more likely to use food stamps in their fifties than were earlier cohorts. Thus, any increase in program use by the elderly as a result of higher takeup among more recent cohorts is at least a few decades off, rather than being just around the corner.

The analysis of transitions over time finds that food stamp use among the elderly and near-elderly is quite persistent in the sense that nearly all of those who use food stamps at all during a calendar year receive them in every month of that year. However, over a longer time horizon, there is quite a bit of movement on and off the program in this population. Most of those who use food stamps at some point during a 6-year interval will not use them all 6 years. Transitions on and off the Food Stamp Program typically involve a period of eligibility without receiving benefits. Most spells of eligible nontakeup do not end in program takeup, but most spells of program use begin or end with a period in which available benefits are not taken up. In this sense, periods of eligible nontakeup are a stepping stone on and off the Food Stamp Program.

Finally, multivariate models of food stamp use and takeup yield quite different results, depending on whether or not they include an individual fixed effect. In particular, while regressions without a fixed effect (FE) suggest that older age is associated with lower takeup, individual FE models suggest that the elderly are more likely to take up benefits as they age. Work, marriage, and good health, which are strongly associated with lower program takeup in ordinary least squares models, do not significantly predict food stamp takeup in FE models. The fact that individuals who retire or lose a spouse—both events that increase the risk of poverty among the elderly—do not take up food stamp benefits suggests a possible intervention to protect the elderly from economic hardship. Both retirement and the death of a spouse are events that are, in theory, known to the Social Security Administration because they affect the receipt of Social Security benefits. If these events triggered automatic receipt of information about food stamps, more eligible beneficiaries might take advantage of benefits available to them. Understanding the potential of food stamps to mitigate the hardships potentially facing retirees, widows, and widowers is a high priority for future research.

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The Economics of the Thrifty Food Plan

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Background and Methodology

The cost of a nutritious diet is a central question in U.S. antihunger and nutrition policy. The benefit level for more than 28 million low-income participants in the Supplemental Nutrition Assistance Program (SNAP), formerly called the Food Stamp Program, is related to the Federal Government's official estimate of the cost of a "thrifty" but nutritionally adequate food plan. One leading explanation for the current epidemic of obesity-related chronic disease emphasizes the comparatively low cost of energy-dense foods and the high cost of healthier foods. The USDA's Thrifty Food Plan (TFP), revised most recently in 2006, offers a useful framework for studying the cost of a nutritious diet.

The TFP framework uses the similarity between a proposed food plan and the average current food consumption pattern as a way of quantifying the likely palatability or consumer acceptability of the proposed plan. USDA generates the TFP by solving a constrained optimization problem, choosing a diet composed of quantities for 59 food groups. The chosen quantities are as similar as possible to the current consumption pattern for low-income Americans, while simultaneously meeting a cost constraint, food group constraints drawn from the MyPyramid nutrition education materials, nutrient constraints from the Dietary Guidelines for Americans, and other miscellaneous constraints. The objective function minimizes the "distance" between a proposed food plan and the current average consumption pattern for low-income Americans. This distance function is a weighted sum of the "distance contributions" from each of the 59 food groups.

In this study, the TFP framework was adapted or extended in three ways. First, USDA's constrained optimization problem was compared with the theory of constrained utility maximization more familiar in consumer economics. In addition to the objective function from the official 2006 TFP, three alternative specifications that make the objective function more similar to a utility function were explored. Second, instead of imposing a fixed-cost constraint, a wide range of cost constraints was studied, showing how the difficulty of achieving a healthy diet changed systematically as the cost constraint tightened. Third, to investigate how the cost depends systematically on the definition of "nutritious," the effects of the different kinds of nutrition constraints were disentangled.

In addition to the quantitative analysis, an Excel-based spreadsheet program was developed, allowing lay audiences more easily to understand the official USDA food plans or to create a new benchmark food plan that meets their own chosen nutrition policy goals.

Findings

When "nutritious" was defined as meeting food energy requirements plus the MyPyramid recommendations for food categories, a low-cost diet necessarily deviated substantially from current consumption. To meet the MyPyramid food category constraints, the model increased the amount of low-fat milk,

whole grain rice and pasta, fruits and fruit juice, vegetables, nuts, seeds, and legumes. At the same time, the model reduced the amount of food groups like coffee and soft drinks, which do not belong to the five main MyPyramid food categories and contribute to added fats and sugars. To stay within the cost constraint, the model substituted lower cost food groups for higher cost food groups within each MyPyramid food category. This food plan did well in terms of meeting most other nutrient targets, even though the nutrient constraints were not imposed on the model. The food plan met the macronutrient targets for fat, carbohydrates, and protein. It also met all the micronutrient targets included in this analysis except for linolenic acid, iron, potassium, and vitamin E.

Alternatively, when "nutritious" was defined in terms of food energy plus nutrient constraints, instead of MyPyramid food categories, a low-cost solution remained closer to the current consumption bundle. The recommended ranges for macronutrients, such as carbohydrates and protein, were easily satisfied, but the constraints were binding for many other nutrients, including calcium, iron, potassium, vitamin E, and vitamin A. The model satisfied these requirements by increasing the amount for food groups that are rich sources of these specific nutrients. This plan reduced the amount of such food groups as regular soft drinks, sugars, fats, and oils, which contribute to energy but not to nutrient content. While meeting nutrient targets, this plan did not satisfy some MyPyramid food category targets. For example, it satisfied the protein and iron requirements using less than the MyPyramid recommendation for the meat group, and it satisfied the calcium requirement using less than the MyPyramid recommendation for the dairy group.

Within the TFP framework, the estimated cost of a nutritious diet depends on the definition of "nutritious" and also on what amount of difference is tolerated between a proposed food plan and the current average consumption pattern. The current official cost target, which is related to the maximum benefit level in SNAP, appears adequate if one defines "nutritious" in terms of nutrients rather than MyPyramid food categories or if one tolerates a high degree of difference between the proposed plan and current consumption. However, if one defines "nutritious" to include both nutrient constraints and MyPyramid food category amounts, while expecting the proposed food plan to be similar to current consumption for reasons of palatability, then the estimates indicate that a higher food cost allowance would be needed.

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The Use of the New World Health Organization Growth Standards To Identify Trends and Determinants of Overweight in WIC Infants and Children

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Background and Methodology

Childhood obesity is a worldwide epidemic. In the United States, 24.4 percent of children are overweight or at risk of overweight. Tools for the adequate diagnosis, treatment, and prevention of childhood obesity are needed. The Special Supplemental Nutrition Program for Women, Infants, and Children (WIC), reaching half of all U.S. pregnant women and their infants and providing followup care until the child is 5 years of age, provides an ideal avenue to effectively address the problem of childhood obesity.

A child's obesity status is determined by calculating his/her body mass index (BMI) (weight (kilograms)/height^2 (meters^2)) and comparing it to an age- and sex-specific reference distribution. If a child's BMI is above the 95th percentile of that distribution, the child is considered overweight. If the BMI is between the 85th and the 95th percentiles, the child is considered at risk of overweight.

Currently in the United States, the reference used for children's BMI is the set of charts known as the Centers for Disease Control and Prevention (CDC) growth charts. These charts were constructed using nationally representative data collected from 1963 to 1994. Most of the children whose anthropometric measurements contributed to the construction of the charts were formula-fed as infants, which is not in line with feeding recommendations for optimal growth. Furthermore, the measurements were not done with sufficient frequency to capture the rapid changes in growth that occur in the first year of life. Because of these and other technical deficiencies in the charts, the World Health Organization (WHO) issued new growth charts in 2006. These charts were constructed with data from children who were provided with conditions that allowed for optimal growth (that is, optimal nutrition, environment, and healthcare). There was frequent followup of the children to collect growth data, and appropriate statistical techniques were used to construct the WHO standards from these data.

The objectives of this study were to (1) use data from Massachusetts WIC participants to determine if, and at what ages, the WHO growth charts identify a larger number of overweight children compared with the CDC children and (2) examine the risk factors associated with child overweight when growth status is assessed using the new WHO standards.

The data were collected from participants in the Massachusetts WIC program from September 2001 to October 2006. The anthropometric measurements were done every 6 months during the participants' certification visits. The measurements are reported to the CDC as part of the State's participation

in the Pregnancy and Pediatric Nutrition Surveillance Systems (PNSS and PedNSS), from which the data were extracted. Information on sociodemographic characteristics and breastfeeding was also extracted. The age- and sex-specific BMI percentiles of children were based on their directly measured height and weight and the two growth charts (WHO and CDC). Data analysis was done using Statistical Analysis Software (SAS) version 9.1.3. The data were cleaned to exclude implausible values, according to PedNSS and PNSS edits. Consistency between a child's data for consecutive visits was also checked. All of the data were used for descriptive statistics. To examine prevalence estimates and risk factors for overweight, a dataset with one randomly chosen visit per child was used.

Findings

The study sample included 143,787 children who collectively had 392,927 WIC visits between the ages of 2 and 5. The mothers had a mean age of 26. About 35 percent of the mothers had not completed high school, 46 percent had a high school diploma, and the remainder had at least some college training. Pre-pregnancy, 5 percent were underweight, 25 percent were overweight, and 22 percent were obese. About half (51 percent) of the children were males. Nine percent of the children had a low birthweight, and another 9 percent had a high birthweight. The racial/ethnic distribution was as follows: 43 percent of the children were Caucasian, 19 percent were African-American, 32 percent were Hispanic, and 6 percent were Asian/Hawaiian/Pacific Islanders. Of those with breastfeeding information (about half of the sample), 65 percent of the children were breastfed at some point, with an average duration of any breastfeeding of 17 weeks.

When the CDC charts were used, 44 percent of the children were classified as overweight or at risk of overweight at least once during the 3 years of followup in WIC, increasing to 53 percent when the WHO charts were used. This and all subsequent comparisons were statistically significant with p-values less than 0.0001. The prevalence of overweight at any given time point was 17 percent when using the CDC cutoffs and 24 percent when using the WHO cutoffs. The prevalence of overweight or at risk of overweight when using the CDC charts was 34 percent and 42 percent when using the WHO charts.

The difference between the prevalence estimates in using the two charts was larger when the children were younger. The estimate for the percentage of overweight children in the group that was 24-27 months of age doubled from 12.6 percent when using the CDC cutoffs to 25.3 percent when using the WHO cutoffs. The same was true when looking at the estimate of overweight or at risk of overweight: In the group that was 24-27 months of age, the estimate increases from 28 percent when using the CDC charts to 45 percent when using the WHO charts. On average, using the WHO charts detects overweight 1.3 months earlier than when using the CDC charts. In a logistic regression model controlling for birthweight and child age, significant predictors of child overweight (defined using the WHO cutoffs) include maternal pre-pregnancy weight (obese versus normal OR=1.81 (1.72-1.91)), Hispanic ethnicity (OR=1.50 (1.43-1.56, ref=non-Hispanic), maternal education (some college versus less than high school graduate (HS), OR=0.80, 0.75-0.85, HS

versus less than HS OR=0.90, 0.86-0.94), and child sex (OR=0.89, 0.85-0.93, ref=male). Using the WHO charts will result in a higher estimated prevalence of childhood overweight and allow for earlier diagnosis, thus making earlier intervention possible.

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WIC Vendor Access and Fruit and Vegetable Availability in Northern Illinois

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Background and Methodology

The rapid increase in overweight and obesity in the United States over the past several decades, particularly among children, has prompted discussions about the role of public policy in addressing this rising epidemic. Although the causes of obesity are clearly multifactorial, unhealthful dietary patterns have caused many of these discussions to focus on modifying or developing food and nutrition policy to ensure adequate access to healthy foods. Consistent with these efforts, USDA's Food and Nutrition Service (FNS) published a final interim rule that would revise regulations governing the food packages provided in the Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) on December 6, 2007. WIC is one of the largest food assistance programs in the United States, with expenditures exceeded only by the Supplemental Nutrition Assistance Program (formerly the Food Stamp Program) and National School Lunch Program. WIC serves over 8 million women, infants and children, with an estimated one-half of all infants and one-quarter of all U.S. children 1-4 years of age participating in the program.

A noteworthy revision is the addition of cash vouchers to the food packages of women and children to purchase fresh fruits ($8 per month) and vegetables ($6 per month) that can be redeemed at participating retailers, or "WIC vendors." While WIC participants receive a variety of benefits, supplemental foods are viewed as an important aspect of the benefit package and constitute a significant portion (about 73 percent) of WIC program costs. Despite overwhelming support from WIC stakeholders regarding the addition of a fruit and vegetable benefit, several concerns have been raised related to vendor burden, including the potential need for vendors to purchase additional equipment, obtain a new business license, and receive training in special handling of fresh produce. Other concerns center on limitations in participant access, particularly for those living in areas with scarce produce, higher fruit and vegetable costs, or inadequate selection. These concerns could impact the number of vendors that participate in the program and the type and amount of fruits and vegetables available, thus limiting the benefits of this important policy for particular subgroups of the WIC population.

In preparation for the proposed policy, this study examined current neighborhood WIC vendor access and fruit and vegetable availability in selected areas in northern Illinois. Specific aims were to (1) describe current availability, selection, price, and quality of fruits and vegetables offered by WIC authorized vendors in selected areas in northern Illinois, (2) examine variations in WIC vendor and fruit and vegetable access by neighborhood characteristics, including geographic (percentage rural), racial/ethnic (percentage African-American), and socioeconomic (percentage in poverty), and (3) understand factors that influence fruit and vegetable availability, selection, price, and quality from the perspective of retailers participating in the WIC program.

Current fruit and vegetable characteristics were assessed at 338 authorized WIC vendors across a 7-county area in northern Illinois. WIC vendor assessments

were conducted using an in-person audit tool adapted from prior work that evaluates the availability of 150 commonly consumed and culturally specific fresh, frozen, and canned fruits and vegetables, as well as the price of 26 and quality of 10 of these items. To determine variations in WIC vendor and fruit and vegetable access by neighborhood characteristics, data on neighborhood attributes in the study area were obtained from the 2000 Census (percentage race, poverty, and urban). Vendors were classified by type and size and addresses were matched to a location-indexed street file using geographic information system (GIS) software. Descriptive statistics, Chi-square, and logistic regression were used in data analysis.

Findings

Of the 338 authorized WIC vendors in the sample, 120 were classified as pharmacies, 115 national/regional chain supermarkets, and 109 small chain/independent grocery stores. Consistent with previous neighborhood food environment studies, larger national/regional chain supermarkets were less likely to be located in predominately minority versus non-Hispanic White neighborhoods and high-poverty versus low-poverty neighborhoods. No relationships were found between neighborhood characteristics and other vendor types. As expected, national and regional chain supermarkets had the greatest availability of fresh or frozen fruits and vegetables and pharmacies had the lowest availability. None of the pharmacies in the study area supplied fresh fruits or vegetables, and only about 2.3 percent carried frozen selections.

Availability of fresh fruits and vegetables was positively correlated with the percentage of neighborhood residents with a college degree and households earning over $75,000 and negatively associated with the percentage in poverty or unemployment and residents without access to a car. The availability of canned fruits and vegetables did not differ by vendor type. However, chain supermarkets and vendors in predominately non-Hispanic White neighborhoods were more likely to supply canned fruits and vegetables without added salt, sugar, or fat than small chain/independent grocery stores, pharmacies, and vendors in predominately minority neighborhoods. Preliminary analysis revealed limited differences in price across different vendor and neighborhood types; however, indepth analyses of fruit and vegetable price and quality were incomplete. Similar to previous studies, these findings suggest that vendors provide less access to fresh fruits and vegetables and canned fruits and vegetables without added salt, sugar, or fat in minority and high-poverty neighborhoods than in non-Hispanic White and more affluent neighborhoods. Small/independent grocery stores, pharmacies, and WIC vendors in minority communities may need more support to expand their availability of fruits and vegetables to meet the needs of WIC participants.

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The Impact of the School Breakfast Program on the National School Lunch Program in an Elementary School

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Background and Methodology

An average of about 10 million children participated in the School Breakfast Program (SBP) each school day in 2006. Together with the 30 million children who participated daily in the National School Lunch Program (NSLP), spending for both programs totaled $10.2 billion. The SBP was permanently instituted in 1975 and the combination of the NSLP and SBP was intended to provide "a coordinated and comprehensive child food service in schools." Yet, the interaction between these two programs has not been examined. The effect of breakfast consumption on subsequent lunch consumption is unknown. Furthermore, little information is known regarding the nutritional impact of the Universal-Free School Breakfast Program or the serving of school breakfast in the classroom as opposed to the cafeteria. One study, the Universal-Free School Breakfast Program Pilot found no significant difference in the average nutrient intakes at breakfast or over 24 hours between SBP participants and nonparticipants. The differences in nutrient intake between SBP participants and nonparticipants generally dissipated over the course of the day.

Studies attempting to evaluate the SBP and the NSLP dietary intakes have been hindered by current dietary assessment methods. Current methods do not address the unique challenges of children who lack the literacy skills, cognitive abilities, and attention span that commonly used dietary intake instruments require. To address these issues, the Spears Point-of-Sale Dietary Assessment Tool (Spears POS-DAT) was developed. The Spears POS-DAT resembles a grocery store checkout arrangement. It uses a bar code scanning system and weighs all food items selected and returned by a student. Actual nutrient intake for a subject is automatically calculated by the difference. The Spears POS-DAT minimizes the burden placed on the students.

A total of 157 children, of which 76 percent were White Hispanic, enrolled in the study. The study was conducted in an elementary school in Reno, NV. One class from each grade kindergarten through fifth was selected. All school meals were provided free of charge to all students in the study. Breakfast and lunch intakes were measured for 9 days at three time periods during school year 2007-08. Breakfast was served in the cafeteria during period 1 and in the classroom during periods 2 and 3. Direct observation assessment method was conducted during period 2 and 3 to determine the validity of the Spears POS-DAT.

Findings

The study focused on six issues to assess the impact of SBP on NSLP nutritional intake by students. Results from this study indicate a complex interaction.

- The location of breakfast service significantly impacted school lunch intake. Lunch intake was less when breakfast was offered in the classroom compared with breakfast in the cafeteria. This was seen for all nutrient variables, except for calories, after adjusting for confounding factors, such as calories consumed at breakfast and student's age, gender, body mass index (BMI), appetite rating, and prior consumption outside school.

- Although, on average, students' NSLP calorie intake significantly decreased with SBP participation, higher calorie intake at breakfast showed a tendency to increase the lunch calorie intake. Higher calorie intake at breakfast and at lunch may be an important factor in childhood obesity. For specific nutrients, eating school breakfast significantly increased the total intakes of Vitamin C, carbohydrates, and calcium but not the total intakes of fat, iron, and protein at lunch.

- An interesting finding was observed for students who usually skip breakfast. When meal skippers incorporated school breakfast into their diet, their lunch intake of calories and nutrients did not significantly change.

- Intuitively, expectations are that students should be hungrier and consume more if they had a longer period between breakfast and lunch. However, the opposite was observed in this study. The longer the time elapsed, a greater reduction in their energy and nutrient intakes at lunch occurred, even after adjusting for potential confounders.

- Among the potential confounding variables investigated (calories consumed at breakfast, prior consumption outside school and student's age, gender, BMI, appetite rating, and time-lapse between breakfast and lunch), the demographic variables of age and sex were the main significant contributors to nutrient intakes in general linear modeling.

- Lunch intakes of 700 trays were evaluated using both direct observation and the Spears POS-DAT. Mean nutrient intakes did not significantly differ. The correlation coefficients range was between 0.5-0.8. No systematic or proportional bias was detected by Bland-Altman plots. Study findings indicate that Spears POS-DAT is a valid instrument for measuring dietary intake in elementary children.

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