

Food Insecurity and Healthcare Costs: Research Strategies Using Local, State, and National Data Sources for Older Adults^{1,2}

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ABSTRACT

Food insecurity in older adults is a clinically relevant problem with important implications for healthcare costs; however, few studies have examined the relationship between food insecurity and the healthcare cost burden in older adults. It may be due in part to lack of appropriate data and methods to examine these issues in the existing datasets. It is critical to identify and obtain the data necessary for estimating healthcare costs associated with food insecurity and to explore specific mechanisms by which food insecurity is related to adverse health outcomes and associated healthcare costs. This paper discusses how to best utilize and link available, nationally representative datasets and develop infrastructure and procedures to establish state and local datasets. As an example, an innovative approach tested in Georgia to establish a state-level dataset in a sample of low-income, older adults in need of food assistance is discussed. In this approach, data from the state aging services client database and the Centers for Medicare and Medicaid Services data were linked. Such efforts are essential to estimate the healthcare cost burden of food-insecure older adults who have a particularly higher burden of chronic diseases and direct future research, program, and policy decisions to improve the food and healthcare security of low-income, older adults. *Adv. Nutr.* 4: 42–50, 2013.

Introduction

Food insecurity is an urgent public health problem affecting the nutrition, health, and well-being of Americans across the lifespan (1). Food insecurity is defined as “the limited or uncertain availability of nutritionally adequate and safe foods or limited or uncertain ability to acquire acceptable foods in socially acceptable ways.” (2) Food insecurity in older adults is a complex, multidimensional phenomenon caused not only by financial constraints but also by poor health, physical limitations, lack of social support, and other problems (3). Older adults tend to show lower levels of food insecurity than younger populations, but estimates of the prevalence of food insecurity among the elderly has been increasing in the last decade (3,4). In 2008 the prevalence of food insecurity in older Americans was the highest it had been in 14 y (5) and this level was unchanged in 2011 (6); ~2.5

million (8.4%) households with older adults had experienced food insecurity in 2011 (6). Since the onset of the recession in 2007 to 2010, the number of older adults experiencing marginal food insecurity has increased by 34% (4). Food insecurity disproportionately affects the elderly who are low-income, less educated, racial-ethnic minorities, and residing in Southern states (3,7,8).

Food insecurity contributes to various nutrition and non-nutrition problems that likely affect the health and well-being of older adults. Food insecurity is associated with poor food and nutrient intake (8,9), physical and mental health problems (8–14), poor chronic disease management (15–17), medication nonadherence (18,19), and increased healthcare service use (17,20,21), all of which may contribute to the development or exacerbation of diet-related chronic illnesses (e.g., diabetes, hypertension, and coronary heart disease). Food insecurity is a persistent, growing, and clinically relevant problem in the elderly; therefore, it has important implications for the quality, expenditures, and utilization of healthcare and may increase demand for individual caregiving costs and national healthcare costs (22).

In a time of rapid population aging and given the current economic condition in the US, it is more critical than ever

¹ Presented at the symposium “Food Insecurity and Health Across the Lifespan” held at the Experimental Biology 2012 meeting, April 22, 2012, in San Diego, CA. The symposium was sponsored by the ASN and supported in part by an educational grant from DSM Nutritional Products, Inc. A summary of the symposium “Food Insecurity and Health Across the Lifespan” was published in the September 2012 issue of *Advances in Nutrition*.

² Author disclosures: J. S. Lee, no conflicts of interest.

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to better understand the current status of economically deprived older Americans in meeting basic food and healthcare needs. Low-income, older adults often have more unique limitations to meet basic food and healthcare needs than their younger counterparts due to age- or disease-related declines of physical function and health status as well as a decrease in the extent and availability of social support systems (23). Many low-income, older adults with multiple chronic conditions and limited financial resources may be forced to choose between basic food and healthcare needs and are at an increased risk of cutting back on expenses for food, medical care, or medications (18–20). Assessing valid and reliable estimates of the cost burden of food insecurity is necessary to better understand the magnitude of the problem in monetary terms; provide information to practitioners, administrators, and policy makers on the economic benefits of potential solutions; and direct future research, program, and policy decisions to improve the food and healthcare security of low-income elderly.

However, very little is known about the economic hardships and related resource constraint phenomena such as food insecurity and lack of adequate healthcare utilization and their potential consequences on health and well-being of the elderly. Only 3 studies are available in the literature regarding the relationship between estimated healthcare costs and food insecurity in study samples including older adults (24–27). Furthermore, very limited conceptual literature is available on the cyclic and complex relationships among food insecurity, health problems, and associated healthcare costs. Seligman and Schillinger (28) speculated that constrained dietary options and quality accompanied by periodic and cyclic food restriction and overconsumption of energy-dense food among food-insecure individuals may put them at a heightened risk for obesity and diet-related chronic diseases and these diseases in turn further restrict the ability of food-insecure individuals to manage their chronic diseases. The available evidence of food insecurity's etiological role for many potential candidate illnesses is mostly from younger populations and is not always significant and consistent across different age, gender, and race-ethnic groups. One of the reasons for the lack of literature may be due in part to lack of appropriate data and methods that permit the examination of these issues in existing datasets. The existing evidence and growing interests in these issues underscore the urgent need to better understand the available datasets or ways to establish new datasets to examine the relationships among food insecurity, related diseases, and associated healthcare costs.

The purpose of this paper is to review the data sources that are needed and available at the national, state, and local levels and the approaches to best utilize existing and potential data sources to estimate the healthcare cost burden of food insecurity in the elderly. As an example, an innovative approach tested in Georgia to establish a state-level dataset to study food insecurity-related healthcare costs in a sample of low-income, older adults in need of food assistance is discussed.

What data and methodological approaches are needed to estimate the healthcare cost burden of food insecurity?

The healthcare cost burden of food insecurity can be estimated by calculating the costs of managing adverse health outcomes associated with food insecurity; therefore, it is essential to have datasets that provide aggregate or individual-level information on both food insecurity and healthcare costs to conduct such studies. Food insecurity is commonly conceptualized as uncertain, insufficient, or unacceptable availability, access, or utilization of food. The most widely accepted definition of food insecurity has provided a basis for developing standardized operational definitions and measurements for defining food insecurity (29,30). Food insecurity has been assessed based on responses to a series of questions about conditions and behaviors that characterize individuals and households when they are having difficulty meeting basic food needs (29). The first national U.S. Household Food Security Survey Module (HFSSM)³ based on standardized concepts, definition, and measurement methodology was developed in 1995 (29,30) and was subsequently implemented in several national surveys, including the Current Population Survey (CPS) and NHANES and various studies at state and local levels. The original HFSSM consists of 10 and 18 items for households without and with children, respectively, that focus on the uncertainty and insufficiency of food availability and access caused by financial constraints and the worry or anxiety and hunger that may result, with a reference period of the last 12 mo or 30 d. A validated, 6-item HFSSM is also available if utilization of the full scale is not possible (31), particularly in low-income, older adults (32). A single question of food insufficiency defined as “an inadequate amount of food intake due to lack of resources” also has been widely used to assess food insecurity in national surveys (e.g., NHANES III) and state- and local-level surveys (3,33).

The healthcare costs associated with food insecurity could include both direct and indirect costs. Direct costs are medical expenditures for diagnosis, treatment, continuing care, rehabilitation, and terminal care as well as non-medical expenditures caused by diseases directly related to food insecurity. Major categories of medical expenditures may include hospitalization; outpatient clinical care; nursing home care; home health care; services of primary physicians, specialists, and other health professionals; medications; and rehabilitation (34). Nonmedical expenditures include costs of transportation to healthcare providers, expenses related to changes in diet, housing, and other similar changes necessary for disease management (34). Indirect costs could include the loss of resources and/or productivity incurred as

³ Abbreviations used: CE, Consumer Expenditure Survey; CMS, Centers for Medicare and Medicaid Services; CPS, Current Population Survey; GA Advanced POMP6, Georgia Advanced Performance Outcomes Measures Project 6; GA AIMS, Georgia Aging Information Management System; GA DAS, Georgia Department of Human Services, Division of Aging Services; HFSSM, U.S. Household Food Security Survey Module; MEPS, Medical Expenditure Panel Survey; NHIS, National Health Interview Survey; OAA, Older Americans Act; OoANP, Older Americans Act Nutrition Program; PAF, population-attributable fraction; SIPP, Survey of Income and Program Participation; UGA, University of Georgia.

a result of food insecurity-related morbidity and mortality as well as opportunity costs of informal care (e.g., economic values of forgone time and other resource use of caregivers to provide informal care). Of note, it is difficult to identify and obtain appropriate healthcare cost components that are due specifically to food insecurity given the limited understanding of how food insecurity contributes to different adverse health outcomes and healthcare costs, especially in the elderly. Limited available data and conceptual difficulties in quantifying all the needed cost components may lead to underestimations of the healthcare costs associated with food insecurity.

The kinds and formats of available data sources on food insecurity and healthcare costs dictate the type of methodological approaches to be employed to estimate the healthcare cost burden of food insecurity. Healthcare costs associated with food insecurity can be estimated by adopting methodological approaches typically used in cost-of-illness evaluations (34). Cost-of-illness methodology estimates the financial impact of specific diseases to a society (34). This method is useful to demonstrate the magnitude of the health problem in financial terms, justify intervention, provide a basis for policy and planning relative to prevention and control initiatives, and provide an economic framework for program evaluation. Two major approaches under the cost-of-illness methodology for estimating healthcare costs of food insecurity include epidemiologic (or attributable risk) and econometric (or incremental) approaches. A large amount of literature is available with detailed descriptions of these approaches and applied examples in the cost-of-illness studies (34–36).

An epidemiological approach can be used to measure healthcare costs for diseases for which food insecurity is a risk factor (34). This approach uses aggregated national or population healthcare cost data along with population-attributable fractions (PAFs) and/or disease risk estimations indicating how much more likely specific diseases are to occur in food-insecure individuals compared with food-secure individuals (i.e., excess fraction). Similar to the approaches adopted in estimating obesity-related healthcare costs (37), the steps to estimate healthcare costs associated with food insecurity would be: 1) identify diseases related to food insecurity; 2) quantify the relationship between food insecurity and associated diseases using the PAFs; 3) identify the relevant economic cost categories to be estimated; 4) quantify the total costs associated with food insecurity-related diseases; and 5) use the PAFs to apportion that share of total costs directly attributable to food insecurity. One of the key issues in this approach is related to the choice of food insecurity-related diseases and PAFs. Given the limited understanding of the etiologic role of food insecurity in various diseases, especially in the elderly, there is no consensus yet on a set of “food insecurity-related diseases” or PAFs. Therefore, this method can be complicated when other factors (e.g., age, sex, race-ethnicity, and other risk factors) affect the association between food insecurity and its related diseases. This approach

was used by Brown et al. (24) and Shepard et al. (25) to estimate the cost burden of food insecurity-related adverse health outcomes in the U.S. population (**Table 1**). To select poor health outcomes related to food insecurity, they identified quantitative estimates of the relationship between food insecurity and its consequences as prevalence, incidence, or ORs as well as their economic/monetary values available in the literature. Their search resulted in 7 poor health outcomes (i.e., poor self-reported health status, depression, suicide, anxiety, hospitalizations, upper gastrointestinal disorders, and cold, migraines, and iron deficiency; ORs ranging from 1.3 to 3.5 times), most of which were based on studies conducted in younger populations. They also estimated the number of food-insecure Americans by using the national prevalence of food insecurity based on the CPS data. Based on these aggregate level data, they calculated how many more people had poor health outcomes as a result of their food insecurity status and multiplied this number by the average economic cost per person with the condition. They estimated that the costs of poor health outcomes related to food insecurity were \$98.4 billion in 2007 and \$130.5 billion for 2010.

An econometric approach can be used to estimate the difference in healthcare costs between food-insecure and food-secure individuals by using real data as obtained from healthcare records or other data sources that are linked to individuals’ food insecurity data (34). In this approach, food-insecure and -secure individuals are matched by other risk factors, including demographic characteristics and chronic conditions using regression analysis. Two methods under this approach can be used: a mean differences method and a multistage regression method. The mean differences method compares the mean healthcare costs incurred by each of the 2 groups to determine the incremental difference attributable to food insecurity. A multiple-stage regression can be used if there are large numbers of observations with zero healthcare costs (i.e., nonusers of healthcare) and right-skewed distribution of healthcare costs for the users. For example, a 2-stage regression model can be used to estimate the likelihood of an individual spending any healthcare costs and then the excess cost of healthcare if care is received. Compared with the epidemiologic approach, this approach is more straightforward without requiring the designation of food insecurity-related diseases and assumptions regarding the extent of association between food insecurity and the related diseases. This approach also does not need to combine aggregate-level data from different sources as is required in the epidemiologic approach. Two studies used this approach. Nielsen et al. (26) examined family-level tradeoff between meeting medical care and food needs using data from the 2001 Panel Survey of Income and Program Participation (SIPP). This study used data on self-reported, family-level, out-of-pocket medical expenditures and food insecurity measured by a 5-item HFSSM (38) while using a 2-part, probit-least squares model. The findings of this study suggest that the probability of food insecurity increases as medical expenses increase, providing insight

Table 1. A summary of 3 studies examining the relationship between healthcare costs and food insecurity¹

	Brown et al. (24) and Shepard et al. (25)	Nielsen et al. (26)	Bhargava et al. (27)
Objectives	To calculate the cost burden of hunger or food insecurity	To examine the trade-off relationship between family-level food insecurity and out-of-pocket medical expenditures	To estimate Medicare and out-of-pocket healthcare costs by food insecurity status
Study sample	Nationally representative U.S. population	49,989 people aged 0–87 y who were members of 16,236 families	903 low-income, older Georgians in need of OAAANP (≥65 y old)
Data sources	CPS; RR or ORs from public health and social science literature; available average economic costs of individual diseases; charity costs from existing data and surveys	2001 Panel of SIPP	Statewide secondary data merged by GA Advanced POMP6 and the CMS data
Time period for healthcare cost data	2007 and 2010	October 2002 to December 2003	2008
Food insecurity data sources	Original HFSSM data from CPS	5-item HFSSM	Validated, modified version of 6-item HFSSM from GA Advanced POMP6 CMS
Healthcare cost data sources	Based on available data sources or authors' own data sources	SIPP	
Direct cost components	Economic costs for food insecurity-related diseases (i.e., poor health, depression, suicide, anxiety, hospitalizations, upper gastrointestinal disorders, cold, migraines, and iron deficiency)	Self-reported, aggregated health insurance and out-of-pocket medical costs	Medicare expenditures for 4 types of medical services (i.e., inpatient, outpatient, emergency room, and home health agency); out-of-pocket expenditures for 2 types of medical services (i.e., inpatient and outpatient)
Indirect cost components	Charity costs (e.g., national coordination and support, regional food banks, community organizations, community volunteer hours and expenses) Educational costs (e.g., dropout due to grade retention, dropout due to absenteeism)	None	None
Analytic approach	Both epidemiological approach and econometric approach	Econometric approach: 2-part probit-least squares model	Econometric approach: 2-part model

¹ CMS, Centers for Medicare and Medicaid Services; CPS, Current Population Survey; GA Advanced POMP6, Georgia Advanced Performance Outcomes Measures Project 6; HFSSM, U.S. Household Food Security Survey Module; OAAANP, Older Americans Act Nutrition Program; SIPP, Survey of Income and Program Participation.

into the tradeoffs families make when allocating resources to food and medical care. Also, Bhargava et al. (27) estimated the first Medicare and out-of-pocket expenditures by food insecurity status in a sample of low-income, older adults. Their healthcare costs focused only on direct medical costs available from the Medicare data. Two-stage models were used to empirically address the unique distribution of healthcare cost data. The findings from this study suggest that food-insecure, older individuals tended to have lower Medicare healthcare costs and showed more unique Medicare healthcare expenditure patterns than their counterparts with comparable health status as measured by chronic conditions examined in this study. The estimated adjusted mean Medicare and out-of-pocket expenditures of food-insecure individuals were \$1875 and \$310 less, respectively, than those of food-secure individuals in 2008. Different methodological approaches used in these previous studies reflect the variation in the availability of required information across different data sources and associated challenges in obtaining accurate, valid, comparable, and useful estimates of healthcare costs of food insecurity.

What data sources are available for estimating the healthcare costs associated with food insecurity?

Several national surveys have collected food insecurity data using the standardized HFSSM since 1995 (Table 2). For example, CPS is a continuous monthly survey by the U.S. Census Bureau focusing on labor force indicators for the U.S. civilian noninstitutionalized population, including those 18 y of age and older, since 1940 (39). Since 1995, the food security supplement has been given once each year in the sample households to inquire about food security, food expenditures, and use of food and nutrition assistance programs. The CPS food security data are the source of national- and state-level statistics on household food insecurity in the US.

Potential data sources for the healthcare costs include national public-use, proprietary, and local data with advantages and disadvantages depending on unique features, including the type of available healthcare cost data (e.g., inpatient, outpatient, emergency, medication, or out-of-pocket cost), time frame (e.g., cross-sectional vs. longitudinal data), source of data (e.g., objective vs. subjective data), and

data record unit (e.g., individual vs. event level). The national public-use data include nationally representative survey data and administrative claims data. National survey data provide self-reported annual costs of different types of medical care and/or other goods and services. For example, the National Health Interview Survey (NHIS) is the nation's primary source of estimates on health indicators, health care utilization and access, and health-related behaviors for the U.S. civilian noninstitutionalized population and has been conducted by the National Center for Health Statistics since 1957 (40). The NHIS provides self-reported, aggregated, out-of-pocket expenditures. The Consumer Expenditure Survey (CE) is designed to provide information on all spending components, including food, housing, and healthcare costs in the U.S. civilian noninstitutionalized population since 1980 (41). The CE consists of the Quarterly Interview Survey and the Diary Survey and provides self-reported, out-of-pocket expenditures. The Medical Expenditure Panel Survey (MEPS) is a nationally representative survey designed to produce national estimates of the health care use, expenditures, and insurance coverage of the U.S. civilian, noninstitutionalized population and has been conducted by the Agency for Healthcare Research and Quality (AHRQ) since 1996 (42). It is composed of 2 component surveys: the Household Component and the Insurance Component. The MEPS uses overlapping panel design and draws the sample from a nationally representative subsample of households that participated in the prior year's NHIS. The Household Component survey collects detailed information for each person in the household on demographic characteristics, health conditions, health status, medical services use, charges and source of payments, access to care, satisfaction with care, health insurance coverage, income, and employment (42). Data are collected for each sample person at the event level and summed across rounds to produce the annual utilization and expenditure data.

Administrative health care data provide relatively comprehensive cost data for a large number of individuals and covering long periods of time. They are associated with health insurance programs and healthcare providers and are usually available at the person level for individual medical services received and the amounts paid for those services (43). For example, Medicare data are based on the largest population-based administrative claims data system in the US covering most older Americans 65 y or older and available from the Centers for Medicare and Medicaid Services (CMS) (44). Claims data for parts A (hospital insurance) and B (medical insurance) are available from the 1990s; data for part D (prescription drug coverage) are available since January 2006 and provide information about demographic and enrollment characteristics, diagnoses, procedures, prescription drugs, and medical equipment use for each beneficiary. Data are collected for each person at the event level and these event expenditures can be summed for a specific period of time.

Proprietary data (i.e., private insurance or employer claims data) also provide healthcare cost information.

However, these data may be limited when estimating healthcare costs in the elderly, because not all records are available to researchers (e.g., private insurance claims data) and employer claims data generally include people <65 y old. Also, claims payment amounts are a function of benefit design features; therefore, differences in benefits and payment methods create challenges in comparing costs across systems (36).

Existing national and local datasets are limited in their ability to study food insecurity-related healthcare costs in older adults

Many of the currently available cross-sectional and longitudinal nationally representative datasets do not provide both food insecurity and healthcare cost information. Datasets such as CPS and NHANES have information on food insecurity as assessed with the HFSSM but lack detailed information on healthcare costs, whereas datasets with detailed information on healthcare expenditures such as CMS data, MEPS, CE, and healthcare plan records lack food insecurity data. The NHIS contains extensive measures of health and well-being and common assistance programs but has included supplementary questions on family food insecurity since 2011. The Health and Retirement Study, a longitudinal panel study on labor force participation and the health transitions around retirement, has extensive, self-reported healthcare cost measures for a variety of medical services, but food insufficiency is assessed with only a single question (45). The SIPP is a longitudinal panel survey of the U.S. civilian, noninstitutionalized population conducted by the U.S. Census Bureau since 1983 (46). The SIPP is designed to provide data on the income dynamics of, eligibility for, and participation in public programs, household and family composition, and other associated characteristics (46). Unfortunately, the SIPP provides limited self-reported information on medical expenditures and assesses food insecurity with a 5-item HFSSM only once per each 3- to 4-y panel. Most of the national public-use data provide cross-sectional information on food insecurity and healthcare costs, which are limited to explore the temporal and causal relationships between the two.

However, some encouraging changes are expected in these datasets. The National Center for Health Statistics recently announced the availability of the NHANES-Medicaid Linked Data files (6). These are restricted-use data files that link 1999–2004 NHANES data with Medicaid Analytic Extract files. The linked Medicaid Analytic Extract files contain enrollment and claims data for enrollees in Medicaid and the Children's Health Insurance Program and cover service from January 1, 1999 through December 31, 2007. Due to the common sampling frame, the NHIS can be linked to the MEPS and its more detailed data on healthcare costs. These changes will provide an exceptional opportunity and efficient way to examine the relationships among food insecurity, health status, and healthcare costs.

Appropriate state- and local-level data sources on food insecurity and healthcare costs of older adults are often

Table 2. Available and potential data sources for estimating healthcare costs associated with food insecurity¹

Data source	Dataset	Data collection agency	Food insecurity measure	Healthcare cost measure	Note
National public-use data	NHANES (54)	National Center for Health Statistics	HFSSM since 1999–2000 (18-item, 12-mo module); food insufficiency question in NHANES III	None	NHANES-CMS MAX data (1999–2004)
	CPS (39)	U.S. Census, Bureau of Labor Services	HFSSM in Food Security Supplement (CPS-FSS) since 1995 (18-item, 12-mo module)	Self-reported data on medical out-of-pocket expenditures in 2010 Annual Social and Economic Supplement	
	NHIS (40)	National Center for Health Statistics	HFSSM since 2011 (10-item adult, 30-d module)	Self-reported data on aggregated out-of-pocket expenditures	NHIS subsample can be merged with MEPS for more detailed information
	Health and Retirement Study (45)	University of Michigan	Food insufficiency since 1996 (one item)	Self-reported data on insurance and out-of-pocket medical expenditures	Health and Retirement Study Medicare claims and summary data
	SIPP (46)	U.S. Census Bureau	HFSSM (5-item, 12-mo module) in 1996, 2001, 2004, and 2008, topical module on Adult Well-Being Data File	Self-reported data on aggregated insurance based and out-of-pocket medical expenditures	
	CE	U.S. Census Bureau	None	Self-reported, out-of-pocket healthcare expenditures	
	MEPS (42)	AHRQ	None	Self-reported and provider data on insurance-based and out-of-pocket healthcare expenditures	
	CMS data (55)	AHRQ	None	Claims data on out-of-pocket and total healthcare expenditures on various healthcare services, including outpatient, inpatient, home health, skilled nursing facility, emergency room, and prescription drugs	
Proprietary data	Insurance or employer claims data	Private insurance	None	Claims data	
State and local data	Survey data merged with cost data sources		Obtained from survey data	Obtained from national public-use, proprietary, or survey data	

¹ AHRQ, Agency for Healthcare Research and Quality; CE, Consumer Expenditure Survey; CMS, Centers for Medicare and Medicaid Services; CPS, Current Population Survey; HFSSM, U.S. Household Food Security Survey Module; MAX, Medicaid Analytic Extract; MEPS, Medical Expenditure Panel Survey; NHIS, National Health Interview Survey; SIPP, Survey of Income and Program Participation.

not available. Most of the existing datasets are not representative of state and local populations. In general, the elderly, especially those who are vulnerable socially and functionally, have been difficult to recruit and are understudied in clinical and epidemiologic studies. Furthermore, collecting new data at the state and local levels has not been easy due to limited infrastructure and procedures to coordinate and share information and data across aging services, public health, and healthcare systems.

Establishing a state-level dataset to study the healthcare cost burden of food insecurity in older adults: an example of linking a state aging services client database and Medicare claims data

If existing data sources do not provide necessary information to study the healthcare cost burden of food insecurity, additional data collection may be required using appropriate measures, samples, and methods. An innovative approach was tested to establish a state-level dataset to study food insecurity-related healthcare costs in a sample of low-income, older adults in need of food assistance in Georgia. To obtain a statewide, low-income, older Georgian sample and data, the aging service network and the state aging services client database system were chosen. Established under the Older Americans Act (OAA) of 1965, the aging services network provides a wide array of home- and community-based social, nutrition, health support, and long-term care services to vulnerable older adults across the nation (47). The OAA Nutrition Program (OAANP) is the largest and oldest primary, community-based food and nutrition assistance program providing congregate meals, home-delivered meals, and other nutritional health services authorized under the OAA.

The aging services network collects information on and inventories a wide array of its services and providers and conducts needs assessments of older participants. The aging service network developed the aging information systems across the states for the purposes of client tracking, case management, provider management, and financial management and administration since 1997 (48). There exists, however, considerable variability in the development and management of the system across the states, as was expected given the decentralized planning and service model and flexibility of federal requirements for reporting from the aging service network in general. Unlike systematic data that are currently available through public health (surveillance) and health care systems, the data collected by the aging services network have been more variable (49).

The Georgia aging services client database system (GA AIMS) is the Web-based, consumer-centered tracking system monitoring the client needs and performance of its programs in a timely manner at the state and local levels in Georgia (50). Using the aging services network and GA AIMS has the potential to reach socio-demographically and economically diverse older adults with varying levels of physical and cognitive function and to serve as an efficient

infrastructure to collect needed data among vulnerable older Georgians.

Using the GA AIMS, the Georgia Advanced Performance Outcomes Measures Project 6 (GA Advanced POMP6) examined the feasibility and ability of using the nationally standardized and validated food insecurity measure across the state (32). A detailed description of the study design, the study population, measurement validation, and major findings have been published elsewhere (32,51,52). In brief, the GA Advanced POMP6 is a cooperative research project between the GA Department of Human Services, Division of Aging Services (GA DAS) and Department of Foods and Nutrition at the University of Georgia (UGA) to examine the impact of OAANP on food insecurity among older Georgians using both cross-sectional and longitudinal substudies (32,51,52). A modified version of the nationally validated, standard, 6-item HFSSM was used to assess food insecurity during the last 30-d period (32). Study samples were identified from the GA AIMS and recruited for an adequate period of time to accrue a substantial sample size for an adequate statistical power. A total of 5465 older Georgian individuals were included in the study. A self-administered mail survey measured food insecurity, various nutritional health status indicators, and socioeconomic status measures that were developed and adapted from previously validated survey tools. Additional study participant data were retrieved from the GA AIMS. The unique data resulting from the GA Advanced POMP6 include the first statewide food insecurity statistics among older Georgians that are comparable with the federal statistics (32).

Secondary data were created by merging 2 complementary datasets from the GA Advanced POMP6 (2008–2009) and the CMS (2008–2009). The GA Advanced POMP6 provides mostly self-reported or subjective data on sociodemographic and economic characteristics, food insecurity (32), medication adherence (18,53), OAANP participation status, and general health status collected through surveys and GA AIMS. The CMS data provide objective measures of Medicare and out-of-pocket service utilization, costs, and health status.

The acquisition process of the CMS data for our own local study participants required unique procedures, resources, infrastructures, and techniques among involved researchers and program providers in handling and managing confidential data. The Institutional Review Boards on human subject reviews and approvals from the GA DAS and UGA were required to use and merge the GA Advanced POMP6 and CMS datasets. The scope and type of proposed analysis plan for using the CMS data needed to be reviewed and approved by the CMS. Once all approvals were obtained, the CMS identified, retrieved, and prepared the requested Medicare data for the GA Advanced POMP6 participants. To ensure the privacy and confidentiality of the CMS data, special data management procedures were required and database management followed best practices for securing sensitive data. The data-merging process between the GA Advanced POMP6 and the CMS was carried out through coordinated efforts among GA DAS, CMS, and UGA. This

merged dataset provided an exceptional opportunity to obtain key study variables in a substantially large sample of low-income, minority, noninstitutionalized, older adults who have been difficult to recruit and are understudied. The merged data has been used to examine the Medicare and out-of-pocket expenditures related to food insecurity (27) and the relationship between food insecurity and prescribed medication utilization and costs.

What needs to be done?

Food insecurity is a unique, persistent, and growing problem in the US affecting the nutrition, health, and well-being of the older population. Given the unique role of food insecurity in nutritional health status, chronic diseases, and comorbidity patterns in the older population, the healthcare cost burden associated with food insecurity in the elderly may be higher than that in other age groups. More efforts should be given to reliably estimate the healthcare costs of food insecurity in older adults.

To better estimate the magnitude of the food insecurity-related healthcare cost burden in the elderly, it is critical to identify the data necessary and examine the feasibility of obtaining the required data. A better understanding of the specific mechanisms by which food insecurity is related to adverse health outcomes, poor disease, and medication management, and healthcare costs and utilization in the elderly can shed light on the type and reference time periods of data needed to adequately examine the temporal and causal relationships among them. These will improve our strategies to use and collect more appropriate datasets with valid, reliable, and comprehensive measures of food insecurity, health status, healthcare access, and healthcare costs in older adults.

Available national public-use data provide different types and extent of mostly cross-sectional healthcare cost information along with food insecurity. Creative and innovative strategies are needed to best utilize and link among available nationally representative datasets. The unique approaches tested in Georgia support the feasibility of merging state- and local-level survey data and national administrative claims data to study the healthcare costs of food insecurity. Such approaches do require infrastructure and procedures to establish state and local datasets and strong, continued successful collaboration among the involved parties (e.g., researchers and service providers) united by the common goal of developing a database for enhancing our understanding and improving the nutritional health of vulnerable older adults. In Georgia, the collaborative partnerships are now being extended to explore the opportunity to use the GA AIMS as a centralized database for collecting and monitoring food insecurity along with other key economic and health characteristics of low-income, older adults. Local aging services providers in Georgia are in the process of collecting food insecurity data using the validated, modified, 6-item HFSSM for a short time interval among clients with varied physical and cognitive function.

These approaches are critical for conducting methodological research to enhance the validity, reliability, and utility of data related to healthcare costs associated with food insecurity. All these efforts have strong potential to contribute to the theory, methodology, literature, and practice in the field of nutrition and healthcare in the elderly, which are essential to improve the food and healthcare security of vulnerable older adults.

Acknowledgments

The sole author had responsibility for all parts of the final manuscript.

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