FOOD INSECURITY AND COST-RELATED MEDICATION NON-ADHERENCE IN A POPULATION OF COMMUNITY-DWELLING, LOW-INCOME OLDER ADULTS IN GEORGIA

by

REBECCA ANNE BENGLE

(Under the Direction of Jung Sun Lee)

ABSTRACT

This study examined the relationship between food insecurity and cost-related medication non-adherence in a population of low-income older adults in Georgia. This study used data from the Georgia Advanced Performance Outcomes Measures Project to evaluate new Older Americans Act Nutrition Program participants and waitlisted people (n = 1000, mean age 75.0 ± 9.1 years, 68.4% women, 25.8% black). Food insecurity was assessed using the modified 6-item USDA Household Food Security Survey Module. Practice of 5 CRN behaviors (e.g., delaying refills, skipping doses) was evaluated. Approximately 49.7% of participants were food insecure, while 44.4% had utilized ≥1 CRN strategy (CRN-P). Those who were food insecure and/or who reported CRN-P were more likely to be black, low-income, younger, and less educated. After controlling for confounders, food insecure participants were 2.9 (95% CI 2.2, 4.0) times more likely to report CRN-P. Improving food security is important for low-income older adults to promote adherence to recommended prescription regimens.

INDEX WORDS: Older adults; food security; cost-related medication non-adherence; Older Americans Act Nutrition Program

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DEDICATION

I would like to dedicate this thesis in loving memory of my grandmother, Mary Elizabeth "Nana" Bengle. Nana, you are the most beautiful person I have ever known. Your kindness and patience inspired me to work with older adults. The world is a better place because of you.

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CHAPTER 1

INTRODUCTION

The proportion of the United States (US) population aged 65 and older is currently 12.4% and is projected to increase to 20.2% by the year 2050 (1). A primary concern pertaining to this shift in population demographics is the increase in national healthcare expenditures that may result. The portion of the Gross Domestic Product (GDP) spent on healthcare is projected to increase from 16.0% in 2006 to 20.0% in 2016 (2). It has been estimated that around half of lifetime health care expenditures are made in the later (age 65+) years (3). Studies indicate that over 80% of Medicare beneficiaries suffered from at least one chronic condition, and around 24% of them experienced four or more chronic illnesses (4). Cumulatively, health care costs arising from chronic illness are estimated to represent 75% of the nation's total healthcare costs (5).

Prescription drugs are a major factor contributing to rising health care expenditures in the US. Costs for prescription drugs are rising at a rate that exceeds the rate of inflation. In 2003, the top 30 brand name prescription drugs used by older adults in the US increased in price at an average rate 4.3 times the rate of inflation (6). Previous studies indicate that more than 75 % of older adults take at least one prescribed medication (7, 8). Although older adults account for only 12.4% of the population, they have been estimated to purchase around 30% of all prescription medicines in the nation (9-11).

Older adults faced with high prescription drug costs may resort to a number of potentially harmful coping mechanisms. **Cost-related medication non-adherence** (CRN) is defined as

taking less medication than prescribed by a healthcare professional due to cost (12). Research indicates that there are several risk factors associated with CRN. Patient characteristics associated with increased likelihood of utilizing CRN strategies include low-income (13, 14), African American race (13, 15, 16), lack of prescription drug coverage, poor physical and mental health (14, 16-18), polypharmacy (14), diagnosis of multiple diet-related chronic conditions (19), and lower perceived risk of adverse effects related to CRN (for a comprehensive review of risk factors, see Briesacher, Gurwitz et al., 2007) (52). Many of these risk factors are relevant to the older population in Georgia.

Utilization of any CRN strategies may put the patient at risk for health complications. Studies have indicated a direct relationship between CRN and poorer overall health status (17, 20), increased emergency room visits (21, 50) and general increases in healthcare costs (17, 21).

Another economic phenomenon that is closely related to CRN is food insecurity. **Food insecurity** is "the limited or uncertain availability of nutritionally adequate and safe foods or limited or uncertain ability to acquire acceptable foods in socially acceptable ways" (23). The 2005-2007 average rate of household food insecurity in the state of Georgia (13.0%) was significantly higher than the national average rate (11.0%) (24). Previous studies suggest that food insecurity has an impact on a number of nutrition-related variables that may affect the health and wellbeing of the older population. In older populations, food insecurity or food insufficiency (a close proxy to food insecurity) have been associated with decreased micronutrient intake and status (25-28), biochemical indicators of poor nutritional status (29), increased nutritional risk status (25, 27), and unhealthy weight and body size (28, 30, 31). Food insecurity and food insufficiency in older adults have also been associated with poorer self-reported health status (25, 28, 29), disability (32), decreased quality of life (33), anxiety and

depression (29, 31). This information suggests that food insecurity may contribute to the development or exacerbation of diet-related chronic illnesses (34). Food insufficiency, a close proxy to food insecurity, has been associated with increases in healthcare utilization (35).

The financial burden of prescription medications experienced by older adults may be significantly more pronounced due to a combination of polypharmacy and fixed income levels. Although the advent of the Medicare Prescription Drug Benefit promised prescription coverage for older adults, research indicates that this benefit is not equally financially affordable in all states (36). In addition, many older adults experiencing one or more diet-related chronic illnesses may require expensive, healthful dietary choices for effective management of their conditions. Monitoring and preventing food insecurity and CRN could potentially ameliorate the rapid increases in healthcare costs associated with diet-related chronic illness.

The purpose of this study was to examine the prevalence of food insecurity and CRN in low-income older adults in Georgia and to examine the relationship between food insecurity and CRN in the study population. For the present study, participants (n = 1000) were individuals identified from the Georgia Older Americans Act Nutrition Program (OAANP) client database systems falling into four categories: Home Delivered Meals (HDM) participants, Congregate Meals (CM) participants, and individuals on the waitlist (WL) for either program (HDMWL and CMWL, respectively). Data regarding demographics, CRN and other prescription cost-cutting (PCC) behaviors, food security, and medication and disease burden were obtained from the Georgia Division of Aging Services (DAS) client databases and a self-administered mail survey. Based on previous studies, our hypotheses were that food insecurity and CRN would be higher in our population than in previous national studies and that food insecurity would be predictive of

practicing CRN. Findings from this study have policy implications at the local, state, and federal levels.

Chapter 2 is a review of the literature pertaining to demographic trends regarding aging, health care expenditures, prescription drug costs, food security and CRN. The review identifies previous studies on food insecurity and CRN including a similar study examining their relationship in a population of low-income adults age 18-65 (22).

Chapter 3 is a manuscript to be submitted to the Journal of the American Dietetic Association. The chapter includes the abstract, introduction, methods, primary results, discussion and implications, and relevant tables and figures.

Chapter 4 is a summary of the present study and provides implications for policy changes and for further research.

CHAPTER 2

LITERATURE REVIEW

An Aging Population

The increasing proportion of and diversity within the older American population has significant implications in the healthcare and public health areas. The proportion of the US population aged 65 and older is currently 12.4% and is projected to increase to 20.2% by the year 2050 (1). The characteristics of this growing older population are expected to change in the next several decades. Projections indicate a disproportionate increase of the older population (aged 65 and older) among different racial and ethnic groups. Between 2000 and 2050 the minority population will increase from 8.4% to 12.0% in African Americans, from 2.9% to 7.8% in Asian Americans, and from 6.0% to 17.5% in people of Hispanic origin (1). These projections are of concern due to the health disparities existing between various racial or ethnic groups. African American older adults in 2006 were more likely than their Caucasian counterparts to suffer from hypertension (70.4% vs. 51.3%), stroke (15.6% vs. 8.9%), and diabetes (28.8% vs. 16.0%) (37). African American older adults are more likely to experience difficulty with 3-6 activities of daily living than are their Caucasian counterparts (17.3% vs. 9.7%, respectively) (38). Nationally, the percentage of older adults with hypertension and diabetes have increased respectively from 46.5% and 13.0% in 1997 to 53.3% and 18.0% in 2004 (37). The combination of population-wide increases in prevalence of chronic disease and disproportional increases in high-risk segments of the older adult population is of concern. These trends translate to an older population at increased risk for poor health and health disparities.

Increasing Health Care Costs with Population Aging

A primary concern pertaining to this shift in population demographics is the increase in national healthcare expenditures that may result. The portion of the Gross Domestic Product (GDP) spent on healthcare is projected to increase from 16.0% in 2006 to 20.0% in 2016 (2). It has been estimated that around half of lifetime health care expenditures are made in the later (age 65+) years (3). Recent estimates suggest that approximately 88% of older adults in the US suffer from one or more chronic illness (39). Cumulatively, health care costs arising from chronic illness are estimated to represent 75% of the nation's total healthcare costs (5). In a national estimation of Medicare beneficiary (age 65+) healthcare expenditures, those with two or more chronic conditions accounted for 65% of the study population and 95% of Medicare expenditures (4). Although older adults accounted for roughly 13% of the population in 2004, they were responsible for 34% of personal healthcare spending in this year (11). Clearly, the increasing proportion of older Americans has implications with regards to current and future healthcare expenditures.

Increasing Prescription Drug Utilization and Costs

Prescription drugs are a major factor contributing to rising health care expenditures in the US. Costs for prescription drugs are rising at a rate that exceeds the rate of inflation. In 2003, the top 30 brand name prescription drugs used by older adults in the US increased in price at an average rate 4.3 times the rate of inflation (6). The rise in drug costs affect the older adult population in the US on a disproportionate level due in part to the high prevalence of polypharmacy in this population. Previous studies indicate that more than 75% of older adults take at least one prescribed medication (7, 8). Although older adults account for only 12.4% of the population, they have been estimated to purchase around 30% of all prescription medicines in

the nation (9-11). Total older adult prescription drug expenditures have continuously increased from over $9 billion in 1987 to $56 billion in 2004 (11). Although the overall yearly percent increase in prescription drug expenditures was lower in 2007 than in previous years, the increase in Medicare prescription drug expenditures (19%) was the greatest of any source of prescription drug funding for that year (40).

Cost assistance options such as the Medicare Prescription Drug Plan and the $4 generic programs have been developed in recent years to assist older adults in the procurement of prescription drugs. However, many drugs are not available in generic form and thus may not be encompassed by the $4 generic programs. The Medicare Prescription Drug Plans (PDP) often have limited drug formularies. In addition, beneficiaries who exceed the yearly benefit cap are responsible for paying the full drug price out-of-pocket for the remainder of the year. A recent national study of Medicare beneficiaries indicated that older adults with Medicare part D coverage experienced higher out-of-pocket prescription drug costs than those covered by employer plans or Veterans Affairs (VA) insurance (41). Additional studies have shown that for each of the top 20 drugs prescribed to older adults, the lowest price charged by Medicare part D plans is higher than the lowest price secured by the VA, with a mean difference of 58% (42). Among Medicare part D beneficiaries, nearly three times as many African-Americans as Caucasians reported forgoing a prescribed medicine because of the cost (43).

Chronic illness is a major contributing factor to the disproportionately high prescription drug utilization in the older population. A study using data from the 1987 National Medical Expenditure Survey indicated that community-dwelling elderly individuals spent an average of 23% of their total income on pharmaceuticals, as compared to 13% of total income for non-elderly adults. About 36% of this elderly sample had at least three chronic illnesses, accounting

for 57% of drug expenditures for all elderly participants (44). A more recent study used 2003 Medicare Expenditure Panel Survey data and determined that individuals with 6 or more chronic conditions were around 6 times more likely than those with less than three chronic conditions to spend more than $3810 per year (a 2003 estimate of the income cutoff for the Medicare "Part D" Medication Therapy Management Program prescription benefit) on prescription drugs (45). The exorbitant amount of pharmaceutical expenditures by the older adult population is of concern from a public health and policy perspective. Preventative health strategies become an increasingly important means of curbing the escalating drug expenditures made by our nation's elders. Programs meant to improve dietary quality, such as the Older Americans Act Nutrition Program (OAANP), have been indicated as potentially effective preventative measures of expensive complications of diet-related chronic illness (46).

Cost-Related Medication Non-adherence

In addition to increased out-of-pocket spending caused by utilization of prescribed medications, the use of pharmaceuticals has secondary implications regarding personal healthcare expenditures. **Medication non-adherence** can be defined as the deviation of an individual's medication taking behaviors from the recommendations made by their medical provider (47). Medication non-adherence has been associated with a number of negative consequences, including increased complications of illnesses (48, 49) and increased acute and overall healthcare utilization (9, 48-51).

There are many factors that contribute to medication non-adherence. **Cost-related medication non-adherence** (CRN) is defined as taking less medication than prescribed by a healthcare professional due to cost (12). Research in this area has identified a number of behavioral strategies that are associated with cost-related non-adherence. In response to financial

pressures, patients may stop taking medications, split pills, delay refills, skip doses, or avoid new prescriptions (52). In addition to these strategies, patients may utilize one or more "cost-cutting" strategy in obtaining prescription medications. Common "cost-cutting" strategies include comparing prices between retailers, taking free samples, requesting generics, increasing debt, importing pills, or cutting back on basic needs (52). Prevalence of CRN varies depending on the population studied, the survey tools used, and other factors (52). An estimated 55.5% of the 1.6 million Medicare beneficiaries who did not fill and/or refill one or more medications in 2004 reported that they failed to do so because they thought the medication(s) would "cost too much" (53). Estimates of CRN prevalence range from less than 3% among a nationally representative sample of community-dwelling Medicare beneficiaries (54) to around 44% among a sample of low-income community-dwelling older adults in North Carolina (16). A study by Safran and colleagues examined the prevalence of CRN among low-income older adults in Illinois, Michigan, New York, Pennsylvania, California, Colorado, Ohio, and Texas. This interviewer administered survey examined prescription drug use and related factors. The study found that 41% of impoverished older adults with no drug coverage did not fill a medication at least once due to cost (19). Although there have been no studies of the prevalence of this phenomenon in the OAANP participant population in Georgia, these data provide information about a population with similar sociodemographic characteristics.

Research indicates that there are several risk factors associated with CRN. Patient characteristics associated with increased likelihood of utilizing CRN strategies include low-income (13, 14), African American race (13, 15, 16), lack of prescription drug coverage, poor physical and mental health (14, 16-18), polypharmacy (14), diagnosis of multiple diet-related chronic conditions (19), and lower perceived risk of adverse effects related to CRN (for a

comprehensive review of risk factors, see Briesacher, Gurwitz et al., 2007) (52). Many of these risk factors are relevant to the older population in Georgia. For example, the proportion of the older adult population in Georgia living at or below 200% of the poverty level in 2000 (38%) was higher than the national average (34%) (55). Thus the prevalence of CRN may be greater in Georgia than previously reported in other states. Study of the prevalence of this problematic coping strategy is warranted in the older Georgia population.

Utilization of any CRN strategies may put the patient at risk for health complications. Studies have indicated a direct relationship between CRN and poorer overall health status (17, 20), increased emergency room visits (21, 50) and general increases in healthcare utilization and costs (17, 21). A study by Motjabai and colleagues found that CRN was associated with increased self-reported worsening of hypertension, arthritis, heart disease, and depression in an older adult sample from the Heath and Retirement Study (17). Kennedy and colleagues discovered that almost 50% of individuals aged 18 and over who reported CRN experienced at least one negative health outcome, including 20.9% who experienced worsening of the condition for which the medication was prescribed (56). Likewise, a study of older adults receiving healthcare through the VA found that CRN among diabetic patients was associated with a 0.6 percentage point increase in hemoglobin A1c, a measure of glucose control (57).

Cost-related Medication Non-adherence and Nutrition

Cost-related medication non-adherence is related to nutrition and diet-related illness. When ranked by total expenditures, the top three therapeutic drug classes purchased by Medicare beneficiaries in 2004 were cardiovascular agents, antihyperlipidemic agents, and hormones (including anti-diabetic hormones such as insulin) (58). These three classes of drugs are all used to treat diet-related chronic illnesses, which can also be treated and/or prevented by diet therapy.

Medication non-adherence may result in increased acute healthcare expenditures, thereby undermining the cost-preventative effects of any diet therapy in which the patient may be participating. The strategy of "cutting back on basic needs," a behavior closely associated with CRN, is of particular concern for patients suffering from diet-related chronic illnesses. These patients often require special diets with greater emphasis on healthful eating. It has been well documented that healthier food alternatives are often more expensive (59, 60). Patients suffering from diet-related chronic illness may feel pressure to choose between purchasing medications and healthful foods. A qualitative study by Schoenberg and colleagues indicated that patients with type 2 diabetes, another chronic illness with high associated medical costs, often experience challenges in adhering to a healthful diet due to the high expense of healthful food options (61). The cumulative financial pressures of prescription costs and healthful foods may be particularly significant to low-income individuals. In a situation necessitating a choice between food and medicine, the patient with limited financial resources might be predestined to make a decision that will compromise his or her health.

Food Insecurity and Older Adults

Food insecurity is "the limited or uncertain availability of nutritionally adequate and safe foods or limited or uncertain ability to acquire acceptable foods in socially acceptable ways" (23). Food insecurity is classified by the US Department of Agriculture (USDA) based on severity. **Low Food Security** occurs when an individual "reports of reduced quality, variety, or desirability of diet, but does not indicate reduced food intake." **Very Low Food Security** occurs when an individual "reports of multiple indications of disrupted eating patterns and reduced food intake" (24). National estimates of food insecurity indicate that roughly 6.5% of households with older adults are food insecure in 2007 (24). This data is obtained by the USDA on a yearly basis

through the Current Population Survey (CPS). The CPS obtains information from a representative sample of the US civilian, non-institutionalized population. The assessment of food insecurity performed by the CPS utilizes a validated form of the USDA Household Food Security Survey Module (HFSSM) (24). The prevalence of food insecurity in the older adult population may be higher than this in certain demographic and geographic groups.

By definition, limited financial resources represent an important risk factor for food insecurity (62). The food insecurity rate in households at or below the poverty level was 37.7%, or around three times the national rate of 11.1%. The rate of food insecurity in low-income households (< 130% of the federal poverty level) with elderly was 20.7%, which is more than three times the national average (6.5%) (24). A study of low-income seniors in New York City indicated that 35% of those surveyed reported food insecurity (63). National rates of food insecurity in 2007 were higher in African-American individuals (22.2%) than in their Caucasian counterparts (7.9%). A reported 7.7% of African-American households experienced very low food security, the most severe form of food insecurity, compared to a 3.1% rate of the nation's households. The southeast region of the US is comprised of many groups of people at particularly high risk for food insecurity. In 2007, the rate of household food insecurity in the southeast region of the US (11.8%) was higher than the national average (24). The 2005-2007 rate of household food insecurity in the state of Georgia (13.0%) was significantly higher than the national rate (11.0%) (24).

Previous studies suggest that food insecurity has an impact on a number of nutrition-related variables that may affect the health and wellbeing of the older population. Variables negatively associated with food insecurity include fruit and vegetable intake (66), micronutrient intake (26, 28, 64, 66), and household food availability (64). Food insecurity has also been linked

with unhealthy weight (66), poor self-reported health status (28, 67), poor health-related quality of life (68), increased healthcare utilization (69), health and disease complications (70), and decreased work productivity (69). In older populations, food insecurity and food insufficiency (a close proxy to food insecurity) have been associated with decreased micronutrient intake (25-28), biochemical indicators of poor nutritional status (29), increased nutritional risk status (25, 71), and unhealthy weight and body size (28, 30-31). Food insecurity in older adults has also been associated with poorer self-reported health status (25, 28-29), multimorbidity and disability (27, 32), decreased quality of life (33), and anxiety and depression (29, 31). This information suggests that food insecurity may contribute to the development or exacerbation of diet-related chronic illnesses (34). Food insufficiency, a close proxy to food insecurity, has been associated with increases in healthcare utilization (35).

There are several innate risk factors for food insecurity which are prevalent in the Georgia older adult population. For example, the poverty rate in the population ages 65 and over (12.6%) is higher than the national average for that age group (9.4%) (72). In 2006, the estimated percentage of elders in Georgia who are African American (20.6%) was much greater than the national average (9%) (37, 73). These statistics indicate that further examination of food insecurity in the Georgia older adult population is important. Information obtained from such studies would help in the development of public policy at the local, state, and federal levels. The OAANP attempts to promote a healthier diet, and consequently an improved state of overall health and wellbeing in the older population. Recently, the Administration on Aging has declared the reduction of food insecurity in OAANP participants as a primary goal of the program (74). A greater understanding of food insecurity in this population will aid the state and the nation in helping at risk individuals maintain a healthy diet.

Food Insecurity and Cost-related Medication Non-adherence

The financial burden of prescription medications experienced by older adults may be significantly more pronounced due to a combination of polypharmacy and fixed income levels. Although the advent of the Medicare Prescription Drug Benefit promised prescription coverage for older adults, research indicates that this benefit is not equally financially affordable in all states (36). In addition, many older adults experiencing one or more diet-related chronic illnesses may require expensive, healthful dietary choices for effective management of their conditions. Monitoring and preventing food insecurity and CRN could potentially ameliorate the rapid increases in healthcare costs associated with diet-related chronic illness. Many individuals who are likely to be food insecure are also predisposed to experience high prescription medication costs (75). Few studies have examined the association between food security and CRN (22). This relationship has primarily been examined in a population of individuals aged 18 to 65.

Preliminary Studies

To our knowledge, few studies have examined the relationship between food insecurity and CRN. Harrison and colleagues examined the relationship in a survey of low-income [< 200% of the federal poverty level (FPL)] Californian adults in the California Health Interview Survey (77). Similarly, Kushel and colleagues examined this relationship in a cross-sectional analysis from the National Survey of America's Families (NSAF). This study was designed to examine various health care utilization patterns in a sample of low-income (< 200% of the FPL) civilian, non-institutionalized people ages 18 to 64 in the US (22). The aim of the study was "to determine the association between housing instability and food insecurity and access to ambulatory healthcare and rates of acute healthcare utilization" (22). Food insecurity was assessed by using three of the questions from the 18-item USDA HFSSM. Postponing needed medications was

assessed by two questions: “in the past year, did you not fill or postpone filling a prescription for drugs when you needed them?” and “was lack of insurance or money a reason why you did not get the drugs you needed?” (76). Additional factors assessed included use of acute care, postponing needed medical care, and not having a usual source of care (22).

A total of 16,651 participants completed the survey. Results showed that 42.7% of the study population experienced food insecurity as defined by Kushel and colleagues. An estimated 9.1% of people surveyed reported postponing medications. Food insecurity was associated with an increased risk for postponing medications, with an Odds Ratio (95% Confidence Interval) of 2.15 (1.62, 2.85). Food insecurity was also found to be a significant risk factor for postponing needed medical care and increased use of acute care (22).

There are several limitations in the design of the aforementioned study. The study does not explore the relationship between food insecurity and CRN in the older adult population, despite the fact that older adults may be at increased risk for CRN. Also, Kushel and colleagues determined food insecurity based on a three item questionnaire derived from the USDA HFSSM. The smallest validated version of the USDA HFSSM consists of six questions, three of which were utilized in the survey by Kushel. In addition, Kushel estimated the prevalence of CRN by utilizing only one measure: whether the individual had postponed medications in the past year. This measure does not encompass the wide range of behaviors exhibited by individuals when restricting medication due to cost. Thus, the true extent to which the population studied practices CRN may have been underestimated in the study population. The survey tool utilized by Kushel and colleagues may be limited in the ability to provide an accurate representation of food insecurity in the study population (22).

Preliminary data from the Nutrition and Heath of Older Adults Study indicate that the Georgia older adult population may be at risk for food insecurity and CRN. The Nutrition and Heath of Older Adults annual evaluation draws from a random sample of older adult senior center participants in the northeast Georgia area. This ongoing nutrition and health assessment uses a modified version of the USDA HFSSM. In 2008, a comprehensive assessment tool devised by nutrition, health, and aging professionals and reviewed by pharmacy professionals was used to determine the prevalence of CRN in this population. Results from the 2008 assessment of 137 older adults participating in senior center programs in northeast Georgia indicated that 7.3% of older adults surveyed experienced food insecurity in the past year, and 9.5% reported practicing one or more CRN behaviors. Food insecure individuals were around 12 times more likely than their food secure counterparts to report practicing CRN after controlling for potential confounders (78). Given the above information and the demographic characteristics of the Georgia older adult population, further study of these issues is warranted.

Rationale, Specific Aims, and Hypotheses

Food insecurity and CRN are two closely related phenomena with individual and public health implications. Many older adults with multiple chronic conditions and limited financial resources may be forced to choose between food and medicine. Monitoring these issues will help health practitioners and policy makers to understand the barriers to healthy, happy living faced by many older adults. Determination of unmet need for food and prescription assistance programs will allow us to better provide for the interests of our elders and for the nation.

Based on previous research and demographic characteristics of the Georgia population, the Georgia OAANP population is at risk for food insecurity and CRN (24, 52). The present study of food insecurity and CRN in older adults uses the study by Kushel as a foundation.

However, the present study uses validated and comprehensive assessment tools for assessment of food insecurity and CRN. A modified version of the validated 6-item USDA HFSSM is used to estimate prevalence of food insecurity. A recent review published by Briesacher and colleagues served as the basis for development of a CRN assessment tool that is more comprehensive than the survey tool used in the study by Kushel and colleagues. This expanded survey tool assesses a series of behaviors that have been established by experts as common strategies used to cope with rising prescription drug costs (12, 16, 52, 57, 79). This survey tool is a useful means of assessing these issues in a population of at-risk older adults.

The first aim of this study is to characterize a population of primarily low-income OAANP participants and waitlisted people with regards to food insecurity and CRN. The second aim of this study is to examine the relationship between food insecurity and CRN in the study population. We hypothesize that 1) rates of food insecurity and CRN are high in this population as compared to previous studies and 2) food insecurity is predictive of CRN in the population studied.

CHAPTER 3

FOOD INSECURITY AND COST-RELATED MEDICATION NON-ADHERENCE IN A POPULATION OF COMMUNITY-DWELLING, LOW-INCOME OLDER ADULTS IN GEORGIA[1]

[1] Bengle, RA, Sinnett, S, Brown, A, Johnson, T, Johnson, MA, and Lee, JS. To be submitted to the Journal of the American Dietetic Association.

Abstract

Background: Many older adults suffer from one or more diet-related chronic conditions that are treated with expensive dietary and prescription regimens. Older people experiencing high medication and dietary cost burdens may resort to unhealthy coping mechanisms in order to manage treatment costs. Low-income older adults are at increased risk of cutting back on basic needs, including food and medication. **Objective:** This study examined the relationship between food insecurity and cost-related medication non-adherence (CRN) in a sample of low-income older adults in Georgia. **Methods:** This study used data from the Georgia Advanced Performance Outcomes Measures Project-6 (Georgia Advanced POMP-6) to evaluate new Older Americans Act Nutrition Program (OAANP) participants and waitlisted people in July through November 2008. The study sample includes individuals who completed all study-related variables in a self-administered mail survey (n = 1000, mean age 75.0 ± 9.1 years, 68.4% women, 25.8% African-American). Food insecurity was assessed using the 6-item USDA Household Food Security Survey Module. Practice of 5 CRN behaviors (delaying refills, stopping medicines, avoiding new prescriptions, taking smaller doses, and skipping doses) over the last month were evaluated. **Results:** About 49.7 % of participants were food insecure, while 44.4 % had utilized ≥1 CRN strategy in the last month. Those who were food insecure and/or who practiced any CRN strategy in the last month were more likely to be African-American, low-income, younger, less educated, and to report poorer self-reported health status. Food insecure participants were 2.9 (95% CI 2.2, 4.0) times more likely to practice ≥1 CRN behaviors than their counterparts even after controlling for potential confounders. **Conclusions:** Food insecure older adults were more likely to restrict medication use due to cost. Improving food security is important for low-income older adults in order to promote adherence to recommended prescription regimens.

Introduction

The proportion of the US population aged 65 and older is currently 12.4% and is projected to increase to 20.2% by the year 2050 (1). A primary concern pertaining to this shift in population demographics is the increase in national healthcare expenditures that may result. The portion of the Gross Domestic Product (GDP) spent on healthcare is projected to increase from 16.0% in 2006 to 20.0% in 2016 (2). It has been estimated that around half of lifetime health care expenditures are made in the later (age 65+) years (3).

Cumulatively, health care costs arising from chronic illness are estimated to represent 75% of the nation's total healthcare costs (5). In an estimation of older adult (age 65+) Medicare beneficiary healthcare expenditures, those with 2 or more chronic conditions accounted for 65% of the study population and 95% of Medicare expenditures (4).

Prescription drugs are a major factor contributing to rising health care expenditures in the US. Costs for prescription drugs are rising at a rate that exceeds the rate of inflation. In 2003, the top 30 brand name prescription drugs used by older adults in the US increased in price at an average rate 4.3 times the rate of inflation (6). The rise in drug costs affects the older adult population in the US disproportionately due in part to the high prevalence of polypharmacy in this population. Previous studies indicate that more than 75 % of older adults take at least one prescribed medication (7, 8). Although older adults account for only 12.4% of the population, they have been estimated to purchase around 30% of all prescription medicines in the nation (9-11).

High prescription drug cost burden may lead older adults to adopt potentially harmful coping strategies. **Cost-related medication non-adherence** (CRN) is defined as taking less medication than prescribed by a healthcare professional due to cost (12). In response to financial

pressures, individuals may stop taking medications, split pills, delay refills, skip doses, or avoid new prescriptions (54). Patient characteristics associated with increased likelihood of utilizing CRN strategies include low-income (13, 14), African American race (13, 15, 16), lack of prescription drug coverage, poor physical and mental health (14, 16-18), polypharmacy, diagnosis of multiple diet-related chronic conditions (19), and lower perceived risk of adverse effects related to CRN (for a comprehensive review of risk factors, see Briesacher, Gurwitz et al., 2007) (52). Utilization of any CRN strategies may put the patient at risk for health complications. Studies have indicated a direct relationship between CRN and poorer overall health status (17, 20), increased emergency room visits (21, 50), and general increases in healthcare utilization and costs (17, 21).

Cost-related medication non-adherence is related to nutrition and diet-related illness. When ranked by total expenditures, the top three therapeutic drug classes purchased by Medicare beneficiaries in 2004 were cardiovascular agents, antihyperlipidemic agents, and hormones (including anti-diabetic hormones such as insulin) (58). These three classes of drugs are all used to treat diet-related chronic illnesses, which can also be treated and/or prevented by diet therapy. Medication non-adherence may result in increased acute healthcare complications and expenditures, thereby undermining the effects of any diet therapy in which the patient may be participating. The strategy of "cutting back on basic needs," a behavior closely associated with CRN, is of particular concern for patients suffering from diet-related chronic illnesses. These patients often require special diets with greater emphasis on healthful eating. It has been well documented that healthier food alternatives are often more expensive (59, 60). Patients suffering from diet-related chronic illness may feel pressure to choose between purchasing medications and healthful foods (61, 80).

Food insecurity is "the limited or uncertain availability of nutritionally adequate and safe foods or limited or uncertain ability to acquire acceptable foods in socially acceptable ways" (23). By definition, limited financial resources represent an important risk factor for food insecurity (62). The southeast region of the US is comprised of many groups of people at particularly high risk for food insecurity. In 2007, the rate of household food insecurity in the southeast region of the US (11.8%) was higher than the national average (24). The 2005-2007 average rate of household food insecurity in the state of Georgia (13.0%) was significantly higher than the national average rate (11.0%) (24).

Previous studies suggest that food insecurity has an impact on a number of nutrition-related variables that may affect the health and wellbeing of the older population. Variables negatively associated with food insecurity include fruit and vegetable intake (64), micronutrient intake (26, 28, 64, 65), and household food availability (64). Food insecurity has also been associated with increased weight (66), poor self-reported health (28, 67), poor health-related quality of life (68), increased healthcare utilization (69), health and disease complications (70), and decreased work productivity (69). In older populations, food insecurity or food insufficiency (a close proxy to food insecurity) have been associated with lower micronutrient intake (25-28), biochemical indicators of poor nutritional status (29), poorer self-reported health (25, 28-29), multimorbidity and disability (27, 32), quality of life (33), and with anxiety and depression (29, 31). Food insufficiency, a close proxy to food insecurity, has been associated with complications of diet-related chronic illnesses and increases in healthcare utilization (34, 35).

Food insecurity and CRN are two closely related phenomena with significant negative consequences and public health implications. A study of US adults age 18-64 indicated that food insecure individuals were 2.15 (95% CI 1.62, 2.85) times more likely than their food secure

counterparts to restrict medication use due to cost (22). Many older adults with multiple chronic conditions and limited financial resources may be forced to choose between food and medicine (63, 82). Monitoring these issues will help health practitioners and policy makers to understand the barriers to achieving a healthy lifestyle faced by many older adults. Determination of unmet need for food and prescription assistance programs will allow us to better provide for the interests of our elders and for the nation.

The first aim of this study was to characterize a study population of primarily low-income OAANP participants and waitlisted people with regards to food insecurity and CRN. The second aim of this study was to determine the relationship between food insecurity and CRN in the study population.

Methods

Study Design

The present study was part of the Georgia Advanced Performance Outcomes Measures Project-6 (Georgia Advanced POMP-6). The 1993 Government Performance and Results Act (GPRA) mandates that all government-sponsored programs monitor program effects on the target population. In addition, the US Office of Management and Budget (OMB) mandates that government-sponsored programs be assessed using the OMB Performance Assessment Rating Tool (PART) (81). In accordance with these laws, the Administration on Aging began to sponsor the POMP and the Advanced POMP in order to assess the various Older Americans Act programs, including the OAANP (81). The Georgia Advanced POMP-6 project is one of many Advanced POMP projects that have been completed in selected states throughout the country. The purpose of Advanced POMP-6 is to develop a more inclusive and quantitative means of assessing the cost-efficiency and effectiveness of the OAANP (81).

The present study is a cross-sectional analysis drawing from data from the baseline wave of the Georgia Advanced POMP-6 longitudinal study. The study's primary objective is to examine the effects of the OAANP on participant food insecurity and health status over a time period of eight months. The Georgia Advanced POMP-6 longitudinal study consists of self-administered mail surveys completed by community-dwelling new OAANP participants and waitlisted people. The Georgia Department of Human Resources, Division of Aging Services (DAS) completed all sampling and mailing procedures, as well as data entry and processing. The University of Georgia (UGA) Department of Foods and Nutrition provided technical assistance and advice regarding study design, survey development and data analysis.

Nutrition and gerontology professionals from the UGA developed and assessed the face validity of the survey tool in December 2007. Pilot testing was completed in February 2008 in two different environments to assess content validity and feasibility. A pilot survey form was mailed to selected participants with a cover letter and return envelope for completion and return. In addition, congregate meals participants at senior centers completed the pilot survey themselves in the presence of UGA research staff. Feedback regarding the survey tool was tape-recorded in addition to observations made by the staff members conducting pilot testing. Unclear items in the survey tool were identified and clarified based on the responses of the pilot testers.

For the present study, participants were individuals identified from the Georgia OAANP client database systems falling into four categories: Home Delivered Meals (HDM) participants, Congregate Meals (CM) participants, and individuals on the waitlist (WL) for either program (HDMWL and CMWL, respectively) (Table 3.1). In order to accrue a substantial sample size, all individuals who were new to the program or waitlist during five consecutive months (July through mid-November 2008) were identified to receive a mailed survey (n = 4731). Surveys

were mailed to identified individuals between October 2008 and January 2009. Exclusion criteria included individuals who were visually impaired or illiterate as documented in the DAS client database. Due to the nature of the OAANP targeting methods, the present study provides a picture of low-income, non-institutionalized Georgia OAANP participants and waitlisted individuals.

Two reminder postcards were mailed to each survey recipient to promote a maximal return rate of surveys. Surveys were completed by participants and returned to DAS via mail. A total of 1594 surveys were returned, for a response rate of 33.7% (Table 3.1). Surveys were processed, stripped of identifying information, and merged with demographic information by DAS before being sent to the UGA for statistical analysis. All methods used by the UGA researchers were approved by the Institutional Review Board at the UGA.

Measures

Cost-related medication non-adherence was assessed using questions adapted from previous studies by Piette, Wilson and Mitchell, with guidance from a conceptual framework provided by Breisacher and colleagues (12, 16, 52, 57, 79). Although at the time that the surveys were constructed there was no validated survey tool for assessment of CRN, the tool that was used is based on a comprehensive summary of CRN behaviors that have been documented. The survey tool consisted of five measures of CRN behaviors and nine additional measures of prescription "cost-cutting" behaviors (PCC) closely associated with CRN and drug cost (see Table 3.2). Measures assessed use of these behaviors over the 30 days prior to survey completion. Potential answer options for all CRN and PCC questions were "yes" or "no." Based on individual responses to the five CRN questions, a summary score of total affirmative responses was calculated for all individuals who answered any of the five CRN questions.

Individuals who responded “yes” to practicing one or more CRN behavior were categorized as practicing CRN (CRN-P). Individuals who did not respond “yes” to any CRN question were categorized as not practicing CRN (CRN-NP).

Medication-related measures included prescription drug coverage, monthly prescription drug costs, and number of prescribed medications (82). Prescription drug coverage was determined using the following question: “Do you have any health insurance that helps pay for prescription medications” where possible responses were “yes” or “no.” Monthly out-of-pocket prescription drug cost categories included: none, $1-50 per month, $51-100 per month, or $101+ per month. Number of prescribed medications was categorized as: none, 1-2, 3-6, or 7+ prescribed medications. These categories for out-of-pocket drug costs and number of medications have been used by previous CRN researchers working with older adults (82).

Food insecurity over a 30 day reference period was assessed using a modified version of the 6-item USDA HFSSM (Table 3.3). The validated survey tool (83) includes a single question evaluating two separate behaviors: “In the past month, did you ever cut the size of your meals or skip meals because there wasn’t enough money for food?” In the modified survey tool, this question is separated into two questions. Each modified question evaluates one of the two behaviors addressed together in the original tool (cutting the size of meals, skipping meals) in the month prior to survey completion. These modified questions were allotted points twice based on: 1) an affirmative response (“1 or 2 days” or “3 or more days”) to either question and 2) a response of “3 or more days” to either question. Food security data were sent to the USDA for Rasch modeling and were determined to fit the model used for developing the validated scoring system (84). The validated 6-item HFSSM scoring system uses a food security summary score to

assign individuals to 1 of 2 categories: food secure (total score 0-1) or food insecure (total score 2-6).

Self-reported health status was evaluated on a five point scale where responses included 'poor,' 'fair,' 'good,' 'very good' and 'excellent.' This measure has been shown to correlate well with health outcomes and mortality in the elderly population (85-88). Participants were classified according to their response as either 1) 'fair' or 'poor' or 2) 'good', 'very good,' or 'excellent' self-reported health status.

Previous diagnosis of selected chronic diseases was assessed with the following question: "Has a doctor, nurse, or other health care professional ever told you that you had any of the following: high blood pressure (hypertension), heart attack/myocardial infarction (MI), angina/coronary heart disease, stroke, inflammation of the joints (arthritis, rheumatoid arthritis, gout, lupus, or fibromyalgia), diabetes, and osteoporosis (89). A summary score of chronic conditions was calculated based on responses to the individual disease questions (range 0-7). Summary scores were categorized as 0, 1, 2-3, or 4-7 chronic diseases to reflect increasing burden of multiple chronic conditions. Other survey measures included food group intake, food acquisition, physical and mental health status, reported acute healthcare services and multi-vitamin and supplement use (81, 89, 90).

Demographic information obtained from the DAS client database systems included age, race, and county of residence. Individuals were classified as either age 60-84 (younger-old) or age 85+ (oldest-old) to reflect the greater burden of disease states experienced by the oldest-old population. The majority of participants surveyed were either White or African-American, and approximately 14% of participants did not disclose race information. All individuals who did not disclose and all other individuals (Asian, American Indian or Alaskan Native, etc.) were

classified as “other” for analysis. Other demographic variables assessed by the survey included income, education, food stamp participation, and number of people in the household.

Participant county of residence was categorized based on the “Five Georgias” classification scheme by Bachtel and colleagues. This classification scheme is based on information from the 2000 census and guided by trends from the 1970 and 1980 census. According to this classification scheme, the 159 Georgia counties are assigned to five categories: urban, urbanizing, suburban, rural growth, and rural declining (91). Under this classification system, urban counties are defined as population core of 50,000 or more people with large numbers of minorities and impoverished individuals. Suburban counties surround urban centers and are characterized by a primarily white and affluent population, of which 25% or more individuals commute daily to urban areas for work. Urbanizing counties are rapidly developing rural areas with improved job opportunities, transportation options, and overall quality of life. Urbanizing counties will likely eventually develop into metropolitan areas. Counties characterized by rural growth are typically characterized by scenic or natural beauty. Some of these counties are located near a military base or regional growth center which allows them to sustain economic growth. Counties in rural decline are characterized by long-term population loss, lack of employment opportunities, poor infrastructure and business development, low education levels, and limited access to health care (91).

Statistical Analyses

The analytic sample (n = 1000) included all individuals with responses to all variables of interest. There were no significant differences in characteristics between the analytic sample and excluded individuals with regards to age, gender, education, race, living arrangement, or program type. However, a greater proportion of individuals in the analytic sample had an income

greater than $20,000 per year than in the excluded sample (24.6% vs. 16.9%, respectively, data not shown).

Descriptive statistics of the sample population were analyzed. For continuous and categorical variables, differences between food secure and food insecure individuals and between CRN-P and CRN-NP individuals were evaluated using t-tests and chi square tests, respectively. A logistic regression was used to determine the relative risk for CRN-P associated with food insecurity; potential confounders were included in these analyses [age, sex, race, education level, number of chronic conditions, participation in the food stamp program (a proxy for household assets), number of prescription medicines, monthly prescription costs, and program type]. All analyses were performed using SAS (92).

Results

Among study participants, 43.2% were active OAANP participants and 56.8% were waitlisted individuals. The largest subgroup of study participants was the HDMWL, which accounted for approximately 54.2% of individuals. The mean age of participants was 75.0 (SD 9.1) years (Table 3.4). Approximately 17.4% of participants were age 85 or older. Participants were 68.4% female, 25.8% African-American, 50.8% did not have a high school education, and 75.4% had an income less than $20,000 per year. Approximately 25.5% of participants lived in urban areas and 48.9% of participants lived alone. Approximately 44.4% and 49.7% of participants reported CRN-P and food insecurity in the 30 days prior to survey completion, respectively. Approximately 28.8% of participants reported both CRN-P and food insecurity in the 30 days prior to completion (data not shown).

Participant responses to the five CRN questions and nine PCC questions are shown in Table 3.5. The two most prevalent CRN strategies were delaying refills and avoiding new

prescriptions (30.8% and 30.4% of participants, respectively). Regarding PCC, common strategies included seeking free samples, spending less on basic needs, and not being able to purchase a medicine. Approximately 39.6% of participants reported spending less money on basic needs other than food and 25.1% of participants reported spending less money specifically on food in order to afford their prescription medicines.

The characteristics of study participants by CRN status are shown in Table 3.6. A greater proportion of those who reported CRN-P were younger, female, less educated, African-American, low-income, and lived in urban areas as compared to their CRN-NP counterparts. Significantly more CRN-P than CRN-NP individuals reported suffering from four to seven chronic conditions (39.2 vs. 30.8%, respectively). Likewise, more CRN-P individuals reported fair-poor health status than did CRN-NP individuals (83.6% vs. 68.4%, respectively). Program participation status was related to CRN-P. The proportion of CRN-P individuals in the HDMWL group was significantly higher than that of the CRN-NP group (59.0% vs. 50.4%, respectively) (Table 3.6). Indicators of prescription cost burden and polypharmacy were also related to CRN-P. More CRN-P than CRN-NP individuals reported a lack of prescription drug coverage (18.5% vs. 13.3%, respectively), seven or more prescription medications (54.3% vs. 43.2%, respectively), and monthly prescription drug costs of $101 or more (37.6% vs. 16.4%, respectively). When comparing individuals by prescription drug coverage status, prevalence of CRN-P was higher among uninsured than among insured individuals (52.6% vs. 42.9%, respectively; data not shown).

A greater proportion of people who reported CRN-P suffered from certain diet-related chronic conditions (Table 3.7). Significantly more CRN-P than CRN-NP individuals reported having been diagnosed with coronary heart disease (34.5% vs. 27.7%, respectively), arthritis

(73.7% vs. 66.9%, respectively), and diabetes (44.6% vs. 37.4%, respectively). Greater proportions of CRN-P individuals also reported being diagnosed each of the four other chronic conditions assessed (hypertension, heart attack, stroke, and osteoporosis), although the differences were not statistically significant.

Practicing cost-related medication non-adherence was significantly related to each of the nine PCC behaviors (Figure 3.1). A greater proportion of CRN-P individuals reported taking less effective medicines, switching to an OTC alternative, seeking free samples, importing a prescription, not being able to purchase a medicine, borrowing money, increasing credit debt, spending less on basic needs (other than food), and having to choose between food and medicine.

Cost-related medication non-adherence status was dependent on food security status as indicated by the USDA HFSSM individual item and total scores. A greater proportion of CRN-P individuals responded affirmatively to each of the 6 individual HFSSM questions (Figure 3.2, $P<0.0001$ for all). After determining food security status based on the HFSSM summary score, significantly more individuals who were CRN-P were classified as food insecure (Table 3.6).

Participant characteristics by food security status are shown in Table 3.8. Those who were classified as food insecure in the 30 days prior to survey completion tended to be younger, less educated, African-American, and low-income. A significantly greater proportion of food insecure than food secure individuals reported fair-poor self-reported health status (82.5% vs. 67.8%, respectively) and two or more chronic conditions (86.7% vs. 79.3%, respectively). The proportion of food insecure individuals specifically on the HDMWL was significantly higher than that of food secure individuals (62.2% vs. 46.3%, respectively, $P<0.0001$).

Multivariate logistic regression results are shown in Table 3.9. Females were more likely to report CRN-P (OR 1.53, 95% CI 1.12, 2.10) than were their male counterparts. As well,

individuals who reported fair-poor self-reported health were more likely to report CRN-P than were those whose self-reported health status was good-excellent (OR 1.72, 95% CI 1.19, 2.49). Individuals who reported higher monthly prescription drug costs ($101 or more) were also significantly more likely to report CRN-P than were those who reported no monthly prescription drug costs. Regarding location, one of the five classifications was significantly different regarding CRN-P risk in the multivariate model. Compared to individuals living in urban areas, those living in an urbanizing county were significantly less likely to report CRN-P (OR 0.67, 95% CI 0.40, 0.98). After adjusting for all potential confounders, food insecure individuals were approximately 2.95 times (95% CI 2.18, 4.0) more likely to report CRN-P than were food secure individuals.

Discussion

This study was the first to our knowledge to characterize and examine the relationship between food insecurity and CRN in a statewide sample of low-income Georgia OAANP participants and waitlisted people. In our study population, factors related to CRN included demographic differences, area of residence, practice of PCC strategies, selected and total number of chronic diseases (in bivariate analyses), and food insecurity. After controlling for potential confounders, food insecurity was the primary factor associated with CRN in the study population.

Almost half of the individuals in this study were food insecure. Previous studies of food security in a population of older adults in five boroughs of New York City estimated that up to 35% of low-income older adults may be food insecure (63). A nationally representative sample of low-income older adults (age 60-90) using pooled data from the 2001-2005 years of the CPS study found that approximately 30% of older adults with income less than 200% of the FPL were

food insecure (28). The population evaluated in the present study is different from the aforementioned studies with regards to geographic location. More importantly, the present study was completed during a time of economic crisis for the US (October 2008-January 2009). Thus, experienced food insecurity in this study might have been elevated relative to levels of food insecurity in previous years.

Approximately 44.4% of individuals in our study reported CRN-P. In a similar study of older adults from eight states, Safran and colleagues found that 19% of poor older adults with drug coverage and 41% poor older adults without drug coverage reported not being able to fill a prescription medicine in the past year because of the cost (19). The prevalence of CRN-P in our study was slightly higher than reported in the Safran study. However, our study used a more comprehensive assessment tool to evaluate CRN and therefore might provide a more complete reflection of CRN than previous studies using less extensive survey tools. As well, the characteristics of our study population, as well as current economic trends, put our population at increased risk for resource-related issues such as CRN-P.

Our findings regarding demographic relationships with CRN were consistent with previous research on this subject (52). Younger-old adults (age 60-84) in this study were more likely than old-old (age 85+) adults to report CRN-P. Similar to previous findings (15, 18, 93-95), individuals who were African-American and/or female were also more likely to report CRN-P than were their white and/or male counterparts. Also consistent with previous studies (94, 96, 97), prescription cost burden and prescription drug coverage were associated with greater likelihood of CRN-P. Thus, the practice of CRN in low-income older adults in Georgia is affected by similar factors as compared to other parts of the country.

Study participants residing in an urbanizing county were approximately 37% less likely to report CRN-P than their counterparts residing in urban areas. Previous comparisons of CRN in rural and urban environments have reported mixed results (15, 16, 96, 98). A study by Levine and colleagues found that older adult stroke survivors who reported inability to afford medication also more frequently reported lack of transportation (96). The urban-rural classification system used in the present study is sensitive to more social, demographic, and economic characteristics than the general census classification system. Individuals living in an urbanizing county have the advantage of living in an area with a cost of living much lower than in urban environments. These individuals likely have access to community resources that are not available in rural declining areas. For example, research indicates that individuals living in rural areas tend to live further from community pharmacies and are less likely to utilize prescription medications than those living in urban areas (99, 100). The relationship between area of residence and CRN warrants further study.

Greater proportions of participants in this study reported practicing the nine PCC strategies than reported CRN. Many of the PCC strategies may be much more commonly used than the CRN strategies. As well, assessment of certain PCC behaviors (e.g., seeking free samples, taking less effective medicines) may be subject to less social desirability bias than the CRN strategies. Of note, PCC and CRN were found to be closely related mechanisms for coping with high prescription drug costs. Significantly more individuals who reported practicing CRN also reported practicing each of the nine PCC behaviors. This finding is consistent with previous research on the relationship between CRN and the PCC behavior of requesting free samples (101). The strong relationship between CRN-P and PCC suggests that evaluating practice of PCC

behaviors may be a useful means of identifying CRN-P individuals. The relationship between CRN and PCC warrants further study.

More individuals who reported CRN-P had also been previously diagnosed with each of the seven chronic conditions assessed. Of particular concern, CRN-P participants were significantly more likely to have a previous diagnosis of diabetes and coronary heart disease. These diet-related chronic illnesses require expensive prescription and dietary treatment. Consistent with previous studies of older adults with diet-related chronic conditions (61, 80), many individuals in the present study were struggling to attain basic food and medication requirements that are essential for management of these conditions. Such individuals might be more likely to experience acute and expensive exacerbations of their conditions (22, 80). Research on the health effects of combined CRN and food insecurity in populations of older adults with diet-related chronic illnesses is needed.

Food insecure individuals were significantly more likely than food secure individuals to report CRN-P, even after controlling for potential confounders. Approximately one in four individuals in the present study population is both food insecure and CRN-P. Thus, many low-income older adults in Georgia are struggling to pay for food and medicine. Often, these older adults are suffering from one or more diet-related chronic illness and facing high cost prescription and dietary therapies. These older adults may be at risk for health and disease complications associated with food insecurity, CRN, or both (22, 80). Further research on the health consequences of combined food insecurity and CRN are needed to determine whether there is a compounding effect of these two phenomena.

Strengths and Limitations

There are a number of strengths of the present study. The study drew from a large body of existing knowledge regarding CRN and provided a comprehensive assessment of CRN behaviors. Through inclusion of recent conceptual frameworks in design of the survey tool, a picture of the prevalence of CRN behaviors was captured that surpasses the detail provided by many previous studies on this topic.

The present study examined an aspect of CRN that has been largely overlooked in the literature. The relationship between CRN and food insecurity is important in gaining an understanding of the multiple and interactive factors affecting health status and disease progression in the older adult population. Previous research indicates that self-administered measures of medication non-adherence are among the more accurate forms of assessing this variable (102). Thus, the means through which this survey was conducted was optimal for providing an accurate depiction of CRN. Findings from this study provide valuable information contributing to a more complete depiction of the factors affecting management of chronic illness in this growing segment of the population.

As is always the case, this study is not without limitations. The study relied on the ability of older adult subjects to read and write in English. This resulted in the exclusion of OAANP participants who were non-English speaking, illiterate, blind, or physically or cognitively unable to complete the survey form. The mail-out survey methodology allows for selection bias. Waitlisted individuals in greatest need may have been more likely to complete and return the survey. Data were self-reported, which may not provide a true picture of all issues measured. By definition, the cross-sectional nature of the study does not allow causal inferences to be made.

Longitudinal research is needed to evaluate the relationship between food security and CRN to better understand the issues involved.

Conclusions and Implications

Results from this study have implications with regards to public policy development at the local, state, and federal levels. Food insecurity is widely recognized as a phenomenon of importance to quality of life in the older adult population. The US Administration on Aging has declared minimization of food insecurity in the older adult population to be a priority (74). In addition, the first goal of Healthy People 2010 is "to help individuals of all ages increase life expectancy and improve their quality of life" (103). The documented negative effects of food insecurity on quality of life in older adults (25, 29, 33) suggest that monitoring food insecurity in this population is important in helping the nation achieve the first goal of Healthy People 2010. Title III of the Older Americans Act provides funds for nutritious meals to promote adequate nutritional intake (OAANP) and "medication management screening and education to prevent incorrect medication and adverse drug reactions" (74). Budget constraints and increasing need for Title III programs has led to long program waitlists and inability of these programs to provide for all older adults in need. Recent administrative acts have provided additional funding for OAANP programs in order to partially alleviate these budget constraints (104, 105). However, this funding may be insufficient for older adults in need, as many OAANP participants remain food insecure despite program assistance. Expansion of OAANP programs to include such services as weekend meals, breakfast, and emergency meals for all OAANP participants would provide additional resources to food insecure older adults. Research indicates that expansion of home-delivered meals to include 2 meals per day (breakfast and lunch) improved food security status in low-income home-delivered meals participants (106). Additional funding for Title III

programs and effective use and targeting of funds to older adults in greatest need is an important means of providing assistance to those who are unable to provide for themselves. Through Title III programs and other forms of food assistance, older adults might be enabled to achieve the universal access to nutrition services and high quality of life identified as a primary goal by the American Dietetic Association (107).

This study was completed during a time of economic crisis for the nation (late 2008 and early 2009). It is likely that prevalence of food insecurity and CRN-P will increase if the economy worsens. As the state of the nation's economy continues to fluctuate, the need for prescription assistance and public food assistance programs becomes increasingly important. Funding for food assistance programs has been indicated as a potentially effective preventative measure of complications of chronic disease (46). In a time characterized by significant financial stress on the Medicare Hospital Insurance benefit and other public health insurance programs for older adults, prevention of disease complications is of utmost importance. Monitoring resource related phenomena such as food insecurity and CRN over time and making policy decisions to accommodate older individuals in need will be vital for the wellbeing of the older adult population and the nation as a whole.

Table 3.1. Georgia Advanced POMP-6 baseline sample response rates by program type and subgroup

Program Type	**Sub-group**	**Identified Sample (n)**	**Surveys Returned (n)**	**Response Rate (%)**
Congregate Meals	Participant (CM)	838	231	27.60
	Waitlisted (CMWL)	246	74	30.10
Home-Delivered Meals	Participant (HDM)	1061	356	33.60
	Waitlisted (HDMWL)	2586	933	36.10
Total		**4731**	**1594**	**33.70**

Table 3.2. Georgia Advanced POMP-6 baseline survey measures of cost-related medication non-adherence (CRN) and prescription cost cutting (PCC) behaviors

CRN Measures
In the past 30 days… • Have you ever **skipped doses** of a medication because of the cost? • Have you ever **taken a smaller dose** of a medication because of the cost? • Have you ever **delayed refills** of prescriptions because of the cost? • Have you ever **stopped taking medicines** because of the cost? • Have you ever **avoided new prescriptions** because of the cost?
PCC Measures
In the past 30 days… • Did you ever **take less effective prescription medications** than those initially prescribed by your doctor because of the cost? • Did you ever **switch to an over-the-counter (OTC) alternative** to a prescription medication because of the cost? • Did you ever **seek free samples** because of the cost? • Did you ever **import** a prescription medication (order from another country) because of the cost? • Were you ever **not able to purchase** a prescribed medication because of the cost? • Have you ever had to **borrow money** from a relative or friend outside your household to pay for medications? • Have you ever had to **increase credit debt** to pay for medications? • Have you ever **spent less money on heat, electricity, clothing, household repairs and appliances, or other basic needs** so that you would have enough money to pay for your medications? • Have you ever had to **choose between purchasing food or medications**?

Table 3.3. Georgia Advanced POMP-6 baseline survey modified 6-item USDA Household Food Security Survey Module (HFSSM)

During the last 30 days, how often was this statement true: **the food that we bought just didn't last, and we didn't have money to get more.** Often Sometimes Never
During the last 30 days, how often was this statement true: **we couldn't afford to eat balanced meals.** Often Sometimes Never
In the last 30 days, did you or other adults in your household ever **cut the size of your meals** because there wasn't enough money for food? Yes, on 3 or more days Yes, on 1 or 2 days No
In the last 30 days, did you or other adults in your household ever **skip meals** because there wasn't enough money for food? Yes, on 3 or more days Yes, on 1 or 2 days No
In the last 30 days, did you ever **eat less than you felt you should** because there wasn't enough money to buy food? Yes No
In the last 30 days, were you ever **hungry but didn't eat** because you couldn't afford enough food? Yes No

Table 3.4. Georgia Advanced POMP-6 baseline analytic sample selected participant characteristics

	n	% or mean ± SD
Age, years		75.0 ± 9.08
60-84	826	82.60
85+	174	17.40
Gender		
Female	684	68.40
Male	316	31.60
Education		
Less than high school diploma	508	50.80
High school diploma or higher	492	49.20
Race		
White	582	58.20
African-American	258	25.80
Other[a]	160	16.00
Location[b]		
Urban	255	25.50
Urbanizing	178	17.80
Suburban	342	34.20
Rural growth	118	11.80
Rural decline	107	10.70
Income		
< $20,000 per year	754	75.40
> $20,000 per year	246	24.60
Living Alone		
Yes	480	48.93
No	501	51.07
Self-reported health		
Fair-poor	751	75.10
Good-excellent	249	24.90
Number of chronic diseases		
4-7	345	34.50
2-3	485	48.50
1	123	12.30
0	47	4.70
Program and participation type		
Congregate meals participants (CM)	172	17.20
Congregate meals waitlist (CMWL)	26	2.60
Home delivered meals participants (HDM)	260	26.00
Home delivered meals waitlist (HDMWL)	542	54.20
Food security status[c]		
Food secure	503	50.30

Food insecure	497	49.70
Cost-related medication non-adherence (CRN) status		
CRN-NP[d]	556	55.60
CRN-P[e]	444	44.40
Total number of prescriptions		
7+	481	48.10
3 to 6	404	40.40
1 to 2	84	8.40
None	31	3.10
Prescription insurance		
Yes	844	84.40
No	156	15.60
Monthly prescription costs		
$101+ per month	258	25.80
$51-100 per month	195	19.50
$1-50 per month	467	46.70
None	80	8.00

[a] Individuals classified as Asian, American Indian or Alaskan Native, Other, or Did Not Disclose by the Georgia Division of Aging Services client database system were classified as "Other" for analysis

[b] Participant county of residence according to the "Five Georgias" classification (91)

[c] Based on the modified 6-item USDA Household Food Security Survey Module classification

[d] CRN-NP denotes those who did not report restricting medication use due to cost in the 30 days prior to survey completion

[e] CRN-P denotes those reporting restricting medication use due to cost in the 30 days prior to survey completion

Table 3.5. Georgia Advanced POMP-6 baseline analytic sample participant responses to individual cost-related medication non-adherence (CRN) and associated prescription cost-cutting (PCC) measures

	Yes		**No**	
CRN				
	n	**%**	**n**	**%**
Skipped doses	226	22.71	769	77.29
Taken a smaller dose	201	20.20	794	79.80
Delayed refills	308	30.83	691	69.17
Stopped taking medicines	190	20.02	759	79.98
Avoided new prescriptions	288	30.41	659	69.59
PCC				
Took less effective prescription medications	241	25.50	704	74.50
Switched to an OTC alternative	192	20.25	756	79.75
Sought free samples	401	42.26	548	57.74
Imported	27	2.84	924	97.16
Weren't able to purchase	332	34.87	620	65.13
Borrowed money	325	34.17	626	65.83
Increased credit debt	233	24.66	712	75.34
Spent less on basic needs	375	39.60	572	60.40
Had to choose between food and medicine	238	25.11	710	74.89

Table 3.6. Georgia Advanced POMP-6 baseline analytic sample participant characteristics by cost-related medication non-adherence (CRN) status

Characteristic	**CRN-P[a]**		**CRN-NP[b]**		**P value[c]**
	n	**% or mean ± SD**	**n**	**% or mean ± SD**	
N (%)	444	44.4	556	55.6	
Age	72.8		76.8		<0.0001
60-84	398	89.64	428	76.98	<0.0001
85+	46	10.36	128	23.02	
Gender					
Female	312	70.27	372	66.91	0.2556
Male	132	29.73	184	33.09	
Education					
Less than high school diploma	235	52.93	273	49.10	0.2291
High school diploma or higher	209	47.07	283	50.90	
Race					
White	249	56.08	333	59.89	0.0181
African-American	133	29.95	125	22.48	
Other[d]	62	13.96	98	17.63	
Location[e]					
Urban	125	28.15	130	23.38	0.0789
Urbanizing	63	14.19	115	20.68	
Suburban	152	34.23	190	34.17	
Rural growth	55	12.39	63	11.33	
Rural decline	49	11.04	58	10.43	
Income					
< $20,000 per year	349	78.60	405	72.84	0.0356
> $20,000 per year	95	21.40	151	27.16	
Living Alone					
Yes	198	45.62	282	51.55	0.0649
No	236	54.38	264	48.45	
Self-reported health					
Fair-poor	371	83.56	380	68.35	<0.0001
Good-excellent	73	16.44	176	31.65	
Number of chronic diseases					
4-7	174	39.19	171	30.76	0.01
2-3	210	47.3	275	49.46	
1	45	10.14	78	14.03	
0	15	3.38	32	5.76	
Program and participation type					
Congregate meals participants (CM)	62	13.96	110	19.78	0.009
Congregate meals waitlist (CMWL)	7	1.58	19	3.42	
Home delivered meals participants (HDM)	113	25.45	147	26.44	

Home delivered meals waitlist (HDMWL)	262	59.01	280	50.36	
Food security status[f]					
Food secure	156	35.14	347	62.41	<0.0001
Food insecure	288	64.86	209	37.59	
Total number of prescriptions					
7+	241	54.28	240	43.17	0.0008
3 to 6	166	37.39	238	42.81	
1 to 2	30	6.76	54	9.71	
None	7	1.58	24	4.32	
Prescription insurance					
Yes	362	81.53	482	86.69	0.0255
No	82	18.47	74	13.31	
Monthly prescription costs					
$101+ per month	167	37.61	91	16.37	<0.0001
$51-100 per month	88	19.82	107	19.24	
$1-50 per month	169	38.06	298	53.60	
$0 per month	20	4.50	60	10.79	

[a] CRN-P denotes those reporting restricting medication use due to cost in the 30 days prior to survey completion

[b] CRN-NP denotes those who did not report restricting medication use due to cost in the 30 days prior to survey completion

[c] Based on χ^2 test

[d] Individuals classified as Asian, American Indian or Alaskan Native, Other, or Did Not Disclose by the Georgia Division of Aging Services client database system were classified as "Other" for analysis

[e] Participant county of residence according to the "Five Georgias" classification (91)

[f] Based on the modified 6-item USDA Household Food Security Survey Module classification

Table 3.7. Georgia Advanced POMP-6 baseline analytic sample previous diagnosis of selected chronic diseases by cost-related medication non-adherence (CRN) status

Disease	**CRN-P**[b]		**CRN-NP**[c]		**P value**[a]
	n	%	**n**	**%**	
Hypertension					
No	80	18.02	126	22.66	0.0712
Yes	364	81.98	430	77.34	
Heart attack (MI)					
No	335	75.45	433	77.88	0.3663
Yes	109	24.55	123	22.12	
Angina/coronary heart disease					
No	291	65.54	402	72.30	0.0213
Yes	153	34.46	154	27.70	
Stroke					
No	339	76.35	434	78.06	0.5222
Yes	105	23.65	122	21.94	
Arthritis					
No	117	26.35	184	33.09	0.0209
Yes	327	73.65	372	66.91	
Diabetes					
No	246	55.41	348	62.59	0.0215
Yes	198	44.59	208	37.41	
Osteoporosis					
No	315	71.11	411	74.05	0.2987
Yes	128	28.89	144	25.95	

[a]Based on χ^2 test

[b] CRN-P denotes those reporting restricting medication use due to cost in the 30 days prior to survey completion

[c] CRN-NP denotes those who did not report restricting medication use due to cost in the 30 days prior to survey completion

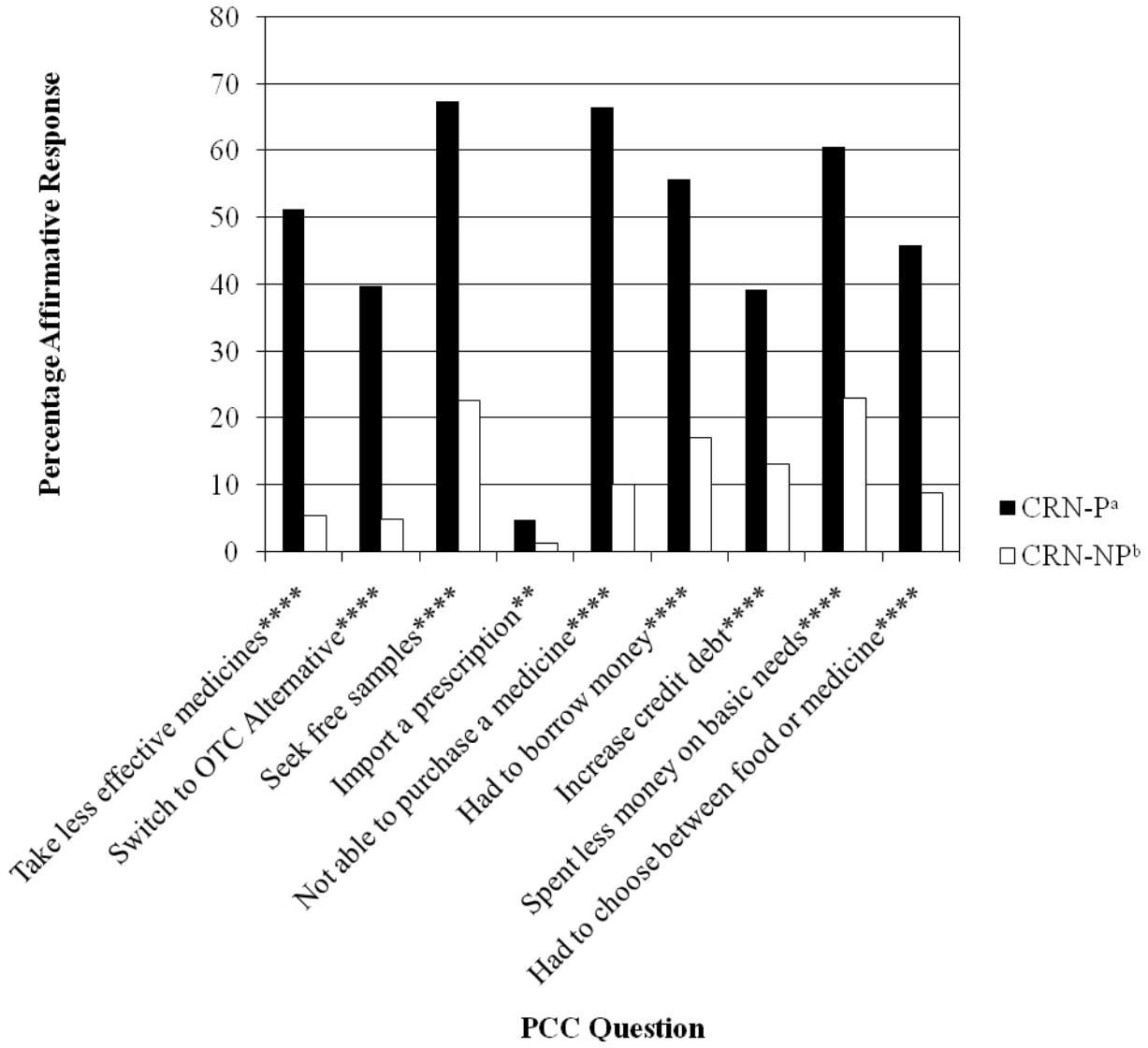

Figure 3.1. Georgia advanced POMP-6 baseline analytic sample itemized affirmative responses to the 9 Prescription Cost-Cutting (PCC) questions by Cost-related Medication Non-adherence (CRN) Status

** Significantly different at $P<0.01$ based on χ^2 test

**** Significantly different at $P<0.0001$ based on χ^2 test

[a]CRN-P denotes those reporting restricting medication use due to cost in the 30 days prior to survey completion

[b]CRN-NP denotes those who did not report restricting medication use due to cost in the 30 days prior to survey completion

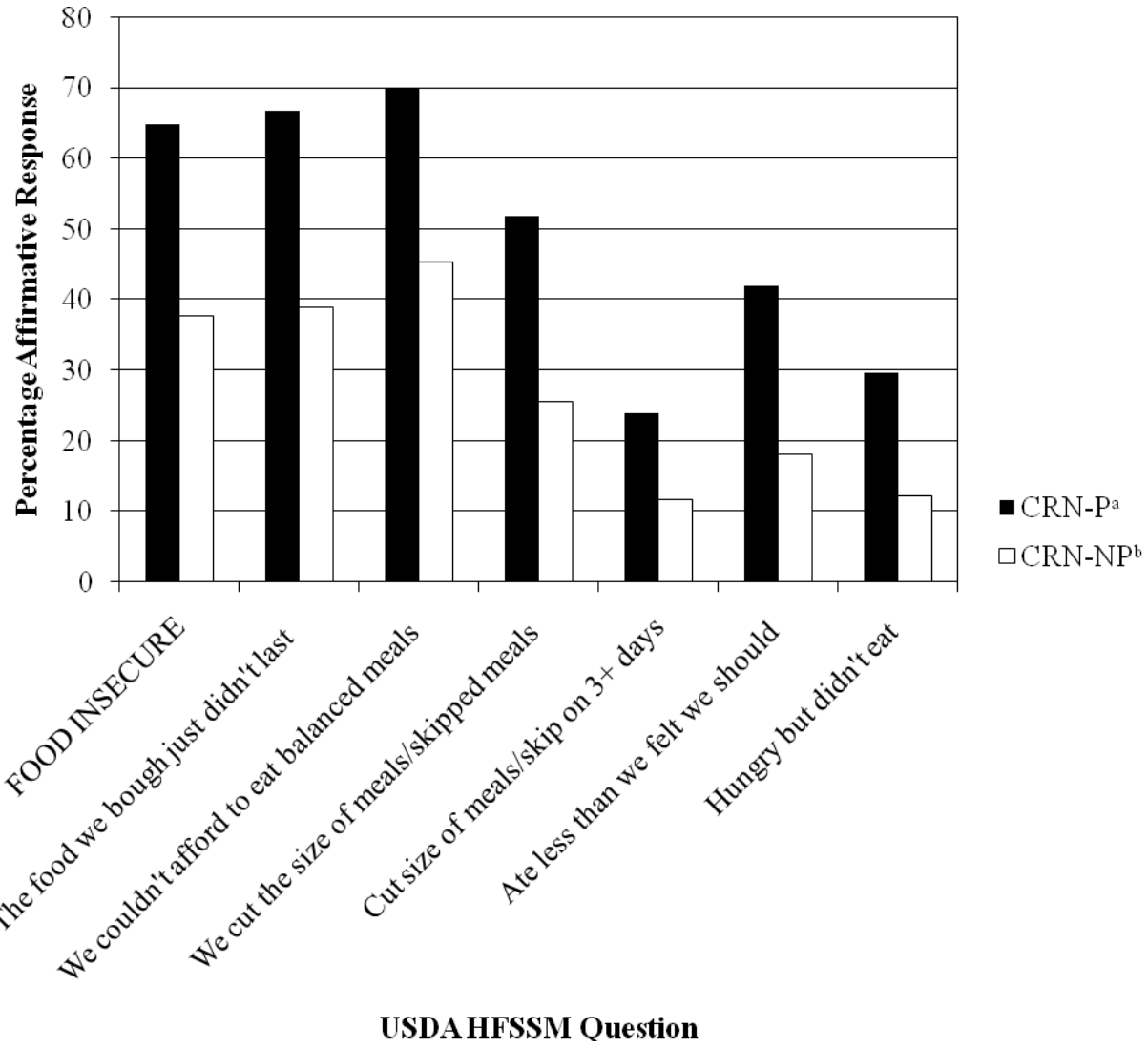

Figure 3.2. Georgia advanced POMP-6 baseline analytic sample itemized affirmative responses to the modified 6-item USDA Household Food Security Survey Module (HFSSM) by CRN status

$P<0.0001$ for all questions based on χ^2 test

[a]CRN-P denotes those reporting restricting medication use due to cost in the 30 days prior to survey completion

[b]CRN-NP denotes those who did not report restricting medication use due to cost in the 30 days prior to survey completion

Table 3.8. Georgia Advanced POMP-6 baseline analytic sample participant characteristics by food security[a] status

Characteristic	Food Insecure		Food Secure		P value[b]
	n	%	n	%	
N (%)	497	49.7	503	50.3	
Age	72.7		77.2		<0.0001
60-84	442	88.93	384	76.34	<0.0001
85+	55	11.07	119	23.66	
Gender					
Female	328	66.00	356	70.78	0.1041
Male	169	34.00	147	29.22	
Education					
Less than high school diploma	299	60.16	209	41.55	<0.0001
High school diploma or higher	198	39.84	294	58.45	
Race					
White	252	50.70	330	65.61	<0.0001
African-American	154	30.99	104	20.68	
Other[c]	91	18.31	69	13.72	
Location[d]					
Urban	140	28.17	115	22.86	0.1798
Urbanizing	90	18.11	88	17.50	
Suburban	153	30.78	189	37.57	
Rural growth	60	12.07	58	11.53	
Rural decline	54	10.87	53	10.54	
Income					
< $20,000 per year	426	85.71	328	65.21	<0.0001
➢ $20,000 per year	71	14.29	175	34.79	
Living Alone					
Yes	236	48.76	244	49.09	0.9166
No	248	51.24	253	50.91	
Self-reported health					
Fair-Poor	410	82.49	341	67.79	<0.0001
Good-Excellent	87	17.51	162	32.21	
Number of chronic diseases					
4-7	195	39.24	150	29.82	0.0021
2-3	238	47.48	249	49.50	
1	48	9.66	75	14.91	
0	18	3.62	29	5.77	
Program and participation type					
Congregate meals participant (CM)	51	10.26	121	24.06	<0.0001
Congregate meals waitlist (CMWL)	11	2.21	15	2.98	
Home delivered meals participant (HDM)	126	25.35	134	26.64	
Home delivered meals waitlist (HDMWL)	309	62.17	233	46.32	
Food stamp recipient					

Yes	167	33.60	67	13.32	<0.0001
No	330	66.40	436	86.68	

[a] Based on the modified 6-item USDA Household Food Security Survey Module classification
[b] Based on χ^2 test
[c] Individuals classified as Asian, American Indian or Alaskan Native, Other, or Did Not Disclose by the Georgia Division of Aging Services client database system were classified as "Other" for analysis
[d] Participant county of residence according to the "Five Georgias" classification (91)

Table 3.9. Multivariate logistic regression model: odds ratio (OR) and 95% confidence interval (CI) for practicing cost-related medication non-adherence (CRN-P) among older adult Older Americans Act Nutrition Program participants and waitlisted people

	OR	**95% CI**
Food security status[a]		
Food insecure	2.95	(2.18, 4.00)
Food secure	referent	
Age		
60-84	2.50	(1.65,3.77)
85+	referent	
Gender		
Female	1.53	(1.12, 2.10)
Male	referent	
Education		
Less than high school diploma	1.02	(0.75, 1.37)
High school diploma or higher	referent	
Race		
African-American	1.36	(0.97, 1.95)
Other[b]	0.77	(0.51, 1.18)
White	referent	
Location[c]		
Urban	referent	
Urbanizing	0.63	(0.40, 0.98)
Suburban	0.98	(0.67, 1.43)
Rural Growth	1.01	(0.61, 1.67)
Rural Decline	1.09	(0.66, 1.82)
Income		
< $20,000 per year	1.20	(0.84, 1.71)
> $20,000 per year	referent	
Self-reported health		
Fair-Poor	1.72	(1.19, 2.49)
Good-Excellent	referent	
Number of chronic diseases		
4-7	1.03	(0.47, 2.24)
2-3	1.07	(0.50, 2.28)
1	0.98	(0.43, 2.24)
0	referent	
Food stamp recipient		
Yes	1.02	(0.71, 1.45)
No	referent	
Program type		
Home delivered meals participant/waitlist (HDM/HDMWL)	1.07	(0.73, 1.59)

Congregate meals participant/waitlist (CM/CMWL)	referent	
Total number of prescriptions		
7+	2.02	(0.73, 5.55)
3 to 6	1.88	(0.69, 5.08)
1 to 2	2.27	(0.77, 6.65)
0	referent	
Prescription insurance		
No	1.47	(0.99, 2.18)
Yes	referent	
Monthly prescription costs		
$101+ per month	5.95	(3.13,11.33)
$51-100 per month	2.61	(1.37, 4.99)
$1-50 per month	1.59	(0.88, 2.89)
$0 per month	referent	

[a] Based on the modified 6-item USDA Household Food Security Survey Module classification

[b] Individuals classified as Asian, American Indian or Alaskan Native, Other, or Did Not Disclose by the Georgia Division of Aging Services client database system were classified as "Other" for analysis

[c] Participant county of residence according to the "Five Georgias" classification (91)

CHAPTER 4

CONCLUSION

The purpose of this study was to determine the relationship between food insecurity and CRN in a population of community-dwelling low-income older adults in Georgia. The goals of this study were 1) to characterize this community-dwelling low-income older adult population in terms of food insecurity and CRN status and 2) to determine the relationship between food insecurity and CRN after controlling for potential confounders. Our hypotheses were that 1) rates of food security and CRN are high in the study population relative to other populations and 2) food insecurity is predictive of CRN in the study population.

In accordance with our hypothesis, almost half (49.7%) of individuals in this study were food insecure. Previous studies of food security in a nationally representative sample of low-income older adults found rates of food insecurity to be slightly lower (approximately 30%) (28). The location and socioeconomic characteristics of out study population suggest that they are at greater risk for experiencing food insecurity. As well, the present study was conducted during a time of economic turmoil for the country. The state of the economy could potentially explain the markedly elevated levels of food insecurity in this study.

A high proportion (approximately 44.4%) of individuals in our study reported CRN-P. In a similar study of older adults from eight states, Safran and colleagues found that 19% to 41% poor older adults reported not being able to fill a prescription medicine in the past year because of the cost (19). The characteristics of our study population as well as the current state of the economy may have affected the rate of CRN-P in our study. As well, our comprehensive survey

tool was able to capture more behavioral aspects of CRN than many previous studies on this topic.

Our findings regarding demographic relationships with CRN were consistent with previous research on this subject (15, 18, 52, 93-95). Individuals who were younger, African-American, or female were more likely to report CRN-P. Also consistent with previous studies (94, 96, 97), medication-related variables such as prescription cost burden and prescription drug coverage were associated with greater likelihood of CRN-P. Certain demographic and prescription-related characteristics placed individuals in our study at significantly higher risk for food insecurity, CRN, and related health complications.

Study participants residing in urbanizing counties were approximately half as likely to report CRN-P as their counterparts residing in urban areas. Previous comparisons of CRN in rural and urban environments have found mixed results (15, 16, 96, 98). A variety of resources and other environmental factors, including availability of adequate transportation and healthcare, may affect propensity toward CRN-P (96). The resources available urbanizing counties in Georgia, in combination with a lower cost of living, may allow older adults residing in these areas to more easily adhere to medication regiments. The relationship between area of residence and CRN warrants further study.

Bivariate analyses indicated that more individuals who reported CRN-P had also been previously diagnosed with specific diet-related chronic illness. As found in previous studies (61, 80), many individuals in our study were struggling to attain the basic food and medication requirements that are essential for disease management. These individuals might be more likely to experience acute and expensive exacerbations of their conditions (21, 80). Research on the

health effects of combined CRN and food insecurity in populations of older adults with diet-related chronic illnesses is needed.

In accordance with our second hypothesis, food insecure individuals were 2.95 times more likely than food secure individuals to report CRN-P, even after controlling for potential confounders. Approximately one in four individuals in our study population is both food insecure and CRN-P. Many low-income older adults in Georgia are struggling to pay for food and medicine. Often, these older adults are suffering from one or more diet-related chronic illness and facing high cost prescription and dietary therapies. These older adults may be at risk for health and disease complications associated with food insecurity, CRN, or both (22, 80). Further research on the health consequences combine food insecurity and CRN are needed to determine whether there is a compounding effect of these two phenomena.

In conclusion, this study demonstrates the high prevalence of food insecurity and CRN in a community-dwelling low-income older adult population in the southeast US. Many study participants experienced the financial burden of multiple diet-related chronic conditions and some (approximately one out of four) were forced to choose between food and medicine in the month prior to survey completion. Title III of the Older Americans Act provides funds for nutritious meals to promote adequate nutritional intake (OAANP) and "medication management screening and education to prevent incorrect medication and adverse drug reactions" (75). Continued and increased funding for these programs and effective use and targeting of funds to older adults in greatest need is an important means of providing assistance to those who are unable to provide for themselves.

This study was completed during a time of economic crisis for the nation. It is likely that rates of food insecurity and CRN-P will continue to rise as the economy worsens. As the state of

the nation's economy continues to fluctuate, the need for prescription assistance and federal food assistance programs becomes increasingly important. Funding for food assistance programs has been indicated as an effective preventative measure (46). Monitoring resource related phenomena such as food security and CRN over time and making policy decisions to accommodate older individuals in need will be vital for the wellbeing of the older adult population and the nation as a whole.

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APPENDICES

APPENDIX A

POWER ANALYSIS

A power analysis conducted utilizing data from the Kushel study was used as a basis for sampling procedures. According to the Kushel study, 4.8% of those who were food secure and 14.9% of those who were food insecure exhibited CRN behaviors. Based on an alpha value of 5% and a power of 80%, a sample population of 600 subjects would be required to determine a statistically significant difference in CRN between the food secure and food insecure populations. The power analysis was conducted utilizing the DSS Researcher's Toolkit (DSS Research, 2006). Previous surveys administered by DAS to this population indicate that the typical response rate is 39-53%. Based on a conservative response rate of 40%, the minimum requirement for initial sample size would be 1500 subjects. Our initial and analytical samples both exceeded the minimum requirements for statistical power.

APPENDIX B

GEORGIA ADVANCED POMP-6 HDM PARTICIPANTS QUESTIONNAIRE

DHR
GEORGIA
DEPARTMENT OF
HUMAN RESOURCES

Home-Delivered Meals Participant Survey

L/0

*Please use a pencil or blue or black ink pen only and fill in answer circles completely.
*Erase completely if needed.
*Write comments only in the boxes provided.

CORRECT: ● INCORRECT: ⊘ ⊗ ◒ ◴

Office Use Only

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Health-Related Questions

1. Would you say that in **general** your **health** is . . .

(1) Excellent (2) Very Good (3) Good (4) Fair (5) Poor

2. Now thinking about your **physical health**, which includes physical illness and injury, for how many days during the past 30 days was your physical health not good?

_____

3. Now thinking about your **mental health**, which includes stress, depression, and problems with emotions, for how many days during the past 30 days was your mental health not good?

_____

4. During the past 30 days, for about how many days did poor physical or mental health keep you from doing your usual activities, such as self care, work or recreation?

_____

During the past 6 months, about how many different times did you stay ...

	Never	1-2 times	3-4 times	5 or more times
5. In the **hospital** overnight or longer?	(1)	(2)	(3)	(4)
6. In a **rehabilitation or nursing facility** (Example: for recovery after a surgery)?	(1)	(2)	(3)	(4)

See reverse side

7. During the past 6 months, about how many times did you see or talk to a **medical doctor or assistant**? (Do not count the doctors you saw while you were an overnight patient in a hospital or nursing home.)

(1) Never (2) 1-6 times (3) 7-11 times (4) 12 or more times

8. During the past 6 months, have you **unintentionally** lost 5 or more pounds?

(1) Yes (2) No

9. How would you describe your **appetite**?

(1) Excellent (2) Very Good (3) Good (4) Fair (5) Poor

10. Regarding your present social activities, do you feel you are doing about enough, too much, or would you like to be doing more?

(1) About enough (2) Too much (3) Would like to be doing more

11. How often do you get the social and emotional support you need from family members, friends, neighbors, etc? Would you say ...

(1) Always (2) Usually (3) Sometimes (4) Rarely (5) Never

12. In general, how satisfied are you with your life? Would you say ...

(1) Very satisfied (2) Satisfied (3) Dissatisfied (4) Very dissatisfied

Food Security Questions

These next questions are about the food eaten in your household in the last 30 days and whether you were able to afford the food you need.

13. During the last 30 days, how often was this statement true:
The food that we bought just didn't last, and we didn't have money to get more.

(1) Often (2) Sometimes (3) Never

14. During the last 30 days, how often was this statement true:
We couldn't afford to eat balanced meals.

(1) Often (2) Sometimes (3) Never

15. In the past 30 days, did you or other adults in your household ever cut the size of your meals because there wasn't enough money for food?

(1) Yes, on 3 or more days
(2) Yes, on 1 or 2 days
(3) No

16. In the past 30 days, did you or other adults in your household ever skip meals because there wasn't enough money for food?

(1) Yes, on 3 or more days
(2) Yes, on 1 or 2 days
(3) No

17. In the last 30 days, did you ever eat less than you felt you should because there wasn't enough money to buy food?
(1) Yes (2) No

18. In the last 30 days, were you ever hungry but didn't eat because you couldn't afford enough food?
(1) Yes (2) No

Food & Nutrition Risk Questions

The following statements are about your nutritional health. Please mark your responses ('Yes' or 'No').

19. I have an illness or condition that made me change the kind and/or amount of food I eat.
(1) Yes (2) No

20. I eat fewer than 2 meals per day.
(1) Yes (2) No

21. I eat few fruits or vegetables.
(1) Yes (2) No

22. I eat few dairy/milk products.
(1) Yes (2) No

23. I have 3 or more drinks of beer, liquor, or wine almost every day.
(1) Yes (2) No

24. I have tooth or mouth problems that make it hard for me to eat.
(1) Yes (2) No

25. I don't always have enough money to buy the food I need.
(1) Yes (2) No

26. I eat alone most of the time.
(1) Yes (2) No

27. I take 3 or more prescribed or over-the-counter drugs a day.
(1) Yes (2) No

28. Without meaning to, I have lost or gained 10 pounds in the last 6 months.
(1) Yes (2) No

29. I am not always physically able to shop, cook, and/or feed myself.
(1) Yes (2) No

30. Do you currently receive food stamps?
(1) Yes (2) No

Food & Nutrient Intake Questions

31. How many days each week do you receive Home Delivered Meals?

(1) 1 day (3) 3 days (5) 5 days (7) 7 days
(2) 2 days (4) 4 days (6) 6 days

32. How many meals do you usually eat each day, including Home Delivered Meals?

(1) 1 meal (3) 3 meals
(2) 2 meals (4) More than 3 meals

33. About how many meals do you eat alone in a day?

(1) None (4) 3 meals
(2) 1 meals (5) More than 3 meals
(3) 2 meals

34. Think about the Home Delivered Meals you get compared to all the other food you usually eat each day. **Please mark whether the meal you get from the Home Delivered Meals Program is**:

(1) Less than 1/3 of the food you usually eat each day
(2) About 1/3 of the food you usually eat each day
(3) About 1/2 of the food you usually eat each day
(4) More than 1/2 of the food you eat each day

35. Now think about the days when you don't get a Home Delivered Meal. Do you eat:

(1) About the same amount of food?
(2) More food?
(3) Less food?

Please answer the following questions about all the food you usually eat each day: ***0 servings also includes less than daily. Example: once a week/month/once in a while.***

36. How many servings of **fruit** do you usually eat each day?
(1 serving = 1 medium piece of fruit; 1/2 cup chopped, cooked or canned fruit; 1/4 cup dried fruit; or 1/2 cup juice.)

(1) 0 servings (4) 3 servings
(2) 1 serving (5) 4 servings
(3) 2 servings (6) 5 or more

37. When you eat the Home Delivered Meal, do you usually eat the **fruit** provided?

(1) Yes (2) No

38. How many servings of **potatoes** do you usually eat each day?
(1 serving = 1 small baked potato; 1/2 cup mashed or boiled potatoes; 10 French fries; or 1/2 cup hashbrowns)

(1) 0 servings (4) 3 servings
(2) 1 serving (5) 4 or more servings
(3) 2 servings

39. When you eat the Home Delivered Meal, do you usually eat the **potatoes** provided?

(1) Yes (2) No

40. Other than potatoes, how many servings of **vegetables** do you usually eat each day?
(1 serving = 1/2 cup cooked or chopped vegetables; 1 cup raw leafy vegetables; or 1/2 cup vegetable juice.)

(1) 0 servings
(2) 1 serving
(3) 2 servings
(4) 3 servings
(5) 4 servings
(6) 5 or more servings

41. When you eat the Home Delivered Meal, do you usually eat the **vegetables** provided?

(1) Yes (2) No

42. How many servings of **bread, cereal, rice, pasta, noodles, or tortillas** do you usually eat each day?
(1 serving = 1 piece of bread or a tortilla; 1 cup cold cereal; 1/2 cup of hot cereal; or 1/2 cup rice, pasta, or noodles.)

(1) 0 servings
(2) 1-2 servings
(3) 3-4 servings
(4) 5 servings
(5) 6 or more servings

43. When you eat the Home Delivered Meal, do you usually eat the **bread, cereal, rice, pasta, noodles, or tortillas** provided?

(1) Yes (2) No

44. How many servings of **milk, cheese, or yogurt** do you usually have each day?
(1 serving = 1 cup milk or yogurt; 1 $^{1/2}$ ounce natural cheese, such as cheddar; or 2 ounces processed cheese, such as American cheese.)

(1) 0 servings
(2) 1 serving
(3) 2 servings
(4) 3 or more servings

45. When you eat the Home Delivered Meal, do you usually eat the **milk, cheese, or yogurt** provided?

(1) Yes (2) No

46. How many servings of **meat such as beef, pork, chicken, fish, cold cuts and eggs** do you usually eat each day?
(1 serving = a 2-3 ounce chicken breast or fish fillet, hamburger patty, or 2 eggs.)

(1) 0 servings
(2) 1 serving
(3) 2 servings
(4) 3 servings
(5) 4 or more servings

47. When you eat the Home Delivered Meal, do you usually eat the **meat, chicken, fish, and eggs** provided?

(1) Yes (2) No

48. How many servings of **nuts, tofu, and beans** such as baked beans, pinto beans, kidney beans, lima beans, soybeans, or black-eyed peas do you usually eat each day?
(1 serving = 1/2 cup cooked beans or tofu; 2 tablespoons peanut butter; or 1/3 cup nuts.)

(1) 0 servings (2) 1 serving (3) 2 servings (4) 3 servings (5) 4 or more servings

49. When you eat the Home Delivered Meal, do you usually eat the **nuts, tofu, or beans** provided?

(1) Yes (2) No

50. Think about all the water or other nonalcoholic fluids you usually drink. How many cups or 8 oz. glasses do you usually drink per day?

(1) 0 cups (2) 1-4 cups (3) 5-7 cups (4) 8 or more cups

51. Do you take a multivitamin-mineral supplement (Examples: Centrum Silver or One-A-Day)?

(1) Yes (2) No

52. If yes, how many days a week do you take it?

(1) 1 day (2) 2 days (3) 3 days (4) 4 days (5) 5 days (6) 6 days (7) 7 days

53. Do you take a calcium supplement (Examples: Caltrate or Oscal)?

(1) Yes (2) No

54. If yes, how many days a week do you take it?

(1) 1 day (2) 2 days (3) 3 days (4) 4 days (5) 5 days (6) 6 days (7) 7 days

55. If yes, does the calcium supplement have Vitamin D?

(1) Yes (2) No

56. Do you take any other dietary supplements? (Examples: garlic pills, fish oil pills)

(1) Yes (2) No

57. If yes, how many do you take?

_____

Food Acquisition Questions

Read each statement below and mark whether this statement is true 'Most of the time', 'Sometimes' or 'Almost never' on days when you receive Home Delivered Meals.

	Most of the time	Sometimes	Almost never
58. I cook for myself.	(1)	(2)	(3)

Read each statement below and mark whether this statement is true 'Most of the time', 'Sometimes' or 'Almost never' on days when you receive Home Delivered Meals.

	Most of the time	Sometimes	Almost never
59. Family or friends provide me with meals.	1	2	3
60. I eat at restaurants.	1	2	3
61. I eat meals that are easy to fix like sandwiches, microwavable meals, or soup.	1	2	3
62. I eat meals that are ready to eat right out of the package.	1	2	3
63. I skip meals or eat less food.	1	2	3
64. I eat food saved from other meals.	1	2	3
65. I eat at a nutrition site.	1	2	3

66. Other, please explain.

_____

Think about the days when Home Delivered Meals are <u>not</u> delivered, like on weekends or holidays. Read each statement below and mark whether this statement is true 'Most of the time', 'Sometimes' or 'Almost never'.

	Most of the time	Sometimes	Almost never
67. I cook for myself.	1	2	3
68. Family or friends provide me with meals.	1	2	3
69. I eat meals that are easy to fix like sandwiches, microwavable meals, or soup.	1	2	3
70. I eat meals that are ready to eat right out of the package.	1	2	3

Think about the days when Home Delivered Meals are <u>not</u> delivered, like on weekends or holidays. Read each statement below and mark whether this statement is true 'Most of the time', 'Sometimes' or 'Almost never'.

	Most of the time	Sometimes	Almost never
71. I skip meals or eat less food.	1	2	3
72. I eat food saved from other meals.	1	2	3
73. I use the emergency packs they provide (Emergency packs are for days when delivery is cancelled due to inclement weather).	1	2	3

74. Other, please explain.

_____

The following statements are about the Home Delivered Meals Program. Please choose one of the following options: 'Yes, definitely', 'Yes, I think so', 'I'm not sure', 'No, I don't think so', 'No, definitely not', or 'Not applicable' (NA).

75. I eat a healthier variety of food.

1 Yes, definitely
2 Yes, I think so
3 I'm not sure
4 No, I don't think so
5 No, definitely not
NA NA

76. I am better able to follow the special diet prescribed by my doctor or dietitian.

1 Yes, definitely
2 Yes, I think so
3 I'm not sure
4 No, I don't think so
5 No, definitely not
NA NA

77. I eat less salt (sodium).

1 Yes, definitely
2 Yes, I think so
3 I'm not sure
4 No, I don't think so
5 No, definitely not
NA NA

78. I eat less high fat foods.

1 Yes, definitely
2 Yes, I think so
3 I'm not sure
4 No, I don't think so
5 No, definitely not
NA NA

79. I can achieve or maintain a healthy weight.

1 Yes, definitely
2 Yes, I think so
3 I'm not sure
4 No, I don't think so
5 No, definitely not
NA NA

80. I believe my health has improved and I feel better.

1 Yes, definitely
2 Yes, I think so
3 I'm not sure
4 No, I don't think so
5 No, definitely not
NA NA

The following statements are about the Home Delivered Meals Program. Please choose one of the following options: 'Yes, definitely', 'Yes, I think so', 'I'm not sure', 'No, I don't think so', 'No, definitely not', or 'Not applicable' (NA).

81. I am less hungry throughout the day.

(1) Yes, definitely (3) I'm not sure (5) No, definitely not
(2) Yes, I think so (4) No, I don't think so (NA) NA

82. I can continue to live in my own home.

(1) Yes, definitely (3) I'm not sure (5) No, definitely not
(2) Yes, I think so (4) No, I don't think so (NA) NA

The following is a list of services that may be offered through the Home Delivered Meals Program. Please mark:
'Yes' if you have received them
'No' if you have not received them
'NA' if the services are not available in your area
'Not Sure' if you are unsure whether or not you have received these services or if you are unsure if these services are available to you.

	Yes	No	Not sure	NA
83. Case management (Help to set up and coordinate any of the services offered with the meals program in your area)	(1)	(2)	(3)	(NA)
84. Legal help	(1)	(2)	(3)	(NA)
85. Nutrition counseling	(1)	(2)	(3)	(NA)
86. Transportation	(1)	(2)	(3)	(NA)
87. Help with shopping	(1)	(2)	(3)	(NA)
88. Help with personal care	(1)	(2)	(3)	(NA)
89. Help with housekeeping	(1)	(2)	(3)	(NA)
90. Help with cooking	(1)	(2)	(3)	(NA)
91. Help getting benefits like foods stamps and other public assistance	(1)	(2)	(3)	(NA)

See reverse side

92. Help paying for prescription drugs	Yes	No	Not sure	NA
	1	2	3	NA

93. Other, describe: _____

Health & Medication Management Questions

Has a doctor, nurse, or other health professional EVER told you that you had any of the following? Fill in the cirlce to answer 'Yes' or leave blank to answer 'No'.

	Yes
94. High blood pressure (Hypertension)	1
95. Heart attack (Myocardial Infarction)	1
96. Angina/coronary heart disease	1
97. Stroke	1
98. Arthritis, rheumatoid arthritis, gout, lupus, fibromyalgia	1
99. Diabetes	1
100. Osteoporosis*	1

**Osteoporosis is a condition where bones become brittle and break (fracture) more easily. It is not the same condition as osteoarthritis, a joint disease.*

101. How many different medications are **currently prescribed** for you?

1 None
2 1-2
3 3-4
4 5-6
5 7-10
6 11 or more

102. About how many different **over-the-counter medications (OTC)** (Examples: aspirin, Colace, ibuprofen) do you take every day?

_____

103. Do you have any health insurance that helps pay for prescription medications (Examples: Wellcare, AARP, Humana Gold Choice, Veteran's Tricare, Medicaid)?

1 Yes
2 No

104. **Not counting the costs paid by your insurance**, how much do your prescription medications cost you and your family each month? In other words, how much do you typically pay out-of-pocket per month for medications prescribed for you?

1. $0
2. $1 - $50 per month
3. $51 - $100 per month
4. $101 - $150 per month
5. $151 - $200 per month
6. $201 - $250 per month
7. $251 - $300 per month
8. Greater than $300 per month

Please read the following questions regarding your use of prescription medications. Mark the appropriate answer ('Yes' or 'No'). In the past 30 days ...

105. Have you ever **skipped doses** of a medicine because of the cost?
1. Yes
2. No

106. Have you ever **taken a smaller dose** of medicine than was prescribed by your doctor because of the cost (Example: cutting pills in half)?
1. Yes
2. No

107. Have you ever **delayed refills** of prescriptions because of the cost?
1. Yes
2. No

108. Have you ever **stopped taking medicines** because of the cost?
1. Yes
2. No

109. Have you ever **avoided new prescriptions** because of the cost?
1. Yes
2. No

110. Did you ever **take less effective prescription medications** than those initially prescribed by your doctor because of the cost?
1. Yes
2. No

111. Did you ever **switch to an over-the-counter alternative** to a prescription medication because of the cost?
1. Yes
2. No

Please answer the following questions about how you obtained your prescription medications. Mark the appropriate answer ('Yes' or 'No'). In the past 30 days ...

112. Did you ever **seek free samples** of a prescription medication because of the cost?
1. Yes
2. No

113. Did you ever **import** a prescribed medication (order from another country) because of the cost?
1. Yes
2. No

114. Were you ever **not able to purchase** a prescribed medication because of the cost?
1. Yes
2. No

See reverse side

Please answer the following questions about how you obtained your prescription medications. Mark the appropriate answer ('Yes' or 'No'). In the past 30 days ...

115. Have you ever **had to borrow money** from a relative or friend outside your household to pay for medications?

(1) Yes (2) No

116. Have you ever **had to increase credit debt** to pay for medications?

(1) Yes (2) No

117. Have you ever **spent less money on heat, electricity, clothing, household repairs and appliances, or other basic needs** so that you would have enough money to pay for your medications?

(1) Yes (2) No

118. Have you ever **had to choose between purchasing food or medications**?

(1) Yes (2) No

Demographics

119. What is your highest education level? Is it ...

(1) Less than a high school diploma
(2) A high school diploma
(3) Some college or an associate's degree
(4) A bachelor's degree
(5) Some post graduate work or advanced degree

120. Including yourself, how many people live in your household?

(1) 1 person (2) 2 people (3) 3 people (4) 4 people (5) 5 people (6) 6 people (7) 7 or more people

121. Thinking about the total combined income from all sources for all persons in this household, was your total household annual income during the year 2007 above or below $20,000?

(1) Below $20,000 (2) Above $20,000

122. What is your total household monthly income?

_____

Thank you for completing this survey!