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Understanding food-related hardships among older Americans: Evidence from the Panel Study of Income Dynamics

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Abstract

Using data from the Panel Study on Income Dynamics (PSID), this small grant conducted three studies designed to increase understanding of food-related hardships among older Americans. Study 1 found that persons who had a work limitation or were food insecure in midlife (ages 40-54) had significantly increased odds (OR: 2.20, $p<.05$ and OR: 4.23, $p<.01$, respectively) of living in a food insecure household at age 60 to 69, holding all else constant. Those who worked more during midlife had significantly reduced odds (OR: 0.26, $p<.01$) of living in a food insecure household in their 60s. Study 2 found that older adults who were currently living in a food secure household had higher odds of healthy aging at age 60 to 69. Having higher midlife income or more time employed in midlife was associated with increased odds of healthy aging, while having a work limitation or a limiting health condition in midlife was associated with lower odds of healthy aging. Study 3 used an instrumental variable approach to examine the probability of living in a food insecure household among households as their family units receive Social Security at retirement age. Study 3 found limited causal evidence that receipt of Social Security at retirement age is associated with an increased probability of living in a food secure household among the full population. These findings were robust to changes of the dependent variable or the endogenous variable but were sensitive to some of the expansions or contractions of the sample.

Executive Summary

Introduction. Using data from the Panel Study on Income Dynamics (PSID), this small grant conducted three studies designed to increase understanding of food-related hardships among older Americans. Studies 1 and 2 build off prior research on the association of midlife characteristics with aging outcomes. Prior aging-related research has identified associations between midlife factors such as employment participation, health, and marital history with economic wellbeing in later life. Study 1 uses multivariate methods to examine midlife (age 40-54) factors that are correlated with living in a food insecure household at age 60 to 69. Study 2 extends research on "healthy aging," a concept that has been used to measure relative levels of success in terms of health as people get older, by exploring whether there is a link between current and midlife experiences with food security and healthy aging. Study 3 addresses a separate issue, examining the association between receipt of Social Security benefits at retirement age and household food security status, using an instrumental variable approach.

Research Methods. For Studies 1 and 2, we use the longitudinal data of the PSID and logistic regressions to estimate the odds of our outcome variables for older adults (living in a food insecure household for Study 1 and healthy aging in Study 2), controlling for contemporaneous and midlife factors. Study 1 examines sociodemographic and contemporaneous characteristics associated with living in a food insecure household at age 60 to 69. Characteristics include age; race; sex; education; marital status; poverty status; urbanicity; family size; activities of daily living (ADL) (e.g. bathing, dressing, feeding), and instrumental activities of daily living (IADL) (e.g. housekeeping, shopping, preparing food) limitations; and any health conditions, as well as midlife characteristics (marital history, mean income in midlife, health insurance history, ever work-limited in midlife, employment history, any limiting health condition, and ever living in a food insecure household). Study 2 examines a similar set of sociodemographic, contemporaneous, and midlife characteristics while adding current food security status as a potential predictor.

For Study 3, we use repeated cross-sections of the PSID to estimate the likelihood of food security among older households. As our focal variable is Social Security income at retirement age, we employ an instrumental variable approach to address the endogeneity of household food security with the decision to receive Social Security. We control for age, educational attainment, sex, race, metropolitan residence, and whether anyone in the household has a limiting health condition.

Data. Each of the studies uses data from the Panel Study on Income Dynamics (PSID). The PSID is a nationally representative study which has tracked over 18,000 individuals living in 5,000 families since 1968. To our knowledge, the PSID is the only nationally representative panel survey that includes the full 18-item Household Food Security Module (HFSM), a supplement designed to measure overall household food security as well as different facets of food security. The PSID also gathers information on correlates of food insecurity (i.e. sociodemographic characteristics, health conditions, household structure, income, employment, and public program participation). All analyses were weighted to adjust for the complex survey design of the PSID.

For Study 1, we used several different samples. First, we used a cross-sectional sample from 2017 (n=3,003) that did not include any midlife measures. Next, we used a sample from 2017 that incorporates persons aged 60 to 69 with midlife history data (n=1,424). We ran additional analyses using a panel sample restricted to persons ages 60 and over with high school or lower levels of education (n=506). For Study 2, we used three different samples. First, we used a cross-sectional sample of adults age 60 to 69 in 2017 that did not include any midlife measures (n=3,000). Second, we used a panel sample of adults age 60 to 69 in 2017 which included midlife history data for that

population (n=1,424). We ran additional analyses using a panel sample restricted to persons age 60 to 69 living in households with low levels of education (n=506), defined as a household where the head of household has, at most, a high school education. For Study 3 we restricted our sample to male headed households ages 60 to 72 years old, including both a full sample (n=3,391) and a low education sample, defined as above (n=1,102).

Results. Study 1 finds that, holding all else constant, persons who had a work limitation or were food insecure in midlife have significantly increased odds of living in a food insecure household at age 60 to 69. Those who worked more during midlife have significantly reduced odds of living in a food insecure household in their 60s. In addition, adults age 60 to 69 who were not currently married or had a current ADL or IADL had an increased risk of living in a food insecure household. Study 2 observes that, controlling for other factors, currently living in a food secure household is associated with higher odds of healthy aging. Having higher midlife income or more time employed in midlife is associated with increased odds of healthy aging, while having a work limitation or a limiting health condition in midlife is associated with lower odds of healthy aging. Study 3 presents evidence that older male-headed households receiving any household Social Security income have a higher probability of living in a food secure household, holding all else constant (β=0.25, p<.05). Those with higher levels of education have higher probabilities and those who are single (as opposed to married) have lower probabilities of living in a food secure household (all p<.001).

Discussion. Study 1 confirms prior research on levels of food insecurity experienced by older adults, while also adding a new contribution by identifying midlife covariates to food insecurity among older adults. Importantly, more stable employment in midlife is associated with a lower risk of living in a food secure household later in life. We base this finding on two measures of midlife employment, a measure of midlife work limitation and a measure of midlife employment. . When work is limited in midlife, the ability to maintain adequate levels of nutrition may be reduced well into the future. Interventions to curb work limitations, including through workplace adjustments and accommodations, may reap benefits by ensuring access to adequate nutrition later in life.

Study 2 confirms prior research on midlife experiences related to healthy aging while also adding a new contribution by examining the relevance of food security to healthy aging outcomes at ages 60 to 69. Overall, 57 percent of all persons and 51 percent of persons with low levels of education met the criteria for healthy aging. Our finding that persons who were currently living in a food secure household are more likely to experience healthy aging adds to the literature on healthy aging and suggests avenues for further research to determine the exact nature of this relationship.

Study 3, in finding evidence that older households that receive Social Security income have an increased probability of living in a food secure household, suggests that this income may play an important role in ensuring that America's seniors have access to the food necessary to live a healthy, active life.

Conclusion. Each of the studies described above uses the PSID to add to the literature about correlates of food security for older Americans while also pointing out avenues for additional research to better understand how to improve food security for this population.

*Copies of each paper are attached (Papers 1 and 2 have not been revised. Paper 3 has been revised to address AEPP Editor and reviewer comments.)

Study 1: Midlife predictors of food-related hardships among older Americans: Evidence from the Panel Study on Income Dynamics

Abstract Using Panel Study in Income Dynamics (PSID) data, this study identifies midlife (ages 40-54) characteristics associated with risks of household food insecurity age 60 to 69. Holding all else constant, having a work limitation or being food insecure in midlife was associated with increased odds (OR: 2.20, $p<.05$ and OR: 4.23, $p<.01$, respectively) of household food insecurity in later life. Those who worked more during midlife had significantly reduced odds (OR: 0.26, $p<.01$) of household food insecurity in their 60s. Policy implications are discussed.

Introduction

Persons who lack consistent access to enough food for an active, healthy life are considered food insecure. In the United States (U.S.), 11.8 percent of households, or 15.0 million households, were food insecure at some point during 2017 (Coleman-Jensen et al. 2018). Rates of living in a food insecure household in the U.S. vary by the composition of households, with higher than average rates for households that include children (13.6 percent) and lower than average rates for households that include persons age 65 or older (7.2 percent) and the elderly living alone (8.7 percent)(Coleman-Jensen et al. 2020). The demographic composition of U.S. households is changing, with more than half of U.S. households now headed by someone age 50 or older (Joint Center for Housing Studies 2019). At the individual level, projections indicate that one in five Americans will be age 65 or older by 2030 (U.S. Census 2018). Understanding the risk for food insecurity among this growing older population is important as access to adequate nutrition has implications for healthy aging. Using unique longitudinal data, this paper aims to identify midlife predictors of food insecurity in older adulthood.

Living in a food insecure household is associated with poor health and well-being, thus compromising the ability to age well. Prior research has linked food insecurity with lower levels of health (e.g. higher cardiovascular risk factors (Seligman et al. 2010), higher rates of chronic disease

(Seligman et al. 2010), higher rates of obesity (Brewer et al. 2010), increased risk for physical and mental health conditions (Kim and Frongillo 2007; Klesges et al. 2001; Lee and Frongillo 2001; Nelson et al. 1998; Stuff et al. 2004; Ziliak et al. 2008), lower rates of cognitive functioning (Portela-Parra and Leung 2019), and poor self-reported health status (Lee and Frongillo 2001; Stuff et al. 2004; Ziliak et al. 2008). Poor management of diet-related conditions such as diabetes (Nelson et al. 1998; Seligman et al. 2010; Seligman and Schillinger 2010) and overall medication non-adherence (Sullivan et al. 2010) have been linked to food insecurity as well. Those who are food insecure also have poorer access to health care (Kushel et al. 2006), increased use of acute health care (Kushel et al 2006; Sullivan et al. 2010; Kersey et al. 1999; Kamik et al. 2011; Biros et al. 2005) and longer hospital stays (Torres 1996). This association between food insecurity and poor health arises as food insecurity may contribute to poor health (e.g. through poor nutrition) or as poor health may lead to food insecurity (e.g. an inability to travel outside the home to access nutritious food).

Current rates of food insecurity experienced in the past year among older Americans range from six to fourteen percent, depending on the data used and the lower-and upper-bound age specified (Brucker and Coleman-Jensen 2017; Brostow et al. 2017; Goldberg and Mawn 2015; Kregg-Byers 2014; Malani et al. 2020). Food insecurity is closely tied to poverty, and poverty is not rare among older Americans: in 2018, 9.9 percent of persons age 60 and older had family incomes below the official poverty line (U.S. Census 2020). In the U.S., low-income older persons waitlisted for federal rental assistance (either public housing or Housing Choice Vouchers) report high levels of food insecurity (Carder et al. 2016).

The purpose of this paper is to closely examine the correlates as well as the midlife factors associated with food insecurity in later life, providing opportunities for advocates, families, individuals, policymakers, and practitioners to identify ways to reduce or mitigate the development of food insecurity among American seniors.

Literature review

Much of the research on food insecurity among older adults has focused on finding contemporaneous correlates of food insecurity. Older adults with low levels of education have increased risks of living in food insecure households (Brewer et al., 2010; Brucker and Coleman-Jensen 2017; Kregg-Byers 2014; Lee and Frongillo 2001; Malani et al. 2020; Ziliak et al. 2008). Having low income, low educational attainment, and social isolation are significantly related to food insecurity for seniors as well (Lee and Frongillo 2001; Malani et al. 2020). The association of race with food insecurity is not quite as clear, with some researchers finding higher rates of food insecurity among older Hispanic persons but no differences in rates between blacks and whites (Goldberg and Mawn 2015) and others (Malani et al. 2020) finding comparable rates between older Hispanic and black adults and lower rates among whites.

Disability, health, and socioeconomic factors have been found to be associated with an increased risk of food insecurity. Among American adults age 60 and older, the presence of functional impairments, measured as limitations in performing activities of daily living (ADL) (e.g. bathing, dressing, eating, getting in or out of bed, toileting) and instrumental activities of daily living (IADL) (e.g. doing light housework, getting around by car or public transportation, preparing own meals, managing money), have been found to be associated with increased odds of living in a food insecure household (Lee and Frongillo 2001). The presence of functional, mobility and other physical limitations have been found to be positively associated with food insecurity (Bishop and Wang 2018; Brewer et al. 2010; Gunderson and Ziliak 2015), with some researchers noting that physical limitations may influence access to food even when income is sufficient to support nutritional needs (Himmelgreen and Romero-Daza 2010). Older adults with two or more chronic health conditions have been found to be at increased risk for food insecurity (Jih et al. 2018). Depression has been linked

to food insecurity among older adults in general (Goldbert and Mawn 2015) and among older veterans (Brostow et al. 2017; Want et al. 2015).

Using cross-sectional data from the National Health Interview Survey, Brucker and Coleman-Jensen (2017) found variation in estimated rates of living in a food insecure household for adults age 62 and older by disability status for a typical respondent. Whereas 1.7 percent of older adults without disabilities were predicted to live in a food insecure household, rates ranged from a low of 1.0 percent for those with only a hearing limitation to a high of 8.1 percent for those with only a mental health limitation among these older adults. Three percent of those reporting more than one type of disability were estimated to live in a food insecure household. Heflin et al. (2019) has found that American adults age 60 and older who have a current work limitation, trouble managing money, or memory loss or confusion have increased odds of living in a food insecure household (Heflin et al. 2019).

Family characteristics have been found to be associated with food insecurity for older adults as well. Brucker and Coleman-Jensen (2017) determined that older adults (age 63 and older) with children under age 18 in the home had increased odds of food insecurity, confirming prior research that has found that multigenerational families are struggling to provide adequate food resources for all family members (Do et al. 2015; Ziliak and Gunderson 2016). Older adults who have adult children or other family members as resources are likely to have lower rates of food insecurity (Wolfe et al. 1996). Family characteristics, such as marital status, are associated with rates of poverty and thus are likely tied to risk of food insecurity as well. Married adults have lower rates of poverty and single parents have higher rates of poverty, for example (Fox et al. 2015; Gibson-Davis 2016; Rothwell and McEwen 2017).

To examine whether social and environmental factors might be associated with risk for household food insecurity, geography can be examined (Tarasuk et al. 2019). Geography captures population characteristics, such as age, income, and ethnicity, as well as place-based contextual factors,

including the availability of nutrition assistance benefits, in-kind food assistance, or other social programs, neighborhood level characteristics such as housing availability and safety, and regional variation in tax policies. Schwartz et al. (2019) found geographic variation in vulnerability to household food insecurity for Canadian adults with mobility impairments, as persons living in some provinces within strong income assistance programs or poverty reduction programs experienced higher rates of household food insecurity.

What is lacking in the studies cited above, however, is research that spans the current aging and nutrition literatures to understand how characteristics and events which occur over the adult lifespan might be associated with later development of food insecurity. As Carr (2019, pg. 3) notes: "[A]s many later-life hardships are a consequence of adversities that have accumulated gradually throughout youth, adolescence, and the working years, the benefits provided by old-age policies may be 'too little too late' to meet the needs of the most disadvantaged Americans." A cumulative inequality perspective can be useful for understanding health and economic disparities in later life (Carr 2019; Crystal and Shea 1990; Ferraro and Shippee 2009).

Prior aging-related research has identified several midlife factors, including time spent living in poverty and time spent having a work limitation, to be inversely associated with healthy aging and longevity among older Americans (Jajtner et al. 2020). Others have explored the association of midlife factors with economic wellbeing in future years. Vartanian and McNamara (2002), using data from the Panel Survey on Income Dynamics (PSID) that spanned the years 1968-1997, found that workforce participation, income and rural residence at midlife were related to economic outcomes for women ages 60 and older. Hungerford (2007) used PSID data from 1968-1996 and determined that those who experienced chronic hardships such as income deprivation (family income below 150% of poverty and family income below 100% of poverty) or housing deprivation (being a renter or living in overcrowded housing) in middle age were statistically significantly more likely to experience adverse

old-age outcomes such as poverty, poor health, and owning few assets. Using data from the PSID, Shuey and Willson (2019) found that work disability in midlife is tied to early life disadvantage and economic insecurity later in life.

The purpose of this paper is to examine midlife factors that may be associated with food insecurity among Americans age 60 and older, controlling for other individual and contextual characteristics. Given the literature reviewed here, we hypothesize that several midlife factors such as health, health insurance coverage, marital status, poverty, and work limitations will be significantly associated with later risk for living in a food insecure household.

Methods

Data

The PSID is a nationally representative study which has tracked over 18,000 individuals living in 5,000 families since 1968. To our knowledge, the PSID is the only nationally representative panel survey that includes the full 18-item Household Food Security Module (HFSM), a supplement designed to measure overall household food security as well as different facets of food security. The PSID also gathers information on correlates of food insecurity (e.g., sociodemographic characteristics, health conditions, household structure, income, employment, and public program participation).

We use several different samples. First, we use a cross-sectional sample from 2017 (n=3,003) that does not include any midlife measures. Next, we use a sample from 2017 that incorporates persons aged 60 to 69 with midlife history data (n=1,424). We run additional analyses using a panel sample restricted to persons ages 60 and over with high school or lower levels of education (n=506). All analyses adjust for PSID complex survey design using 2017 cross-sectional weights.

Measures

Food security status measured in 2017 is our focal variable. In the PSID, food security is measured using the HFSM which includes 18 questions for households with children and a subset of 10 of those questions for households without children (Tiehen et al. 2018). The HFSM is included in the 1999, 2001, 2003, 2015, and 2017 waves of the main family file. In the 1999-2003 surveys, HFSM questions relate to the year prior to the survey. In the 2015 and 2017 surveys, the reference period is the prior 12 months (Tiehen, et al. 2018). While rates of food insecurity reported in the PSID are lower than those reported in the Current Population Survey, due to more stringent screeners in the PSID and higher levels of income among PSID households, the PSID identifies similar correlates of food security (e.g. being further above the poverty line is associated with lower rates of food insecurity; higher rates of education, being married, and being white are associated with lower rates of food insecurity) (Tiehen et al. 2018). Persons who are described as having high food security do not report any food access problems or limitations. Persons who report one or two concerns over accessing necessary food but report little or no indication of changes in diets or food intake are considered marginally food secure. Low food security equates with reduced quality and variety of diet but little or no indication of reduced food intake. Persons who report multiple indications of changes in eating patterns or reduced food intake are deemed to have very low food security (USDA 2019). For our study, we categorized food security into secure (high and marginal) and insecure (low and very low).

Covariates measured in 2017 included current age, disability, educational attainment, family size, health, marital status, urbanicity, poverty, race, and sex. Age, educational attainment, and family size were measured as interval variables. Disability was measured as the presence of a limitation in ADL (e.g. bathing, walking, feeding, dressing, toileting) or IADL (e.g. cooking, cleaning, managing finances, transportation). Current health status was measured as self-reported physician diagnosis of any chronic health condition (arthritis, asthma, hypertension, cancer, diabetes, heart disease/heart attack, chronic lung disease (i.e. bronchitis or emphysema), stroke or 'any emotional, nervous, or

psychiatric problems', 'permanent loss of memory or mental ability', or 'a learning disorder'). Marital status was measured nominally, as either married or not. Living in a metropolitan area was measured in a binary fashion, as either living in a metropolitan area or not. Current poverty status was measured as living in income poverty (below the U.S. poverty line) or not. The U.S. poverty guideline in 2017 for a family of four was $24,600 (U.S. DHHS 2019).

We examined midlife variables as well. A binary work limitation variable measured whether the respondent ever indicated that he or she experienced a work limitation (regardless of severity) between the ages of 40 and 54. ("Do you/does your) (Head/Wife/"Wife"/Spouse/Partner) have any physical or nervous condition that limits the type of work or the amount of work you can do?"). While this type of work limitation measure is commonly used within disability policy research as a determinant of labor force participation, it is important to note that responses to this question might reflect workplace barriers and limits in accommodating workers with disabilities as well as an inability to work among persons with disabilities, and that such a measure could be capturing a variety of situations in terms of disability severity and duration. Such a measure could be a marker of a temporary condition or a more permanent condition (i.e. since birth or disabilities acquired later in life). As an alternative to the midlife work limitation measure, we also specified a midlife employment variable (percent of midlife reports with employment).

A 'limiting health condition in midlife' variable was created using two steps. First, midlife health was measured in a binary fashion, incorporating measures of the presence of a condition and its severity. Presence of a condition was measured like the current health measure described above. Severity was measured next, based on responses to a question which gathered information about the impact of health conditions on normal daily activities ("How much does this condition limit your normal daily activities?", where responses included: 'a lot' (severe), 'somewhat' (moderate), 'just a little' (mild), 'not at all' (health condition present but no limitation)). These two measures were used to

create a binary midlife health measure where persons with any health condition that was limiting at any level were counted as having a 'limiting health condition.'

We include a measure of midlife food security. Our 'ever food insecure' variable measures whether a person ever lived in a household with low or very low food security during midlife.

Other midlife factors (health insurance coverage, marital status, and income) were measured as the percent of observations over midlife (age 40-55) with a certain characteristic. For this study, these midlife factors included the following: percent of observations with health insurance, percent of observations married, and mean income over midlife. Based on the structure of the PSID, marital status was measured a minimum of six times over midlife (between the ages of 40 to 54), as was income. Detailed health insurance coverage questions were introduced later in the PSID (1999) and therefore were measured at least three times over midlife.

Analytical approach

For all analyses, alpha was set to .05. Bivariate statistics are provided first, comparing older adults who are and who are not food insecure by current characteristics and midlife variables. A series of logistic regressions, with an aim of estimating the odds of living in a food insecure household at age 60 to 69, are run next. The same current covariates are included in all models as well as different mixes of possible midlife predictors, drawing from information collected when respondents were between the ages of 40-54 ("midlife").

IRB

As we used publicly available PSID data, we did not require IRB approval.

Limitations

Several limitations of this study must be noted. First, given the small sample sizes used for our analyses, results must be interpreted with caution. Next, the Food Security Module questions were designed to measure food insecurity due to financial resource constraints but do not specifically

measure food insecurity associated with other constraints common among older adults (e.g. mobility or transportation limitations) (Lee and Frongillo 2001; Wolfe et al. 2003). We also note that the PSID sample has slightly higher levels of education than the general U.S. population which may limit the generalizability of our results.

Results

Table 1 shows characteristics for our full panel sample (*n*=1,424) and our low-education sample (*n*=506), as well as significant differences by 2017 food security status for persons age 60 to 69. The lower bound for birth year is 1948 because only persons with valid midlife covariates of marriage, poverty, work limitations, and health insurance from ages 40-54 inclusive are included. Of these midlife covariates, health insurance presents the most binding constraint as it is only available from the 1999 survey onward. Additionally, health insurance status must be observed a minimum of three times in midlife for sample inclusion. Thus, the oldest individuals eligible for sample inclusion will observe health insurance status before age 55 in the 3rd wave (2003), after also having observed health insurance in 1999 and 2001, and these persons are born in 1948. This panel sample only includes those ages 60-69 because observing food security status for persons 60 and older in 2017 creates an upper bound on birth cohorts of 1957.

INSERT TABLE 1 HERE

For the full sample of 60 to 69-year old persons, 18 percent were minorities, 55 percent were female, and 68 percent were currently married. The mean years of schooling was 14.28, with 30 percent or respondents having low levels of education (high school or less). Mean family size was 1.93. Five percent were living in income poverty and eight percent had incomes of 130% of the official poverty line or less. Eighty-two percent lived in a metropolitan area. Seventy-six percent had at least one health condition, although only a small portion (11 percent) noted that their health condition severely limited

their activities in some way. Six percent were receiving SNAP and one percent were receiving free or reduced cost meals for seniors. Differences in sociodemographic characteristics by food security status are in the expected directions, with significantly more minorities, persons who are not married, persons with lower levels of education and income, and persons with limiting health conditions living in households which were food insecure. A higher proportion of those who were food insecure were receiving SNAP.

The low-education sample had higher proportions of minorities (28 percent) and females (59 percent), lower mean years of schooling (11), and a lower likelihood of living in metropolitan areas (73 percent) than the full sample. Mean family size was slightly higher (2.06). The percent with any health condition was higher (79 percent) as was the percent with a severely limiting condition (16 percent). Thirteen percent were receiving SNAP and two percent were receiving free or reduced cost meals for seniors. Within the low-education sample, no differences in food security were noted by mean years of schooling. Those living in food secure households at age 60 to 69 were more likely to be married and less likely to have health conditions, live in poverty, have low income, or participate in SNAP.

Table 2 shows our midlife covariate distributions by food security status for both the full sample and low education sample. Recall that midlife variables were measured between the ages of 40 and 54.

INSERT TABLE 2 HERE

On average, older adults age 60 to 69 had spent most of their midlives married (76 percent) and with health insurance (91 percent). The percent of midlife reports in poverty was less than 5 percent. Thirty-five percent of older adults had at least one instance of a work limitation during midlife. On average, older adults age 60 to 69 spent 13 percent of their midlife with a work limitation. Forty percent had at least one mention of a limiting health condition during midlife. Adults age 60 to

69 who were living in food insecure households spent larger proportions of their midlives in poverty, with work limitations or with limiting health conditions. Those who were married or covered by health insurance for more of their midlives were less likely to be food insecure.

The low-education sample had higher rates of midlife poverty (9 percent), lower levels of health insurance coverage (84 percent), higher rates of ever having at least one work limitation in midlife (41 percent), higher proportions of midlife in which the respondent had midlife work limitations (17 percent), and higher proportions with limiting health conditions (52 percent) compared to the full sample. Higher proportions of those living in food insecure households had histories of living in poverty, having a midlife work limitation, or having a limiting health condition.

Table 3 shows the results of our logistic regressions for the full sample, estimating the odds of living in a food insecure household at age 60 to 69.

INSERT TABLE 3 HERE

Model 1 is from a cross sectional sample and does not include any midlife covariates. Persons age 60 to 69 who were any race/ethnicity apart from non-Hispanic white (OR: 2.211, $p<.01$), living in poverty (OR: 3.15, $p<.001$), not currently married (OR: 3.66, $p<.001$), with larger family sizes (OR: 1.27, $p<.01$) or had an ADL or IADL limitation (OR: 2.55, $p<.001$) had significantly increased odds of living in a food insecure household, compared to their comparison groups and holding all other variables constant. Educational attainment had an inverse relationship with living in a food insecure household (OR: 0.86, $p<.001$). Sex, urban/rural status, and current health condition were not significantly associated with food insecurity.

Model 2 of Table 3 examines the same characteristics from the cross-sectional sample, adding in midlife covariates (marital status, mean income, health insurance, and any work limitation). Persons age 60 to 69 who were not currently married (OR: 4.84, $p<.01$), and persons who had any history of work limitation in midlife (OR: 2.51, $p<.05$) had increased odds of living in a food insecure household,

holding all else constant. Those with higher incomes had reduced odds of living in a food insecure household (OR: 0.633, $p<.01$).

Model 3 of Table 3 replaces the work limitation midlife variable with the percent of reports employed measure. Spending more time employed in midlife was associated with significantly reduced odds of living in a food insecure household at age 60 to 69 (OR: 0.211, $p<.01$). Being currently unmarried (OR: 4.99, $p<.01$) was associated with higher odds of food insecurity. Those with higher incomes in midlife (OR: 0.700, $p<.05$) and higher percentages of time covered by health insurance in midlife (OR: 0.326, $p<.05$) had reduced odds.

Model 4 of Table 3 replaces the work limitation variable with the limiting health condition variable. Having a limiting health condition in midlife was not associated with odds of living in a food insecure household at older ages, controlling for other factors. Being currently unmarried was associated with increased odds of living in a food insecure household (OR: 4.72, $p<.01$). Having higher mean income in midlife was associated with reduced odds of living in a food insecure household (OR: 0.633, $p<.01$).

Model 5 includes the midlife work limitation measure as well as the 'ever food insecure' midlife variable which indicates that a person had lived in a household with low or very low food security at some point during midlife. Those with a midlife work limitation (OR: 2.20, $p<.05$) and those who had lived in a food insecure household during midlife (OR: 4.23, $p<.01$) had increased odds of living in a food insecure household at age 60 to 69, holding all else constant. Being unmarried was associated with increased odds of living in a food insecure household (OR: 4.65, $p<.01$).

Model 6 includes the midlife employment and food security variables. Those spending more time employed in midlife had reduced odds of later food insecurity (OR: 0.26, $p<.01$), and those who had been food insecure during midlife had increased odds of living in a food insecure household at

age 60 to 69 (OR: 4.43, $p<.01$), controlling for other factors. Being currently unmarried was significantly associated with living in a food insecure household (OR: 5.23, $p<.01$).

Table 4 shows results from the low education sample ($n=506$).

INSERT TABLE 4 HERE

Model 1 includes the standard set of current covariates as well as our midlife marital, income, health insurance and work limitation variables. Having a work limitation in midlife was significantly associated with increased odds (OR: 4.99, $p<.05$) of living in a food insecure household at age 60 to 69, holding all else constant. Being unmarried (OR: 4.30, $p<.05$) was associated with significantly increased odds of living in a food insecure household.

In Model 2, the employment variable replaces the work limitation variable. Midlife employment was not associated with increased odds of living in a food insecure household at age 60 to 69 for this low education subpopulation. Model 3 replaces the midlife work limitation variable with the midlife limiting health condition variable. Currently living in poverty was associated with increased the odds of living in a food insecure household (OR: 4.06, $p<.05$). Midlife health condition was not significantly associated with living in a food insecure household at age 60 to 69. Model 4 includes both the work limitation midlife variable and the midlife 'ever food insecure' variables. In this model, the work limitation variable is no longer significant. Persons with low levels of education who were ever food insecure in midlife had increased odds of food insecurity at older ages (OR: 10.98, $p<.01$)

Discussion

The findings presented here corroborate prior research on levels of food insecurity experienced by older adults while also adding a new contribution on midlife predictors of food insecurity among older adults. Among the full sample, adults age 60 to 69 who were not currently married had significantly increased odds of living in a food insecure household. In addition, those with a current ADL or IADL limitation had an increased risk of living in a food insecure household. These

factors match those reported by others as increasing the risk for food insecurity (Bishop and Wang 2018; Brucker and Coleman-Jensen 2017; Brewer et al. 2010; Gunderson and Ziliak 2015; Lee and Frogillo 2010).

More stable employment in midlife was associated with a lower risk of living in a food secure household later in life. We base this finding on two measures of midlife employment, a measure of midlife work limitation and a measure of time spent employed. The association of midlife work limitation with later food insecurity concurs with recent PSID research which has found that midlife work limitations are associated with later life economic insecurity (Shuey and Willson 2019) and points to a need to consider the long-term effects of work limitations on specific consequences of economic instability such as food insecurity. When work is limited in midlife, the ability to maintain adequate levels of nutrition may be reduced well into the future. Interventions to curb work limitations, including through workplace adjustments and accommodations, may reap benefits by ensuring access to adequate nutrition later in life.

Mean income in midlife was associated with later risk for living in a food insecure household. Being food insecure in midlife was associated with later risk for food insecurity, suggesting that struggles to be food secure are persistent for some individuals and families.

One of our models for the general population indicated that having more consistent health insurance coverage in midlife was associated with lower odds of living in a food insecure household at later ages. The provision of health insurance during the prime working years (ages 40-54) may help to protect employment, income and expenses, which perhaps reaps benefits later in life and reduces the likelihood of facing challenges in accessing the food necessary for a healthy and active life. Policymakers interested in reducing food insecurity for seniors should consider the affordable and consistent availability of health insurance for working-age adults. This contrasts with the findings for the low-income sample, however, where more coverage by Medicaid in midlife was associated with

increased risk of living in a food insecure household. In 2010, as part of the Affordable Care Act, Medicaid was expanded to cover persons with incomes up to 138 percent of the federal poverty level, including persons without children. As the expansion of Medicaid is optional for states, expansion has been uneven across the country (Rudowitz et al. 2019). Future research can disentangle whether a measure such as Medicaid coverage at midlife points to geographic differences not included in our analyses or whether such coverage is identifying persons with particular characteristics (lower overall levels of income, more severe health needs or other characteristics) which increase later risk for living in a food insecure household.

The U.S. Department of Health and Human Services' Administration on Community Living, which provides nutrition services to seniors as authorized by the Older Americans Act, can use the information on contemporaneous correlates of food insecurity to guide service delivery to older adults. During federal fiscal year 2018, Title III of the Older Americans Act allocated $484.7 million to area agencies on aging for congregate meals and services (GAO, 2019). Area agencies on aging are public or non-profit entities that plan and deliver home and community-based services and supports to older adults. Highlighting the importance of targeting outreach to those who are not married, for example, can ensure that these agencies are assisting those most at risk for food insecurity. Non-profit organizations that address hunger in America (e.g. Feeding America, Meals on Wheels, etc.) can also benefit from the information provided here. The current coronavirus crisis may be restricting access to food, particularly among seniors. Older adults may face challenges getting to store or redeeming their SNAP benefits, for example. Future research and surveillance efforts should closely monitor food access and food insecurity among this population.

Sharing information with at-risk groups during midlife about available nutrition assistance programs might help to ensure appropriate uptake of these services as people age. Our analyses indicated that midlife food insecurity was associated with later life food insecurity. Take up of SNAP

by the elderly is relatively low. In 2017, 48 percent of eligible elderly (age 60 and older) enrolled in SNAP compared to 84 percent of eligible individuals overall. The participation rate of older persons who were living with others was lower (29%) compared to those living alone (62%) (Vigil 2019). Levin et al. (2020), in reviewing five demonstration projects and waivers designed to increase the participation of seniors in SNAP (Elderly Simplified Application Project, Combined Application Project, Standard Medical Deduction, Elderly and Disabled Recertification Interview Waiver, and 36-Month Certification Demonstration) found that any intervention designed to increase older people's access that are implemented with high fidelity and consistency have positive effects on SNAP caseloads, new applications and rates of churning (Levin et al 2020). The authors recommend that application processes be simplified, certification periods be extended, eliminating recertification interviews and interim income reporting requirements and combining the SNAP and SSI application processes (Levin et al. 2020). While decreasing the complexity of applying for SNAP has been suggested as one approach to improving participation rates among this population, providing information to persons in midlife about the importance of these benefits as they age could also increase later enrollment.

Conclusion

This study highlights ties between midlife experiences and the risk of living in a food insecure household at older ages. Holding all else constant, persons who had a work limitation or who had been food insecure in midlife have significantly increased odds of living in a food insecure household at age 60 to 69.

Bibliography

Biros, M.H., Hoffman, P.L, and Resch, K. (2005). The prevalence and perceived health consequences of hunger in emergency department patient populations. *Academy of Emergency Medicine*, 12:310–7.

Bishop, N. and Wang, K. (2018). Food insecurity, comorbidity, and mobility limitations among older U.S. adults: Findings from the Health and Retirement Study and Health Care and Nutrition Study. *Preventive Medicine*, 114, 180-187.

Brewer, D.P, Catletter, C.S., Porter, K.N., Lee, J.S., Hausman, D.B., Reddy, S. and Johnson, M.A. (2010). Physical limitations contribute to food insecurity and the food insecurity-obesity paradox in older adults at senior centers in Georgia. *Journal of Nutrition for the Elderly*, *29*(2), 150-169.

Brostow, D.P., Gunzburger, E., and Thomas, K.S. (2017). Food insecurity among veterans: Findings from the Health and Retirement Study. *The Journal of Nutrition, Health and Aging*, 21, 10, 1358-1364.

Brucker, D.L. and Coleman-Jensen, A. (2017). Food insecurity across the adult life span for persons with disabilities. *Journal of Disability Policy Studies*, 28, 2, 109-118.

Carder, P., Luhr, G., and Kohon, J. (2016). Differential health and social needs of older adults waitlisted for public housing or Housing Choice Vouchers. *Journal of Aging and Social Policy*, 28:4, 246-260. doi: 10.1080/08959420.2016.1156507

Carr, D. (2019). *Golden years? Social inequality in later life.* New York: Russell Sage Foundation.

Coleman-Jensen, Alisha, Matthew P. Rabbitt, Christian A. Gregory, and Anita Singh. 2020. Household Food Security in the United States in 2019, ERR-275, U.S. Department of Agriculture, Economic Research Service.

Crystal, S. and Shea, D. (1990). Cumulative advantage, cumulative disadvantage, and inequality among elderly people. *Gerontologist*, 30, 4, 437-443.

Do, D., Rodgers, R., and Drew, J. A. R. (2015). Multigenerational families and food insecurity in the United States, 1998-2013. University of Minnesota.
www.ihis.us/ihis/resources/IHIS_Data_Brief_No_1.pdf

Ferraro, K.F. and Shippee, T.P. (2009). Aging and cumulative inequality: How does inequality get under the skin? *The Gerontologist, 49,* 333-343. doi: 10.1093/geront/gnp034.

Fox, L., Wimer, C., Garfinkel, I. Kaushal, N. Nam, I, and Waldfogel, J. (2015). Trends in deep poverty from 1968 to 2011: Influence on family structure, employment patterns, and the safety net. RSF: The Russell Sage Foundation Journal of the Social Sciences, 1, 1, 14-34. doi: 10. 7758/RSF.2015.1.1.02.

Gibson-Davis, C. (2016). Single and co-habiting parents and poverty. In D. Brady and L. Burton (Eds.), *The Oxford handbook of poverty and society.* (pp. 417-437). Oxford, England: Oxford University Press.

Goldberg, S.L. and Mawn, B.E. (2014). Predictors of food insecurity among older adults in the United States. *Public Health Nursing*, 32, 5, 397-407.

Government Accountability Office (GAO). (2019). Older Americans Act: HHS could help rural service providers by centralizing information on promising practices. GAO-19-330. Washington, DC: GAO.

Gunderson, C. and Ziliak, J.P. (2015). Food insecurity and health outcomes. *Health Affairs*, 34, 11, 1830-1839.

Heflin, C.M., Altman, C.E. and Rodriquez, L.L. (2019). Food insecurity and disability in the United States. *Disability and Health Journal* 12, 220-226 doi: 10.1016/j.dhjo.2018.09.006.

Himmelgreen, D.A., and Romero-Daza, N. (2010). Eliminating 'hunger' in the U.S.: Changes in policy regarding the measurement of food security. *Food and Foodways: History and Culture of Human Nourishment*, 18, ½, 96-113. doi: 10.1080/07409711003708611.

Hungerford, T.L. (2007). The persistence of hardship over the life course. *Research on Aging*, 29, 6, 491-511. doi: 10.1177/0164027507305736.
Jajtner, K., Brucker, D.L. and Mitra, S. (2020). Midlife work limitations are associated with poor aging outcomes. Working paper.

Jih, J., Stijacic-Cenzer, I., Seligman, H.K., Boscardin, W.J., Nguyen, T.T. and Ritchie, C.S. (2018). Chronic disease burden predicts food insecurity among older adults. *Public Health Nutrition*, 21, 9, 1737-1742.

Joint Center for Housing Studies. (2019). Housing America's older adults 2018. Cambridge, MA: Harvard University, Joint Center for Housing Studies. Available: https://www.jchs.harvard.edu/sites/default/files/Harvard_JCHS_Housing_Americas_Older_Adults_2018_1.pdf

Kersey MA, Beran MS, McGovern PG, Biros MH, and Lurie N. (1999). The prevalence and effects of hunger in an emergency department patient population. *Academy of Emergency Medicine,* 6:1109–14.

Kim K, and Frongillo EA. (2007). Participation in food assistance programs modifies the relation of food insecurity with weight and depression in elders. *Journal of Nutrition*, 137:1005–10.

Klesges LM, Pahor M, Shorr RI, Wan JY, Williamson JD, and Guralnik JM. (2001). Financial difficulty in acquiring food among elderly disabled women: Results from the Women's Health and Aging Study. *American Journal of Public Health*, 91:68–75.

Kregg-Byers, C.M. (2014). Predictors of food security status in older adults living in the Northeast United States. Pittsburgh, PA: University of Pittsburgh. Dissertation. https://drive.google.com/drive/folders/1kZkKd29pAN1o2auaMa8TOZ4L5tKSYxmf

Kushel MB, Gupta R, Gee L, and Haas JS. (2006). Housing instability and food insecurity as barriers to health care among low-income Americans. *Journal of General Internal Medicine*, 21:71–7.

Lee, J.S. and Frongillo Jr., E.A. (2001). Factors associated with food insecurity among U.S. elderly persons: Importance of functional impairments. *The Journals of Gerontology Series B: Psychological Sciences and Social Sciences* 56 (2): S94–99. doi: 10.1093/geronb/56.2.S94.

Levin, M., Negoita, M., Goger, A., Paprocki, A., Gutierrez, I., Sarver, M., Kauff, J., Dragoset, L., Baxter, C., Makowsky, L., and Brown, E. (2020). Evaluation of alternatives to improve elderly access to SNAP. https://fns-prod.azureedge.net/sites/default/files/resource-files/AlternativesImproveElderlyAccess.pdf.

Malani, P., Kullgreen, J., Solway, E., Leung, C., Wolfson, J., Singer, D., and Kirch, M. (2020). National Poll on Healthy Aging – How food insecurity affects older adults. Ann Arbor, MI: University of Michigan.

Mitra, S., Brucker, D.L. and Jajtner, K. (2020). Wellbeing at older ages: an inclusive and multidimensional measure. *Disability and Health*. https://doi.org/10.1016/j.dhjo.2020.100926.

Nelson K, Brown ME, and Lurie N. (1998). Hunger in an adult patient population. *JAMA*. 279,1211–4.

Portela-Parra, E.T. and Leung, C.W. (2019). Food insecurity if associated with lower cognitive functioning in a national sample of older adults. *The Journal of Nutrition*, 149, 10, 1812-1817. Doi: org.unh.idm.oclc.org/10.1093/jn/nxz120.

Rothwell, D. W. and McEwen, A. (2017). Comparing child poverty risk by family structure during the 2008 recession. *Journal of Marriage and Family*, 79, 1224-1240. doi: 10.1111/jomf.12421.

Rudowitz, R., Garfield, R. and Hinton, E. (2019). 10 things to know about Medicaid: Setting the facts straight. Kaiser Family Foundation. Available: https://www.kff.org/medicaid/issue-brief/10-things-to-know-about-medicaid-setting-the-facts-straight/.

Schwartz, N., Tarasuk, V., Buliung, R., and Wilson, K. (2019). Mobility impairments and geographic variation in vulnerability to household food insecurity. *Social Science and Medicine*, doi: 10.1016/j.socscimed.2019.112636.

Seligman HK, and Schillinger D. (2010). Hunger and socioeconomic disparities in chronic disease. *New England Journal of Medicine*., 363:6–9.

Seligman HK, Laraia BA, and Kushel MB. (2010). Food insecurity is associated with chronic disease among low-income NHANES participants. *Journal of Nutrition*, 140:304–10.

Seligman HK, Davis TC, Schillinger D, and Wolf MS. (2010). Food insecurity is associated with hypoglycemia and poor diabetes self-management in a low-income sample with diabetes. *J Health Care Poor Underserved*, 21:1227–33.

Shuey, K.M. and Willson, A.E. (2019). Trajectories of work disability and economic insecurity approaching retirement. *Journals of Gerontology: Social Science, 74,* 7, 1200-1210.

Stuff JE, Casey PH, Szeto KL, Gossett JM, Robbins JM, Simpson PM, Connell C, and Bogle ML. (2004). Household food insecurity is associated with adult health status. *Journal of Nutrition*, 134:2330–5.

Sullivan AF, Clark S, Pallin DJ, Camargo CA Jr. (2010). Food security, health, and medication expenditures of emergency department patients. *Journal of Emergency Medicine,* 38:524–8.

Tarasuk V., St-Germain, A.A.F., and Mitchell, A. (2019). Geographic and socio-demographic predictors of household food insecurity in Canada, 2011-2012. *BMC Public Health*, 19(1), 12. doi: 10.1186/s12889-018-6344-2.

Tiehen, L., Vaughn, C., and Ziliak, J.P. (2018). Food insecurity in the PSID: A comparison with the levels, trends, determinants, and correlates in the CPS 1999-2017. Paper presented at APPAM, November 2018.

Torres-Gil FM. (1996). Malnutrition and hunger in the elderly. *Nutrition Review*, 54, S7–8.

U.S. Department of Agriculture (USDA). (2019). Definitions of food security. Washington, DC: USDA. Available: https://www.ers.usda.gov/topics/food-nutrition-assistance/food-security-in-the-us/definitions-of-food-security.aspx.

U.S. Census. (2018). Older people projected to outnumber children for first time in U.S. history. Washington, DC: U.S. Census. Available: https://www.census.gov/newsroom/press-releases/2018/cb18-41-population-projections.html.

U.S. Census. (2020). Poverty status in the past 12 months: 2018. American Community Survey one-year estimates, Table S1701. Washington, DC: U.S. Census.

U.S. Department of Health and Human Services. (2019). 2017 poverty guidelines. Washington, DC: U.S. DHHS, Office of the Assistant Secretary for Planning and Evaluation. Available: https://aspe.hhs.gov/2017-poverty-guidelines.

Vartanian, T.P. and McNamara, J.M. (2002). Older women in poverty: The impact of midlife factors. *Journal of Marriage and Family*, 64, 532-548.

Vigil, A. (2019). Trends in Supplemental Nutrition Assistance Program participation rates: Fiscal year 2010 to fiscal year 2017. Washington, DC: USDA. Available: b

Wolfe, W.S., Olson, C.M., Kendall, A. and Frongillo, E.A. (1996). Understanding food insecurity in the elderly: A conceptual framework. *Journal of Nutrition Education*, *28*(2), 92-100.

Wolfe, W.S., Frongillo, E.A., and Valois, P. (2003). Understanding the experience of food insecurity by elders suggests ways to improve its measurement. *Journal of Nutrition, 133* (March), 2762-2769.

Ziliak, J. and Gunderson, C. (2016). Multigenerational families and food insecurity. *Southern Economic Journal*, *82*, 1147-1166.

Ziliak, J. and Gunderson, C. (2017). *The health consequences of senior hunger in the United States: Evidence from the 1999-2014 NHANES*. Report submitted to Feeding America.

Ziliak, J. and Gunderson C. (2019). Hunger among adults age 50-59 in 2017. Washington, DC: Feeding America. Available: https://www.feedingamerica.org/sites/default/files/2019-05/hunger-among-adults-50-59_full-report.pdf.

Ziliak J, Gundersen, C., and Haist, M. (2008). The causes, consequences, and future of senior hunger in America [cited 2012 Feb 20]. Lexington, KY: University of Kentucky, Center for Poverty Research. Available from: http://216.235.203.153/Document.Doc?id=13.

Table 1

Panel sample's descriptive statistics of contemporaneous experiences (by 2017 food security status), PSID

	Full sample				Low education			
	All	FS	FI	Sig.	All	FS	FI	Sig.
	%	%	%		%	%	%	
	(s.e.)	(s.e.)	(s.e.)		(s.e.)	(s.e.)	(s.e.)	
Food Insecure	0.0490				0.0839			
	(.009)				(0.016)			
Age 60 - 64	0.473	0.468	0.584		0.509	0.493	0.678	
	(0.020)	(0.019)	(0.103)		(0.036)	(0.035)	(0.106)	
Age 65 - 69	0.527	0.532	0.416		0.491	0.507	0.322	
	(0.020)	(0.019)	(0.103)		(0.036)	(0.035)	(0.106)	
Minority	0.180	0.170	0.373	*	0.279	0.258	0.503	*
	(0.017)	(0.017)	(0.077)		(0.033)	(0.034)	(0.110)	
Female	0.551	0.546	0.655		0.588	0.577	0.714	
	(0.016)	(0.017)	(0.067)		(0.028)	(0.028)	(0.083)	
Years of Schooling (mean)	14.28	14.37	12.530	***	11.40	11.50	10.270	
	(0.097)	(0.097)	(0.499)		(0.120)	(0.129)	(0.590)	
< High School	0.0469	0.0406	0.169	*	0.158	0.142	0.332	
	(0.008)	(0.008)	(0.058)		(0.025)	(0.025)	(0.102)	
High School/GED	0.250	0.245	0.339		0.842	0.858	0.668	
	(0.013)	(0.013)	(0.067)		(0.025)	(0.025)	(0.102)	
Some College	0.282	0.280	0.317					
	(0.013)	(0.015)	(0.080)					
4+ yrs College	0.421	0.434	0.175	***				
	(.081)	(.060)	(.487)					

Married	0.681	0.706	0.195	***	0.658	0.701	0.198	***
	(0.022)	(0.020)	(0.064)		(0.032)	(0.032)	(0.074)	
In Income Poverty	0.0522	0.0379	0.329	***	0.107	0.0704	0.505	**
	(0.009)	(0.008)	(0.071)		(0.021)	(0.018)	(0.130)	
Low-Income (130% poverty or less)	0.081	0.060	0.487	***	0.152	0.105	0.666	***
	(0.011)	(0.009)	(0.076)		(0.022)	(0.019)	(0.098)	
Metropolitan Area	0.816	0.821	0.726		0.726	0.735	0.627	
	(0.021)	(0.022)	(0.066)		(0.038)	(0.042)	(0.120)	
Family size (mean)	1.930	1.945	1.648		2.055	2.073	1.858	
	(0.032)	(0.032)	(0.160)		(0.071)	(0.073)	(0.247)	
% Any Health Condition	0.757	0.748	0.923	***	0.788	0.775	0.930	**
	(0.013)	(0.014)	(0.034)		(0.025)	(0.026)	(0.041)	
% No/Mild Limiting Health Condition	0.511	0.521	0.312	**	0.467	0.488	0.237	*
	(0.017)	(0.016)	(0.079)		(0.032)	(0.032)	(0.099)	
% Moderate Limiting Health Condition	0.134	0.131	0.190		0.160	0.147	0.305	
	(0.011)	(0.012)	(0.059)		(0.018)	(0.019)	(0.104)	
% Severe Limiting Health Condition	0.112	0.0963	0.422	***	0.161	0.140	0.389	**
	(0.012)	(0.011)	(0.075)		(0.026)	(0.028)	(0.086)	
SNAP Participation	0.0613	0.0404	0.467	***	0.133	0.0865	0.643	***
	(0.009)	(0.007)	(0.077)		(0.018)	(0.016)	(0.086)	
Free/Reduced Cost Meals for Seniors	0.0109	0.0101	0.028		0.0185	0.0152	0.054	
	(0.004)	(0.004)	(0.025)		(0.009)	(0.008)	(0.047)	
Observations	1424	1322	80		506	457	49	

Source: Authors' calculations using PSID data.

Notes: Food secure includes marginally food secure. Food security and all other variables are measured in 2017.

*$p < 0.05$, ** $p < 0.01$,
***$p < 0.001$

FS= food secure; FI=food insecure; s.e.= standard error

Table 2

Food security status by midlife factors, PSID

	Full Sample				Low Education sample			
	All	FS	FI	Sig.	All	FS	FI	Sig.
	%	%	%		%	%	%	
	(s.e.)	(s.e.)	(s.e.)		(s.e.)	(s.e.)	(s.e.)	
Marital History (% years married)	0.759	0.775	0.442	***	0.754	0.783	0.441	***
	(0.019)	(0.018)	(0.070)		(0.029)	(0.028)	(0.074)	
Poverty History (% years in income poverty)	0.045	0.035	0.250	***	0.086	0.0583	0.383	***
	(0.005)	(0.004)	(0.049)		(0.009)	(0.007)	(0.078)	
Health Insurance History (% time insured)	0.912	0.923	0.693	***	0.841	0.865	0.579	**
	(0.008)	(0.007)	(0.059)		(0.016)	(0.015)	(0.085)	
Ever Work Limited	0.346	0.326	0.725	***	0.414	0.375	0.836	***
	(0.016)	(0.014)	(0.062)		(0.034)	(0.032)	(0.074)	
Work limitation (% waves with work limitation)	0.134	0.120	0.409	***	0.172	0.147	0.444	***
	(0.009)	(0.008)	(0.058)		(0.019)	(0.018)	(0.057)	
Ever Limiting Health Condition	0.404	0.387	0.743		0.519	0.491	0.828	***
	(0.016)	(0.015)	(0.062)		(0.034)	(0.036)	(0.075)	
Observations	1424	1344	80		506	457	49	

Source: Authors' calculations using PSID data.
Notes: Food secure includes marginally food secure. Food security and all other variables are measured in 2017.
*$p < 0.05$, ** $p < 0.01$, ***$p < 0.001$

FS= food secure; FI=food insecure; s.e.= standard error

Table 3

Odds of living in a food insecure household at age 60 to 69, PSID full sample

	(1)	(2)	(3)	(4)	(5)	(6)
	Xsection	Main Panel	Main Panel	Main Panel	Main Panel	Main Panel
Year food security observed:	2017	2017	2017	2017	2017	2017
	OR	OR	OR	OR	OR	OR
	(s.e.)	(s.e.)	(s.e.)	(s.e.)	(s.e.)	(s.e.)
1948-1952 birth cohorts	0.714	0.615	0.655	0.696	0.595	0.690
	(0.209)	(0.238)	(0.267)	(0.284)	(0.228)	(.283)
1943-1947 birth cohorts	0.550					
	(0.204)					
1938-1942 birth cohorts	0.502					
	(0.183)					
Birth cohorts before 1938	0.128***					
	(0.0735)					
Minority	2.211**	1.050	0.989	1.033	0.768	0.803
	(0.595)	(0.460)	(0.453)	(0.445)	(0.334)	(0.382)
Female	1.077	1.322	1.088	1.132	0.995	0.903
	(0.180)	(0.407)	(0.379)	(0.361)	(0.368)	(.360)

Years of schooling	0.861***	0.982	0.998	0.977	0.983	1.007
	(0.029)	(0.078)	(0.082)	(0.080)	(0.0775)	(0.079)
Current Characteristics						
Not married	3.658***	4.843**	4.993**	4.717**	4.645**	5.229**
	(1.085)	(2.374)	(2.335)	(2.296)	(2.422)	(2.564)
In poverty	3.145***	1.875	1.745	1.995	2.198+	1.952
	(0.797)	(0.845)	(0.877)	(0.898)	(1.016)	(1.026)
Non-metropolitan area	1.104	1.207	1.238	1.130	1.164	1.149
	(0.261)	(0.407)	(0.468)	(0.385)	(0.410)	(0.437)
Family size	1.266**	1.109	1.126	1.105	1.076	1.085
	(0.105)	(0.153)	(0.137)	(0.154)	(0.150)	(0.149)
ADL or IADL limitation	2.547***	1.480	1.528	1.623	1.230	1.231
	(0.538)	(0.609)	(0.673)	(0.590)	(0.524)	(0.540)
Any health condition (HC)	1.516	1.341	1.693	1.515	1.361	1.74
	(0.469)	(0.943)	(1.146)	(1.097)	(0.887)	(1.115)
Midlife Characteristics						
Marital history (% reports married)		1.296	1.231	1.309	1.188	1.444
		(0.730)	(0.711)	(0.765)	(0.720)	(0.862)
Income history (mean income)		0.633**	0.700*	0.633**	0.734	0.782
		(0.107)	(0.112)	(0.107)	(0.118)	(0.129)
Health insurance history (% time insured)		0.505	0.326*	0.439	0.655	0.355
		(0.265)	(0.176)	(0.232)	(0.344)	(0.192)
Any work limitation		2.509*			2.196*	
		(0.965)			(0.826)	
% reports employed			0.221**			0.259**
			(0.098)			(0.119)
Any limiting health condition				1.702		
				(0.620)		
Ever food insecure					4.227**	4.434**

					(1.987)	(1.949)
Constant	0.069***	0.073*	0.261	0.01	0.030**	0.100
	(0.050)	(0.094)	(0.374)	(0.129)	(0.038)	(0.134)
Observations	3003	1424	1424	1424	1424	1424
F-test	12.000	9.820	8.489	8.914	8.288	9.799
p-value	0.000	0.000	0.000	0.000	0.000	0.000

Source: Authors' calculations using PSID data.

Notes: Food secure includes marginally food secure. Food security and all other variables are measured in 2017.

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

OR = odds ratio; s.e.= standard error

Table 4

Odds of living in a food insecure household at age 60 to 69, PSID low education sample

Year food security observed:	Model 1 Any	Model 2 Any	Model 3 Any	Model 4 Any
	OR (s.e.)	OR (s.e.)	OR (s.e.)	OR (s.e.)
1948-1952 birth cohorts	0.386 (0.224)	0.443 (0.275)	0.496 (0.281)	0.390 (0.284)
1943-1947 birth cohorts				
1938-1942 birth cohorts				
Birth cohorts before 1938				
Minority	0.927 (0.693)	0.856 (0.650)	0.992 (0.741)	0.733 (0.502)
Female	1.730 (0.839)	1.097 (0.544)	1.376 (0.649)	1.241 (0.708)
Years of schooling	0.914 (0.096)	0.925 (0.107)	0.894 (0.102)	0.920 (0.092)

Current Characteristics				
Not married	4.296*	3.247	3.771	5.233
	(3.073)	(2.162)	(2.687)	(4.919)
In poverty	3.172	3.080	4.060*	4.490*
	(2.214)	(2.256)	(2.600)	(3.160)
Non-metropolitan area	1.784	2.039	1.898	1.815
	(1.400)	(1.661)	(1.363)	(1.369)
Family size	1.38	1.295	1.394	1.415
	(0.261)	(0.244)	(0.236)	(0.264)
ADL or IADL limitation	2.041	2.914	2.458	1.564
	(1.657)	(2.081)	(1.624)	(1.177)
Any health condition (HC)	0.800	1.402	1.008	1.043
	(0.609)	(1.155)	(0.895)	(0.789)
Midlife Characteristics				
Marital history (% reports married)	0.638	0.604	0.720	0.713
	(0.446)	(0.485)	(0.504)	(0.480)
Income history (mean income)	0.583	0.597	0.550	0.812
	(0.207)	(0.236)	(0.212)	(0.257)
Health insurance history (% waves w/ health insurance)	0.678	0.400	0.604	1.142
	(0.451)	(0.308)	(0.446)	(0.766)
Ever work limited (binary)	4.992*			3.186
	(3.986)			(2.316)
% reports employed		0.321		
		(0.308)		
Any limiting health condition			2.724	
			(1.805)	
Ever food insecure in midlife				10.98**
				(9.237)

Constant	0.093	0.602	0.142	0.011*
	(0.205)	(1.483)	(0.287)	(0.023)
Observations	506	506	506	506
F-test	6.440	7.520	6.815	6.376
p-value	0.000	0.000	0.000	0.000

Source: Authors' calculations using PSID data.
Notes: Food secure includes households and persons identified as marginally food secure.
WL: Work Limitation, HC: Health Condition.
$p < 0.05$ *, $p < 0.01$ **, $p < 0.001$ ***.
OR = odds ratio; s.e.= standard error

Study 2: Healthy aging, food security and midlife experiences: Evidence from the Panel Study on Income Dynamics

Abstract: Using longitudinal data from the Panel Study in Income Dynamics (PSID), this study uses multivariate methods to examine the association between healthy aging and food insecurity. More specifically, it considers the correlation between, on the one hand, healthy aging among 1) all persons age 60 to 69, and 2) persons age 60 to 69 with high school or lower levels of education and on the other hand, contemporaneous food security and midlife experiences (ages 40 to 54). Models control for sociodemographic characteristics, current food security status, and seven midlife experiences as follows: food security, marital history, mean income, health insurance, work limitations, employment, and limiting health conditions. Results suggest that, controlling for other factors, currently living in a food secure household is associated with higher odds of healthy aging. Having higher midlife income or more time employed in midlife is associated with increased odds of healthy aging, while having a work limitation or a limiting health condition in midlife is associated with lower odds of healthy aging. Midlife food security and health insurance coverage are not significantly associated with healthy aging. Policy implications are discussed.

Introduction

Evidence on socioeconomic inequalities in health are well established in the United States (U.S.) (Braveman et al. 2010; Currie and Schwandt 2016) while less is known on the dynamics of health inequalities across the life course. This paper, bridging the literatures concerning healthy aging and food security, is concerned with health in late life and how it might correlate with food security contemporaneously and at midlife, while controlling for individual characteristics and other midlife socioeconomic experiences. The research goal is to better understand healthy aging as it relates to food security and other socioeconomic experiences.

Persons who lack consistent access to enough food for an active, healthy life are considered food insecure. In the U.S., food insecurity is not rare: 11.8 percent of households, or 15.0 million households, were food insecure at some point during 2017 (Coleman-Jensen et al. 2018). Living in a food insecure household is associated with poor health and well-being. Prior research has linked food insecurity with lower levels of health (e.g. higher cardiovascular risk factors (Seligman et al. 2010), higher rates of chronic disease (Gregory and Coleman-Jensen, 2017; Seligman et al. 2010), higher rates of obesity (Brewer et al. 2010), increased risk for physical and mental health conditions (Kim and Frongillo 2007; Klesges et al. 2001; Lee and Frongillo 2001; Nelson et al. 1998; Stuff et al. 2004; Ziliak et al. 2008), lower rates of cognitive functioning (Portela-Parra and Leung 2019), and poor self-reported health status (Lee and Frongillo 2001; Stuff et al. 2004; Ziliak et al. 2008). Poor management of diet-related conditions such as diabetes (Nelson et al. 1998; Seligman et al. 2010, Seligman and Schillinger 2010) and overall medication non-adherence (Sullivan et al. 2010) have been linked to food insecurity as well. Those who are food insecure have also been found to have poorer access to health care (Kushel et al. 2006), increased use of acute health care (Kushel et al 2006; Sullivan et al. 2010; Kersey et al. 1999; Kamik et al. 2011; Biros et al. 2005) and longer hospital stays (Torres 1996).

The established links between food insecurity and health suggest that those who are food insecure throughout their lives would be more likely to have poor health outcomes as they age. As current projections estimate that one in five Americans will be age 65 or older by 2030 (U.S. Census 2018), understanding the correlates of healthy aging, particularly those which might be modifiable by policy or practice, becomes increasingly important.

"Healthy aging" is a notion that has been used to measure relative levels of success in terms of health as people enter old age. McLaughlin et al. (2012) designate four separate levels of healthy aging for persons age 65 and older, building off the "successful aging" definition developed by Rowe and Kahn (1987). McLaughlin et al.'s most restrictive measure of healthy aging (2012) is similar to Rowe and Kahn's measure (although it does not include measures of active engagement included by Rowe and Kahn (1987)) and is defined as the absence of activity-limiting disease (arthritis, cancer, chronic lung disease, diabetes, heart disease, hypertension, obesity, psychiatric illness, stroke), no more than one difficulty with 11 physical functions because of a health problem (e.g., picking up a dime, climbing several flights of stairs without resting), no permanent memory loss or cognitive decline (measured as obtaining a cognitive score greater than or equal to the median score (22) on the Telephone Interview for Cognitive Status (TICS) (Brandt et al. 1988), and no limitations of six activities of daily living (ADLs) (walking across a room, dressing, bathing or showering, eating, getting into or out of bed, using the toilet) and/or five instrumental activities of daily living (IADLs) (making phone calls, managing money, preparing a hot meal, shopping for groceries, taking medications). Slightly over three percent of persons age 65 and older was estimated to achieve this base level of healthy aging (McLaughlin et al. 2012).

Level I excludes the freedom from physiological risk factors (obesity, hypertension) criterion and relaxes the threshold for meeting the minimum cognitive conditions, requiring a score of 11 or greater on the TICS as an indication of being free from cognitive impairment. Approximately nine

percent of persons age 65 and older met this Level I definition (McLaughlin et al. 2012). Level II is equivalent to level I, except that the disease criterion includes freedom from conditions that limit a person's ability to perform his or her usual activities. This criterion of having 'no symptomatic disease' was ascertained by reported use of medication, rehabilitation therapies, invasive treatments such as surgery and/or self-reported limitation in ability to engage in 'usual activities'. Nearly twenty percent of adults age 65 and older met this Level II definition (McLaughlin et al. 2012). Level III includes the same disability, physical functioning and cognitive functioning criteria as used in Level I. For Level III, however, the disease criterion is entirely excluded. Approximately 36 percent of adults age 65 and older met this Level III definition (McLaughlin et al. 2012). Using these measures for four levels of healthy aging, McLaughlin et al. (2012) estimated that overall the prevalence of healthy aging in the U.S. ranged from 3.5 to 35.5 percent and that the odds of being classified as healthy varied by age, educational attainment, and sex. Among persons age 65 and older, those who were older, had less education or were women were less likely to age well compared to reference groups.

A complementary line of research has identified midlife factors that are tied to healthy aging. Percent of midlife unmarried, living in poverty, or with a work limitation are negatively associated with healthy aging (Jajtner et al., 2020) while higher levels of social integration at midlife are positively associated with healthy aging (Li et al. 2018). Hungerford (2007) determined that those who experience chronic hardships such as income deprivation (family income below 150% of poverty and family income below 100% of poverty) or housing deprivation (being a renter or living in overcrowded housing) in middle age are significantly more likely to experience adverse old-age outcomes such as poor health. Health status, health conditions and health behaviors at midlife have also been found to be associated with aging outcomes. Self-assessed poor health in midlife among volunteers of a primary prevention trial has been shown to be related to the development of both pre-frailty and frailty in old age (Huohvanainen et al. (2016). Midlife smoking and low levels of physical activity are inversely

associated with healthy aging (Södergren 2013). Among older men, low levels of physical activity at midlife are associated with greater risk of frailty (Savela 2014).

What is lacking in the studies cited above, however, is research that spans the current aging and nutrition literatures to understand whether the experience of being food secure, either currently (in older age) or in midlife might be associated with healthy aging. Midlife estimates of food insecurity suggest that 11 percent of those age 50 to 59 experience food insecurity, but that this percentage varies greatly by sociodemographic characteristics such as employment, income, marital status, race and sex (Ziliak and Gunderson 2018).

As later-life hardships can be viewed as consequences of adversities that have accumulated gradually throughout a lifetime, a cumulative inequality perspective can be useful in understanding health disparities in older age (Carr 2019; Crystal and Shea 1990; Ferraro and Shippee 2009) and in conceptualizing a link between midlife food insecurity and healthy aging at older ages. This paper fills this research gap, examining whether midlife food insecurity is associated with healthy aging among Americans age 60 to 69 while controlling for other individual and contextual characteristics. Given the literature reviewed here, we hypothesize that living in a food secure household in midlife is associated with reduced odds of healthy aging.

Methods

Data

The PSID is a nationally representative study which has tracked over 18,000 individuals living in 5,000 families since 1968. The PSID is the only nationally representative panel survey that includes the full 18-item Household Food Security Module (HFSM), a supplement designed to measure overall household food security as well as different facets of food security. The PSID also gathers information on correlates of food insecurity (e.g., sociodemographic characteristics, health conditions, household

structure, income, employment, and public program participation), measures of wellbeing and healthy aging, and Social Security receipt.

We use two different samples. First, we use a cross-sectional sample of adults age 60 to 69 in 2017 (n=1,424) which includes midlife history data for that population. We run additional analyses using a panel sample restricted to persons age 60 to 69 living in households with low levels of education (n=506), defined as a household where the head of household has, at most, a high school education.

Measures

Our dependent variable, healthy aging, was measured in 2017. Healthy aging was defined as the absence of (1) activity-limiting disease[1], (2) permanent memory loss or cognitive decline, (3) limitations of Activities of Daily Living (ADLs) and limitations in Instrumental Activities of Daily Living (IADLs). This formulation equates to "Level II" of McLaughlin et al. (2012) reviewed earlier and utilizes the ADLs and IADLs in McLaughlin (2017).

In the PSID, food security is measured using the household food security module (HFSM) which includes 18 questions for households with children and a subset of 10 of those questions for households without children (Tiehen et al. 2018). The PSID is the only nationally representative panel survey that includes the full 18-item HFSM. The HFSM is included in the 1999, 2001, 2003, 2015, and 2017 waves of the main family file. In the 1999-2003 surveys, HFSM questions relate to the year prior to the survey. In the 2015 and 2017 surveys, the reference period is the prior 12 months (Tiehen, et al. 2018). While rates of food insecurity reported in the PSID are lower than those reported in the Current Population Survey, primarily due to differences in demographics between the two samples,

[1] Disease is the presence of any condition (arthritis, asthma, cancer, diabetes, heart conditions (including heart attack), lung conditions (e.g. bronchitis or emphysema), or stroke) as reported by the respondent indicating a doctor or medical professional had told him/her/spouse that he/she had a specific medical condition. Activity-limiting disease is the presence of one or more of the above conditions that pose some limit to the individual's normal daily activities.

the PSID identifies similar correlates of food security (e.g. being further above the poverty line is associated with lower rates of food insecurity; higher rates of education, being married, and being white are associated with lower rates of food insecurity) (Tiehen et al. 2018). Persons who are described as having high food security do not report any food access problems or limitations. Persons who report only one or two concerns over accessing necessary food but report little or no indication of changes in diets or food intake are considered marginally food secure. Low food security equates with reduced quality and variety of diet but little or no indication of reduced food intake. Persons who report multiple indications of changes in eating patterns or reduced food intake are deemed to have very low food security (USDA 2019). For our study, we categorized midlife food security, measured in 1999, 2001, or 2003, as ever having been food insecure (low or very low food security) in midlife. Current food security status, measured in 2017, was defined as marginally food secure or food insecure (low or very low).

A binary work limitation variable was included as a midlife characteristic, based on whether the respondent ever indicated that there was any work limitation (regardless of severity) between the ages of 40 and 54. ("Do you (HEAD) have any physical or nervous condition that limits the type of work or the amount of work you can do?").

Related to the work limitation variable, a variable estimating the percent of midlife reports in which a respondent was employed was defined. We categorized this into three levels, as the data was skewed: 100% employed (reference) vs. 75%-99% vs. <75%. Five hundred and ninety of 1,424 respondents fall in the last two categories and the 75 percent mark is the median of the 590.

Health in midlife was measured in a binary fashion and incorporated both measures of the presence of a health condition and its severity to create one measure of a 'limiting health condition'. Presence of a condition was measured as self-reported physician diagnosis of any chronic health condition (e.g., arthritis, asthma, hypertension, cancer, diabetes, heart disease/heart attack, chronic

lung disease (i.e. bronchitis or emphysema), stroke, or 'any emotional, nervous, or psychiatric problems', 'permanent loss of memory or mental ability', or 'a learning disorder'.) Level of severity was measured next, based on responses to a question which gathered information about the impact of health conditions on normal daily activities ("How much does this condition limit your normal daily activities?", where responses included: 'a lot' (severe), 'somewhat' (moderate), 'just a little' (mild), 'not at all' (health condition present but no limitation)). These two measures were used to create a binary midlife health measure where persons with any health condition that was limiting at any level were counted as having a 'limiting health condition.' In the PSID, limiting health condition was measured at least three times over midlife.

Other midlife factors were measured as the percent of observations over midlife (age 40-54) with a certain condition. For this study, these midlife factors included the following: mean income, percent of observations married, and percent of waves with health insurance. Based on the structure of the PSID, marital status and income were measured a minimum of six times over midlife (between the ages of 40 to 54), as was experience with poverty. Health insurance coverage was measured at least three times over midlife.

Current covariates included family size, years of schooling, food security, marital status, urbanicity, poverty, race, and sex. Marital status was measured nominally, as either married or not. Living in a metropolitan area was measured in a binary fashion as well, as people were coded as either living in a metropolitan area or not. Current poverty status was measured as living in income poverty (below the U.S. poverty line) or not. The U.S. poverty guideline in 2017 for a family of four was $24,600 (U.S. DHHS 2019). Current food security status was measured as well. For our multivariate analyses, current food security status was defined as 'marginally food secure' or food insecure (low or very low food security), with food secure as the comparison group.

Analytical approach

For all analyses, alpha was set to .05. Bivariate statistics were estimated first, comparing older adults by healthy aging status for each sociodemographic and midlife variable. Next, a series of logistic regressions were estimated, with an aim of estimating the odds of healthy aging at age 60 to 69. The same current covariates were included in all models, but different mixes of possible midlife variables were included, drawing from information collected when respondents were between the ages of 40-54 ("midlife"). Predicted probabilities of healthy aging were provided for each midlife variable for the full sample.

IRB

As we used publicly available PSID data, we did not require IRB approval.

Results

Table 1 shows our full panel sample (n=1,424) and our low-income sample (n=506) characteristics, as well as significant differences by 2017 healthy aging status. Overall, 57 percent of the full sample and 51 percent of the low education sample met the criteria for healthy aging.

TABLES INCLUDED IN APPENDICES; INSERT TABLE 1 HERE

For the full sample of 60 to 69-year old persons, 18 percent were minorities, 55 percent were female, and 68 percent were married. The mean years of schooling was 14.28, with thirty percent having a high school or lower levels of education. The mean family size was 1.93. Eighty-two percent lived in a metropolitan area. Five percent had family incomes below the official poverty line and eight percent had incomes below 130% of poverty. Ninety percent were living in households that were food secure. Thirteen percent had a moderate or severely limiting health condition. One percent were receiving free or reduced cost meals for seniors.

Differences in contemporaneous individual characteristics by healthy aging were in the expected directions. Among those not aging well, 84 percent were living in food secure households,

compared to 94 percent of those who were aging well (p<.001). Persons who were not aging well were significantly more likely to be female, have low incomes, have lower levels of education, and have a limiting health condition compared to those meeting healthy aging criteria. Those not meeting these criteria were less likely to be married and less likely to live in a metropolitan area.

The low education sample had higher proportions of minorities (28 percent) and females (59 percent), lower mean years of schooling (11.4), and a higher concentration in metropolitan areas (73 percent) than the full sample. Mean family size was slightly higher (2.06). Eleven percent had incomes below the official poverty line. Compared to the full sample, a slightly smaller proportion (83 percent) were living in food secure households. The percent with a moderate or severely limiting health condition was slightly higher (16 percent). Differences in characteristics by healthy aging status were in the expected directions (p<.01 or less), as the low-education subpopulation that was aging well had larger proportions of persons who were married, with higher incomes, higher levels of food security, and lower levels of health conditions than those who were not aging well.

Table 2 shows our midlife covariate distributions by healthy aging status for both the full sample and low education sample. Recall that midlife variables were measured between the ages of 40 and 54.

INSERT TABLE 2 HERE

On average, older adults spent midlife years as follows: spent 76 percent married, 91 percent covered by health insurance and five percent in poverty. Thirty-five percent of older adults had at least one instance of a work limitation during midlife. Older adults spent approximately 13 percent of their midlife with a work limitation. Forty percent had at least one mention of a liming health condition during midlife. On average, older adults spent nine percent of their midlives living in food insecure households while sixteen percent reported ever being food insecure in midlife. Nearly 85 percent of respondents were employed during their midlives. Older adults with poor healthy aging spent

significantly higher percentages of their midlives living in food insecure households (14 percent compared to 5 percent, $p<.001$), as well as unmarried, in poverty, without health insurance, or with a work limitation or limiting health condition (all $p<.001$) and with lower proportions of their midlives employed ($p<.001$).

Table 3 shows the results of our logistic regressions for the full sample, estimating the odds of healthy aging at age 60 to 69.

INSERT TABLE 3 HERE

Model 1 is from a cross-sectional sample (n=1,424) and does not include any midlife covariates. Persons age 60 to 69 who were not currently married (OR: 0.620, $p<.001$) or who were living in poverty (OR: 0.517, $p<.05$) had significantly decreased odds of healthy aging, compared to their comparison groups and holding all other variables constant. Higher levels of educational attainment were associated with healthy aging (OR: 1.126, $p<.001$). Sex, race, urban/rural status, and family size were not significantly associated with healthy aging.

Model 2 of Table 3 examines these same characteristics for the panel sample as well as measures of current levels of food security and the following midlife covariates: percent of reports not married, mean income, percent of time with health insurance, and whether someone ever lived in a food insecure household. Those who were currently living in food insecure households had reduced odds of healthy aging, compared to those who were living in food secure households and holding all else constant (OR: 0.367, $p<.01$). Those who ever lived in a food insecure household during midlife had reduced odds of healthy aging (OR: 0.538, $p<.05$). Females had reduced odds (OR: 0.755, $p<.05$) of healthy aging.

Model 3 of Table 3 adds in the binary work limitation midlife variable. In this case, persons age 60 to 69 who ever reported a work limitation in midlife had significantly reduced odds (OR: 0.237 $p<.001$) of healthy aging. The association of living in a food insecure household in midlife with healthy

aging was no longer significant and no other midlife factors were significantly associated with the outcome. Females (OR: 0.692, $p<.01$) and those who were currently residing in food insecure households (OR: 0.457, $p<.05$) had reduced odds of aging well.

Model 4 replaces the binary work limitation at midlife variable with our employment in midlife measure. Persons who had more time employed in midlife had higher odds (OR: 3.170, $p<.001$) of healthy aging at ages 60 to 69. No other midlife variables were significantly associated with healthy aging. Once again, currently living in a food insecure household was associated with decreased odds of healthy aging (OR: 0.455, $p<.05$).

Model 5 replaces the employment variable with the variable indicating that a person had a moderately or severely limiting health condition at least once in midlife. Those who ever had a limiting health condition at midlife had significantly reduced odds (OR: 0.167, $p<.001$) of healthy aging at age 60 to 69, ceteris paribus. Controlling for other factors, being female (OR: 0.746, $p<.05$) or currently living in a food insecure were negatively associated (OR: 0.411, $p<.001$) with healthy aging.

For the full sample, we can estimate the predicted probabilities of healthy aging for the significant midlife variables found in the panel data, providing a more intuitive way of noting how experiences in midlife might impact aging well (Table 4). We use a slightly different specification to produce these estimates, categorizing midlife employment, a highly skewed variable, as employed all the time, employed 75 to 99 percent of midlife and employed less than 75 percent of midlife. Approximately 59 percent of persons who were living in food secure households during midlife are predicted to age well, compared to 49 percent of those living in food insecure households. Large percentage point gaps are evident in the predicted probabilities of healthy aging between those with and without midlife work limitations (36 percent and 69 percent, a gap of 33 percentage points) ($p<.01$) and between those with and without midlife health limitations (34 percent and 74 percent, a gap of 39 percentage points) ($p<.01$). Sixty-three percent of those who were consistently employed in midlife

met the definition of healthy aging, with lower proportions for those employed 75 to 99 percent of midlife (52%) or less than 75 percent (48%) ($p<.01$).

INSERT TABLE 4 HERE

Table 5 shows regression results from the panel low education sample. Model 1 used the cross-sectional data ($n=1,239$) and the remaining models (2 through 5) use the panel data ($n=506$). Model 1 included the standard set of current covariates. Model 2 added in midlife factors including mean midlife income and percent of midlife waves: married, covered by health insurance and ever not food secure. Those with higher mean incomes at midlife had higher odds of healthy aging (OR: 1.237, $p<.05$). None of the other midlife factors were associated with healthy aging in this model. Being non-white was associated with increased odds of healthy aging (OR: 2.136, $p<.05$) while currently living in a food insecure household was associated with decreased odds of healthy aging for this low education population (OR: 0.276, $p<.05$). In Model 4, where the midlife work limitation variable was replaced with the midlife employment variable, persons with higher midlife incomes (OR: 1.170, $p<.05$) or more time in employment (OR: 6.676, $p<.01$) had significantly increased odds of healthy aging. Ever having a limiting health condition in midlife was significantly associated with reduced odds of healthy aging in Model 5 (OR: 0.114, $p<.05$). Across all models, midlife food security status was not associated with healthy aging at ages 60 to 69.

INSERT TABLE 5 HERE

Discussion

The findings presented here confirm prior research on healthy aging while also adding a new contribution of examining the relevance of food security to healthy aging outcomes at ages 60 to 69. Overall, 57 percent of all persons and 51 percent of persons with low levels of education met the criteria for healthy aging. The estimates for both the general population and for the low education population are higher than the estimated 20 percent of persons meeting the Level II healthy aging definition included in McLaughlin et al.'s initial study (2012), however, their sample was older (persons aged 65 and older) and they did note that persons of younger age (age 65-74) were more likely to experience healthy aging.

Our estimate that approximately ten percent of the 36.4 million persons age 60 to 69 were living in food insecure households in 2017 is similar to results from others. Ziliak and Gunderson (2017), for example, estimated that eight percent of Americans aged 60 and older were living in food insecure households in 2017. A December 2019 poll estimated that 14 percent of Americans age 50 to 80 experienced household food insecurity in the past year (Malani et al., 2020). As the current coronavirus pandemic is increasing rates of food insecurity for all ages, at least in the short term, these rates can be expected to rise, and adaptations of nutrition assistance programs will be needed to meet this growing demand. Future surveillance and research can examine how the economic changes arising from the coronavirus pandemic impact levels of food insecurity for older adults now and in the future, a vulnerable population that may be challenged to adapt to new ways of accessing food.

Our finding that persons who were currently living in a food secure household are more likely to experience healthy aging adds to the literature on healthy aging and suggests avenues for further research to determine the exact nature of this relationship. Those who do not experience healthy aging may be less able to access the food needed to support their nutritional needs. Alternatively, living in a food insecure household may exacerbate health conditions which in turn can lead to less healthy aging.

Qualitative research with older adults can delve into these interrelationships to better understand where opportunities for intervention might be targeted.

While we identified strong associations between midlife employment and midlife health conditions with healthy aging, we did not find evidence that midlife food security was associated with the odds of healthy aging. This finding may vary, however, if different conceptualizations of healthy aging are used. Using more expansive measures of healthy aging, such as Level III of McLaughlin et al. (2012), or using broader definitions and measures of wellbeing in older age such as those used by Mitra et al. (2020a, 2020b), which incorporate not only health but also material wellbeing, personal activities, social connections, and economic security dimensions, might find associations with midlife food security. Varying the age range beyond age 69 might produce different results as well. Future research can explore these variations in more detail.

Having a limiting health condition in midlife was consistently associated with reduced odds of healthy aging for both the general population and the low-education sample. Whether the condition in midlife remained the same, worsened, or led to additional health conditions as people aged was not examined in our study, but needs a closer look. Some portion of those with a limiting health condition in midlife, for example, may have had a temporary condition or have been able to receive treatment which improved functioning and thus such a condition would not impact healthy aging trajectories.

In terms of midlife experience with food insecurity, Americans age 60 to 69 spent less than five percent of their midlives (when they were age 40 to 54) living in food insecure households. While not strictly analogous, Ziliak and Gunderson (2018) estimated that 11 percent of all persons aged 50 to 59 were living in food insecure households in 2017. Midlife is typically the prime working years for individuals, a time of relative economic security compared to other ages, and so low rates of experiencing deprivations such as food insecurity are to be expected. The low-education population spent more than 15 percent of their midlives living in food insecure households, however, suggesting

that the nutrition assistance supports in place to assist this population did not fully address all nutrition needs.

Limitations

This study has three key limitations. First, the HFSM questions included in the PSID were designed to measure limitations in the under-report of food insecurity due to physical limitations alone (Wolfe et al., 2003). Other studies have suggested that the concept of food insecurity among older adults may include altered eating patterns due to functional limitations and health problems as well as inadequate availability, affordability, and accessibility of food (Lee and Frongillo 2001). Second, a small sample size limited our ability to fully explore multiple variables within the low-education sample. Third, the nature of the PSID in measuring certain variables only in certain years or waves created challenges in developing consistent measures.

Conclusion

This study adds to the healthy aging and food security literature research by highlighting an association between currently living in a food secure household and increased odds of healthy aging for older Americans. Having higher midlife income or more time employed in midlife is associated with increased odds of healthy aging, while having a work limitation or a limiting health condition in midlife is associated with lower odds of healthy aging. Midlife food security and health insurance coverage are not significantly associated with healthy aging.

Bibliography

Biros MH, Hoffman PL, and Resch K. (2005). The prevalence and perceived health consequences of hunger in emergency department patient populations. *Academy of Emergency Medicine*, 12:310–7.

Brandt, J., Specter, M., and Folstein, M.F. (1988). The telephone interview for cognitive status. *Neuropsychiatry, Neuropsychology, Behavioral Neurology*, 1, 111-17.

Braveman, P. A., Cubbin, C., Egerter, S., Williams, D. R., and Pamuk, E. (2010). Socioeconomic disparities in health in the United States: what the patterns tell us. *American Journal of Public Health*, *100*(S1), S186–S196.

Brewer, D.P, Catletter, C.S., Porter, K.N., Lee, J.S., Hausman, D.B., Reddy, S. and Johnson, M.A. (2010). Physical limitations contribute to food insecurity and the food insecurity-obesity paradox in older adults at senior centers in Georgia. *Journal of Nutrition for the Elderly*, *29*(2), 150-169.

Carr, D. (2019). *Golden years? Social inequality in later life.* New York: Russell Sage Foundation.

Coleman-Jensen, A. (2010). U.S. food insecurity status: Toward a refined definition. *Social Indicators Research*, 95: 215-230. doi: 10.1007/s11205-009-9455-4.

Coleman-Jensen, A., Rabbitt, M. P., Gregory, C.A., and Singh, A. (2018.). *Household food security in the United States in 2017* (ERR-256). Washington, DC: U.S. Department of Agriculture, Economic Research Service. Available: https://www.ers.usda.gov/webdocs/publications/90023/err-256.pdf?v=0.

Crystal, S. and Shea, D. (1990). Cumulative advantage, cumulative disadvantage, and inequality among elderly people. *Gerontologist*, 30, 4, 437-443.

Currie, J., and Schwandt, H. (2016). Mortality inequality: the good news from a county-level approach. *Journal of Economic Perspectives*, *30*(2), 29–52.

Ferraro, K.F. and Shippee, T.P. (2009). Aging and cumulative inequality: How does inequality get under the skin? *The Gerontologist, 49,* 333-343. doi: 10.1093/geront/gnp034.

Huohvanainen, E., Strandberg, A. Y., Stenholm, S., Pitkälä, K. H., Tilvis, R. S., and Strandberg, T. E. (2016). Association of self-rated health in midlife with mortality and old age frailty: a 26-year follow-up of initially healthy men. *Journals of Gerontology Series A: Biomedical Sciences and Medical Sciences*, *71*(7), 923–928.

Hungerford, T.L. (2007). The persistence of hardship over the life course. *Research on Aging*, 29, 6, 491-511. doi: 10.1177/0164027507305736.

Jajtner, K., Brucker, D.L. and Mitra, S. (2020). Midlife work limitations are associated with poor aging outcomes. Working paper.

Kersey, M.A., Beran, M.S., McGovern, P.G., Biros, M.H., and Lurie, N. (1999). The prevalence and effects of hunger in an emergency department patient population. *Academy of Emergency Medicine,* 6:1109–14.

Kim K, and Frongillo EA. (2007). Participation in food assistance programs modifies the relation of food insecurity with weight and depression in elders. *Journal of Nutrition*, 137:1005–10.

Klesges LM, Pahor M, Shorr RI, Wan JY, Williamson JD, and Guralnik JM. (2001). Financial difficulty in acquiring food among elderly disabled women: Results from the Women's Health and Aging Study. *American Journal of Public Health*, 91:68–75.

Kushel MB, Gupta R, Gee L, and Haas JS. (2006). Housing instability and food insecurity as barriers to health care among low-income Americans. *Journal of General Internal Medicine*, 21:71–7.

Lee, J.S. and Frongillo Jr., E.A. (2001). Factors associated with food insecurity among U.S. elderly persons: Importance of functional impairments. *The Journals of Gerontology Series B: Psychological Sciences and Social Sciences* 56 (2): S94–99. doi: 10.1093/geronb/56.2.S94.

McLaughlin, S.J., Jette, A.M., and Cornell, C.M. (2012). An examination of healthy aging across a conceptual continuum: Prevalence estimates, demographic patterns, and validity. *Journals of Gerontology Series A: Biomedical Sciences and Medical Sciences*, *67*(7), 783-789. Doi: 10.1093/gerona/glr234.

McLaughlin, S.J. (2017). Healthy aging in the context of educational disadvantage: The role of "Ordinary Magic." *Journal of Aging and Health*, *29*(7), 1214–1234.

Mitra, S., Brucker, D.L. and Jajtner, K. (2020a). Wellbeing at older ages: Towards an inclusive and multidimensional measure. *Disability and Health Journal.* doi: 10.1016/j.dhjo.2020.100926.

Mitra, S., Brucker, D.L. and Jajtner, K. (2020b). Disability and aging: From successful aging to wellbeing through the capability and human development lens. *Disability and Health Journal*, doi: 10.1016/j.dhjo.2020.100924.

Portela-Parra, E.T. and Leung, C.W. (2019). Food insecurity if associated with lower cognitive functioning in a national sample of older adults. *The Journal of Nutrition*, 149, 10, 1812-1817. Doi: org.unh.idm.oclc.org/10.1093/jn/nxz120.

Rowe, J. W., and Kahn, R. L. (1987). Human Aging: Usual and Successful. *Science, New Series*, *237*(4811), 143–149.Rothwell, D. W. and McEwen, A. (2017). Comparing child poverty risk by family structure during the 2008 recession. *Journal of Marriage and Family*, 79, 1224-1240. doi: 10.1111/jomf.12421.

Savela, S. (2014). *Physical Activity in Midlife and Health-related Quality of Life, Frailty, Telomere Length and Mortality in Old Age*. University of Oulu.

Scott-Marshall, H. K., Tompa, E., Wang, Y., and Liao, Q. (2014). Long-term mortality risk in individuals with permanent work-related impairment. *Can J Public Health*, *105*(5), 330–335.

Seligman HK, and Schillinger D. (2010). Hunger and socioeconomic disparities in chronic disease. *New England Journal of Medicine*., 363:6–9.

Seligman HK, Laraia BA, and Kushel MB. (2010). Food insecurity is associated with chronic disease among low-income NHANES participants. *Journal of Nutrition*, 140:304–10.

Seligman HK, Davis TC, Schillinger D, and Wolf MS. (2010). Food insecurity is associated with hypoglycemia and poor diabetes self-management in a low-income sample with diabetes. *J Health Care Poor Underserved*, 21:1227–33.

Södergren, M. (2013). Lifestyle predictors of healthy ageing in men. *Maturitas*, *75*(2), 113–117.

Stuff JE, Casey PH, Szeto KL, Gossett JM, Robbins JM, Simpson PM, Connell C, and Bogle ML. (2004). Household food insecurity is associated with adult health status. *Journal of Nutrition*, 134:2330–5.

Sullivan AF, Clark S, Pallin DJ, Camargo CA Jr. (2010). Food security, health, and medication expenditures of emergency department patients. *Journal of Emergency Medicine,* 38:524–8.

Tarasuk V., St-Germain, A.A.F., and Mitchell, A. (2019). Geographic and socio-demographic predictors of household food insecurity in Canada, 2011-2012. *BMC Public Health*, 19(1), 12. doi: 10.1186/s12889-018-6344-2.

Taylor, M. G. (2010). Capturing transitions and trajectories: The role of socioeconomic status in later life disability. *The Journals of Gerontology, Series B: Psychological Sciences and Social Sciences*, 65, 733-743. doi:10.1093/geronb/gbq018.

Tiehen, L., Vaughn, C., and Ziliak, J.P. (2018). Food insecurity in the PSID: A comparison with the levels, trends, determinants, and correlates in the CPS 1999-2017. Paper presented at APPAM, November 2018.

Torres-Gil FM. (1996). Malnutrition and hunger in the elderly. *Nutrition Review*, 54, S7–8.

Tucker, J. S., Friedman, H. S., Wingard, D. L., and Schwartz, J. E. (1996). Marital history at midlife as a predictor of longevity: Alternative explanations to the protective effect of marriage. *Health Psychology*, *15*(2), 94.

U.S. Department of Agriculture (USDA). (2019). Definitions of food security. Washington, DC: USDA. Available: https://www.ers.usda.gov/topics/food-nutrition-assistance/food-security-in-the-us/definitions-of-food-security.aspx.

U.S. Department of Agriculture (USDA). (2019b). SNAP eligibility. Washington, DC: USDA. https://www.fns.usda.gov/snap/recipient/eligibility#What%20are%20the%20SNAP%20income%20limits?.

U.S. Census. (2018). Older people projected to outnumber children for first time in U.S. history. Washington, DC: U.S. Census. Available: https://www.census.gov/newsroom/press-releases/2018/cb18-41-population-projections.html.

U.S. Census. (2020). Poverty status in the past 12 months: 2018. American Community Survey one-year estimates, Table S1701. Washington, DC: U.S. Census.

U.S. Department of Health and Human Services. (2019). 2017 poverty guidelines. Washington, DC: U.S. DHHS, Office of the Assistant Secretary for Planning and Evaluation. Available: https://aspe.hhs.gov/2017-poverty-guidelines.

Vartanian, T.P. and McNamara, J.M. (2002). Older women in poverty: The impact of midlife factors. *Journal of Marriage and Family*, 64, 532-548.

Vigil, A. (2019). Trends in Supplemental Nutrition Assistance Program participation rates: Fiscal year 2010 to fiscal year 2017. Washington, DC: USDA. Available:

von Bonsdorff, M. B., Seitsamo, J., Ilmarinen, J., Nygard, C.-H., von Bonsdorff, M. E., and Rantanen, T. (2011). Work ability in midlife as a predictor of mortality and disability in later life: a 28-year prospective follow-up study. *Canadian Medical Association Journal*, *183*(4), E235–E242. https://doi.org/10.1503/cmaj.100713.

Wang, E.A., McGinnis, K.A., Goulet, J., Bryant, K., Gilbert, C., Leaf, D.A., Mattocks, K., Fiellin, L.E., Vogenthaler, N., Justice, A.C., and Fiellin, D.A. (2015) Food insecurity and health: Data from the veterans aging cohort study. *Public Health Reports*, *130*(3), 261-268.

Winkleby, M. A.,and Cubbin, C. (2003). Influence of individual and neighbourhood socioeconomic status on mortality among black, Mexican-American, and white women and men in the United States. *Journal of Epidemiology and Community Health*, *57*(6), 444–452.

Wolf, D. (2018). Uses of the Panel Study of Income Dynamics Data in Research on Aging. The *Annals of the American Academy of Political and Social Science*. Doi: 10.1177/0002716218791751.

Wolfe, W.S., Olson, C.M., Kendall, A. and Frongillo, E.A. (1996). Understanding food insecurity in the elderly: A conceptual framework. *Journal of Nutrition Education*, *28*(2), 92-100.

Wolfe, W.S., Frongillo, E.A., and Valois, P. (2003). Understanding the experience of food insecurity by elders suggests ways to improve its measurement. *Journal of Nutrition, 133* (March), 2762-2769.

Yan, L. L., Daviglus, M. L., Liu, K., Stamler, J., Wang, R., Pirzada, A., … Liao, Y. (2006). Midlife body mass index and hospitalization and mortality in older age. *Jama*, *295*(2), 190–198.

Ziliak, J. and Gunderson, C. (2016). Multigenerational families and food insecurity. *Southern Economic Journal*, *82*, 1147-1166.

Ziliak, J. and Gunderson, C. (2017). *The health consequences of senior hunger in the United States: Evidence from the 1999-2014 NHANES*. Report submitted to Feeding America.

Ziliak, J. and Gunderson C. (2019). Hunger among adults age 50-59 in 2017. Washington, DC: Feeding America. Available: https://www.feedingamerica.org/sites/default/files/2019-05/hunger-among-adults-50-59_full-report.pdf.

Ziliak J, Gundersen, C., and Haist, M. (2008). The causes, consequences, and future of senior hunger in America [cited 2012 Feb 20]. Lexington, KY: University of Kentucky, Center for Poverty Research. Available from: http://216.235.203.153/Document.Doc?id=13.

Table 1

Descriptive statistics of contemporaneous experiences by 2017 healthy aging status, PSID

	(1) Main panel All % (s.e.)	(2) Main panel HA % (s.e.)	(3) Main panel NHA % (s.e.)	Sig.	(4) Low educ. All % (s.e.)	(5) Low educ. HA % (s.e.)	(6) Low educ. NHA % (s.e.)	Sig.
Healthy Aging	0.574				0.506			
	(0.019)				(0.033)			
Age 60 - 64	0.473	0.490	0.451		0.509	0.555	0.462	
	(0.020)	(0.023)	(0.028)		(0.036)	(0.046)	(0.049)	
Age 65 - 69	0.527	0.510	0.549		0.491	0.445	0.538	
	(0.020)	(0.023)	(0.028)		(0.036)	(0.046)	(0.049)	
Minority	0.180	0.167	0.197		0.279	0.291	0.267	
	(0.017)	(0.017)	(0.025)		(0.033)	(0.043)	(0.038)	
Female	0.551	0.511	0.606	***	0.588	0.537	0.641	
	(0.016)	(0.017)	(0.027)		(0.028)	(0.035)	(0.046)	
Years of Schooling (mean)	14.28	14.57	13.89	***	11.40	11.49	11.3	
	(0.097)	(0.122)	(0.141)		(0.120)	(0.156)	(0.132)	
<High School	0.047	0.0348	0.063	*	0.158	0.133	0.183	
	(0.008)	(0.009)	(0.012)		(0.025)	(0.031)	(0.031)	
High School/GED	0.250	0.226	0.281		0.842	0.867	0.817	
	(0.013)	(0.017)	(0.021)		(0.025)	(0.031)	(0.031)	
Some college	0.282	0.253	0.321	*				
	(0.013)	(0.020)	(0.018)					
4+ years of college	0.421	0.485	0.335	***				

	(0.020)	(0.026)	(0.025)					
Married	0.681	0.738	0.604	***	0.658	0.744	0.571	***
	(0.022)	(0.024)	(0.029)		(0.032)	(0.036)	(0.043)	
Metropolitan Area	0.816	0.843	0.780	*	0.726	0.747	0.704	
	(0.021)	(0.018)	(0.035)		(0.038)	(0.060)	(0.051)	
Family size (mean)	1.930	1.985	1.857	*	2.055	2.165	1.942	
	(0.032)	(0.036)	(0.048)		(0.071)	(0.092)	(0.092)	
In Income Poverty	0.0522	0.028	0.085	***	0.107	0.050	0.165	**
	(0.009)	(0.008)	(0.015)		(0.021)	(0.017)	(0.036)	
Income to poverty ratio (mean)	6.414	7.439	5.032	***	3.695	4.199	3.179	**
	(0.210)	(0.343)	(0.269)		(0.127)	(0.168)	(0.212)	
Low-income (130% poverty or less)	0.081	0.042	0.133	***	0.152	0.075	0.230	***
	(0.011)	(0.009)	(0.021)		(0.022)	(0.021)	(0.034)	
Food Secure	0.895	0.938	0.838	***	0.826	0.889	0.762	**
	(0.014)	(0.012)	(0.024)		(0.026)	(0.029)	(0.034)	
Marginally Food Secure	0.0556	0.044	0.071		0.090	0.086	0.095	
	(0.008)	(0.011)	(0.012)		(0.017)	(0.026)	(0.017)	
Food Insecure	0.0490	0.018	0.091	***	0.084	0.0256	0.144	***
	(0.009)	(0.005)	(0.017)		(0.016)	(0.010)	(0.029)	
% any health condition	0.757	0.585	0.989	***	0.788	0.589	0.992	***
	(0.013)	(0.017)	(0.005)		(0.025)	(0.040)	(0.008)	
% no/mild limiting health condition	0.511	0.575	0.424	***	0.467	0.578	0.353	***
	(0.017)	(0.018)	(0.029)		(0.032)	(0.039)	(0.050)	
% moderate limiting health condition	0.134	0.010	0.302	***	0.160	0.011	0.314	***
	(0.011)	(0.003)	(0.025)		(0.018)	(0.007)	(0.034)	
Free/Reduced Cost Meals for Seniors	0.011	0.006	0.018		0.019	0.003	0.035	
	(0.004)	(0.004)	(0.024)		(0.009)	(0.002)	(0.047)	
Observations	1,424	835	589		506	272	234	

Source: Authors' calculations using PSID data.
Notes: HA=Healthy aging; NHA=Not healthy aging
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$
s.e.= standard error

Table 2

Descriptive statistics of midlife experiences by 2017 healthy aging status, PSID

	Full sample				Low education sample			
	(1)	(2)	(3)		(4)	(5)	(6)	
	All	HA	NHA		All	HA	NHA	
	%	%	%		%	%	%	
	(s.e.)	(s.e.)	(s.e.)	Sig.	(s.e.)	(s.e.)	(s.e.)	Sig.
Marital History (% years married)	0.759	0.798	0.707	**	0.754	0.789	0.718	
	(0.019)	(0.021)	(0.025)		(0.029)	(0.033)	(0.038)	
Poverty History (% years in income poverty)	0.045	0.026	0.071	***	0.086	0.049	0.123	***
	(0.005)	(0.004)	(0.009)		(0.009)	(0.008)	(0.014)	
Income:Poverty Ratio (mean)	6.142	6.791	5.268	***	3.935	4.459	3.399	***
	(0.245)	(0.347)	(0.276)		(0.142)	(0.177)	(0.177)	
Health Insurance History (% time insured)	0.912	0.928	0.889		0.841	0.875	0.807	*
	(0.008)	(0.009)	(0.013)		(0.016)	(0.017)	(0.027)	
Ever Work Limit in Midlife	0.346	0.198	0.544	***	0.414	0.214	0.619	***
	(0.016)	(0.016)	(0.024)		(0.034)	(0.032)	(0.046)	
Work Limitation (% waves with work limitations)	0.134	0.057	0.238	***	0.172	0.0627	0.284	***
	(0.009)	(0.006)	(0.015)		(0.019)	(0.013)	(0.027)	
Work Limitation Index	0.081	0.027	0.153	***	0.114	0.036	0.194	***
	(0.007)	(0.003)	(0.012)		(0.014)	(0.008)	(0.021)	
Ever limiting Health Condition in Midlife	0.404	0.220	0.653	***	0.519	0.283	0.762	***
	(0.016)	(0.017)	(0.023)		(0.034)	(0.040)	(0.041)	
Health Condition (% waves with limiting health condition)	0.214	0.081	0.393	***	0.285	0.109	0.465	***
	(0.012)	(0.008)	(0.020)		(0.024)	(0.017)	(0.037)	
Health Condition Index	0.212	0.114	0.343	***	0.262	0.134	0.393	***

	(0.010)	(0.005)	(0.016)		(0.020)	(0.014)	(0.028)	
% waves food insecurity (**ages 40-59**)	0.088	0.053	0.136	***	0.154	0.106	0.203	**
	(0.008)	(0.008)	(0.014)		(0.007)	0.019	(0.029)	
Ever Food Insecure in Midlife	0.159	0.101	0.238	***	0.281	0.204	0.360	**
	(0.017)	(0.014)	(0.031)		(0.029)	(0.032)	(0.046)	
Ever Very Low Food Security in Midlife	0.035	0.020	0.055	**	0.061	0.0317	0.091	*
	(0.007)	(0.007)	(0.013)		(0.014)	(0.014)	(0.022)	
Max Low Food Security in Midlife	0.055	0.039	0.075	*	0.095	0.072	0.119	
	(0.008)	(0.008)	(0.014)		(0.017)	(0.019)	(0.029)	
Max Marginal Food Security in Midlife	0.0698	0.042	0.107	**	0.124	0.100	0.149	
	(0.010)	(0.008)	(0.019)		(0.02`)	(0.025)	(0.030)	
% FS Items Yes Response	0.0240	0.014	0.038	**	0.0391	0.0234	0.055	**
	(0.004)	(0.003)	(0.008)		(0.005)	(0.005)	(0.009)	
% waves employed	0.845	0.894	0.779	***	0.786	0.880	0.689	***
	(0.010)	(0.010)	(0.018)		(0.018)	(0.017)	(0.034)	
% waves unemployed	0.0372	0.028	0.050	**	0.049	0.036	0.062	
	(0.004)	(0.005)	(0.006)		(0.007)	(0.009)	(0.010)	
Observations	1424	835	589		506	272	234	

Source: Authors' calculations using PSID data.
Notes: HA=Healthy aging; NHA=Not healthy aging
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$
s.e. = standard error

Table 3

Odds of healthy aging (observed in 2017) for persons age 60-69, PSID full sample

	(1) Xsection OR (s.e.)	(2) Main Panel OR (s.e.)	(3) Main Panel OR (s.e.)	(4) Main Panel OR (s.e.)	(5) Main Panel OR (s.e.)
1948-1952 birth cohorts	0.848	0.813	0.874	0.811	0.733
	(0.106)	(0.115)	(0.134)	(0.114)	(0.124)
1943-1947 birth cohorts	0.630**				
	(0.095)				
1938-1942 birth cohorts	0.665				
	(0.143)				
Birth cohorts before 1938	0.366***				
	(0.070)				
Minority	1.021	1.215	1.102	1.227	1.295
	(0.141)	(0.271)	(0.270)	(0.274)	(0.300)
Female	0.926	0.755*	0.692**	0.851	0.746*
	(0.077)	(0.090)	(0.087)	(0.109)	(0.096)
Years of schooling	1.126***	1.069	1.061	1.058	1.071
	(0.022)	(0.045)	(0.045)	(0.044)	(0.044)
<u>Current Characteristics</u>					
Not Married	0.620***	0.889	0.914	0.874	0.944
	(0.064)	(0.180)	(0.212)	(0.179)	(0.200)
In poverty	0.671	0.597	0.647	0.704	0.579
	(0.157)	(0.229)	(0.254)	(0.243)	(0.245)
Non-metropolitan area	0.870	0.773	0.772	0.744	0.861

	(0.116)	(0.156)	(0.165)	(0.164)	(0.193)
Family size	0.975	1.082	1.094	1.085	1.077
	(0.050)	(0.108)	(0.107)	(0.108)	(0.117)
Marginally food secure		0.887	0.916	0.966	1.174
		(0.320)	(0.325)	(0.345)	(0.398)
Food insecure		0.367**	0.457*	0.455*	0.411*
		(0.122)	(0.146)	(0.157)	(0.145)
Midlife Characteristics					
Marital history (% reports married)		1.159	1.087	1.211	1.153
		(0.288)	(0.298)	(0.297)	(0.341)
Mean income		1.028	1.018	1.025	1.007
		(0.030)	(0.022)	(0.029)	(0.026)
Health insurance history (% time insured)		0.766	0.611	0.724	0.762
		(0.316)	(0.291)	(0.310)	(0.364)
Ever food insecure in midlife		0.538*	0.627	0.576	0.740
		(0.160)	(0.186)	(0.166)	(0.226)
Ever work limited in midlife			0.237***		
			(0.035)		
% reports employed				3.170***	
				(0.975)	
Ever limiting health condition in midlife					0.167***
					(0.026)
Constant	0.325**	0.706	1.715	0.293	1.595
	(0.126)	(0.487)	(1.250)	(0.230)	(1.177)
Observations	3000	1424	1424	1424	1424
F-test	13.400	4.486	11.34	5.779	14.730

p-value	0.000	0.000	0.000	0.000	0.000

Source: Authors' calculations using PSID data.

Notes:

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

OR = odds ratio; s.e.= standard error

Food insecure identifies those living in households with low or very low food security.

Current ADL/IADL lim. and limiting health conditions are not included as covariates b/c they are included in the HA variable.

Table 4

Adjusted predictions of healthy aging, persons age 60-69, PSID full sample

		Probability	95% CI	Sig.
Midlife variable				
	Work limitation[1]	0.364	(.307, .421)	**
	No work limitation	0.689	(.640, .739)	
	Employed all of midlife[2]	0.630	(.582, .677)	**
	Employed 75-99% of midlife	0.520	(.446, .594)	
	Employed less than 75% of midlife	0.475	(.382, .568)	
	Health limitation[3]	0.343	(.275, .411)	**
	No health limitation	0.741	(.698, .784)	

Source: Authors' calculations using PSID data.
Notes: Estimates show predicted probability of HA for the indicated midlife variable, holding all else constant.
[1] Based on Model 3 of Table 3.
[2] Uses the covariates included in Model 4 of Table 3, with an alternative specification of the midlife employment variable.
[3] Based on Model 5 of Table 3.
**p<.01
CI = confidence interval

Table 5

Odds of healthy aging in 2017 among persons age 60 and older, PSID low education sample

	(1) Xsection OR (s.e.)	(2) Panel OR (s.e.)	(3) Panel OR (s.e.)	(4) Panel OR (s.e.)	(5) Panel OR (s.e.)
1948-1952 birth cohorts	0.659	0.643	0.757	0.572*	0.506*
	(0.143)	(0.157)	(0.222)	(0.140)	(0.147)
1943-1947 birth cohorts	0.534*				
	(0.126)				
1938-1942 birth cohorts	0.606+				
	(0.164)				
Birth cohorts before 1938	0.340***				
	(0.078)				
Minority	1.227	2.136*	2.136*	2.539*	1.929
	(0.187)	(0.678)	(0.794)	(0.892)	(0.664)
Female	0.950	0.684	0.587	0.878	0.632
	(0.157)	(0.188)	(0.191)	(0.257)	(0.209)
Years of schooling	1.157**	1.026	0.989	1.011	1.109
	(0.054)	(0.067)	(0.068)	(0.065)	(0.087)
Current Characteristics					
Not Married	0.677*	0.852	0.901	0.935	1.234
	(0.121)	(0.300)	(0.381)	(0.329)	(0.501)
In poverty	0.517*	0.680	0.714	0.891	0.343
	(0.153)	(0.422)	(0.367)	(0.553)	(0.183)
Non-metropolitan area	0.882	1.096	1.113	1.045	1.270
	(0.189)	(0.468)	(0.476)	(0.457)	(0.564)
Family size	0.945	1.129	1.166	1.176	1.131

	(0.073)	(0.126)	(0.123)	(0.138)	(0.127)
Marginally food secure		0.966	0.922	1.020	1.457
		(0.421)	(0.374)	(0.426)	(0.523)
Food insecure		0.276*	0.428	0.360	0.379*
		(0.140)	(0.214)	(0.207)	(0.173)
Midlife Characteristics					
Marital History (% reports married)		0.666	0.886	0.852	0.919
		(0.358)	(0.486)	(0.452)	(0.492)
Mean income		1.237*	1.201*	1.170*	1.118
		(0.100)	(0.103)	(0.0810)	(0.107)
Health Insurance History (% waves with Medicaid)		1.242	1.180	1.657	1.413
		(0.701)	(0.761)	(1.013)	(0.817)
Ever not food secure		0.770	0.843	0.798	0.998
		(0.292)	(0.324)	(0.284)	(0.367)
Ever work limited (binary)			0.190***		
			(0.049)		
% reports employed				6.676**	
				(3.654)	
Ever limiting health condition					0.114***
					(0.035)
Constant	0.315	0.463	1.141	0.072*	0.607
	(0.224)	(0.517)	(1.352)	(0.086)	(0.749)
Observations	1239	506	506	506	506
F-test	5.775	3.009	7.198	2.996	8.064
p-value	0.000	0.004	0.000	0.004	0.000

Source: Authors' calculations using PSID data.
Notes:
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

OR = odds ratio; s.e.= standard error

Study 3: Does Social Security promote food security? Evidence for older households

Abstract: Rates of food insecurity among older Americans range from six to nine percent. Older adults may have access to Social Security benefits, which may increase household income levels and make food more affordable for older households. This study examines the effect of Social Security benefits received in old age on the probability of living in a food secure household using repeated cross sections from the Panel Study on Income Dynamics (PSID) and an instrumental variable approach to address the endogeneity between the decision to claim Social Security pensions and household food security. Results suggest that Social Security might increase the probability of living in a food secure household. While our results were robust to changes of the dependent variable or the endogenous variable, they were sensitive to some of the expansions or contractions of the sample. The links between Social Security income and food security should continue to be explored in further research.

Introduction

An estimated six to nine percent of older Americans are living in food insecure households, depending on the data used, the lower-bound age specified, the reference period, and the time frame in question (Brostow et al., 2017; Brucker and Coleman-Jensen 2017; Goldberg and Mawn 2015; Kregg-Byers 2014; Ziliak and Gundersen, 2020). Rates of food insecurity are higher for subpopulations of older adults, including those with lower levels of household income. For example, 39 percent of adults aged 60 and older who live in households with incomes below or at the poverty line and 30 percent of seniors with incomes between 100 and 200 percent of the poverty line live in food insecure households (Ziliak and Gundersen, 2020). In the U.S., older adults may have access to

monthly public retirement income benefits (i.e., Social Security benefits) which may increase household income levels and make food more affordable for older households. At the same time, prior research has also found that nutrient intake reduces at retirement (Stephens and Thoohey 2018) and aging may bring chronic health conditions that strain the household budget and associated food purchasing. Reducing senior food insecurity in the U.S. is a continuing challenge, and one that the COVID-19 pandemic may have worsened. Social Security benefits could be a lifeline to seniors struggling economically as manifested through food insecurity. While Social Security benefits have been found to reduce income poverty for older adults in the U.S. (Engelhardt et al. 2005; Engelhardt and Gruber 2006; Marchand and Smeeding 2016), whether Social Security benefits impact food security, and if so, how, has not been examined to date and is an important policy question. If receipt of Social Security benefits is associated with reductions in levels of food insecurity on the aggregate, policymakers can further investigate whether this impact is similar across subpopulations and, if not, how to ensure equity. If receipt of Social Security income is associated with increases in food insecurity overall or for certain subpopulations, policymakers can examine ways this impact can be reversed. Lastly, if no impact is found, policymakers can still consider possible policy actions, including linking older adults with available nutrition assistance programs at the time of application for Social Security benefits.

Using data from the Panel Study on Income Dynamics, this paper uses an instrumental variable technique to model Social Security benefit receipt and its effect on food security for older adults. Our results provide suggestive evidence that Social Security income may improve food insecurity for older adults.

Literature review

Upon retirement, older Americans may have access to monthly public retirement income benefits as well as public health insurance. Adults qualify for retired worker benefits if they have a minimum level of earnings over 40 3-month periods or a total of ten years of earnings over their working lives (Carr 2019). In 2017, the average monthly payment was $1,400 for retired workers and $2,300 for couples when both spouses were receiving benefits. Marital status thus plays a critical role in terms of Social Security retirement benefits. Those who are married are more likely to not only receive Social Security but also to have higher monthly benefits and lower rates of poverty (Lin et al. 2017). An estimated 40 percent of older adults would be living beneath the official poverty line, compared to the current rate of 10 percent, without Social Security retirement benefits (Carr 2019).

In the U.S., monthly income from the age-based component of Social Security (Old-Age and Survivors Insurance) is available to insured workers at age 62 (although at 70 percent of full benefit levels). Beneficiaries who delay claiming benefits until older ages (until age 70) receive actuarial increases in the monthly benefit (Brown et al., 2020; Social Security Administration, 2020). Many individuals are waiting until full retirement age to receive benefits (Behaghel and Blau 2012; Kopczuck and Song 2009; Song and Manchester 2008). In 2018, approximately one quarter of fully insured people opted to receive Social Security retirement benefits prior to full retirement age (24 percent of men, 26 percent of women). While 44% - 45% of men who were eligible to claim Social Security benefits at age 62 did so prior to the year 2000, this portion fell to just 22% in 2015 – 2018. Relatedly, over 80% of 65-year-old men claimed retirement benefits up to the early 2000s. However, this portion has precipitously dropped to 52% in 2010 and 39% in 2018 (Purcell 2020). Persons with lower levels of education are more apt to claim benefits early (Venti and Wise 2014).

The age at which people can claim full Social Security retirement benefits is shifting to later ages in the U.S. Workers born before 1942 are eligible at age 65, workers born between 1942 and 1960 are not eligible for full benefits until age 66, and those born after 1960 become eligible for full benefits

at age 67 (Social Security Administration, 2020). Social Security Disability Insurance (DI) receipt can provide a source of income for older adults as well. DI provides monthly income to persons who have worked at a sufficient level over their careers and who are unable to work for a year or more due to a disability (SSA, 2021). In 2018, a significant proportion of older adults aged 62 to 64 received DI (16 percent of men, 14 percent of women). Older persons might also receive Supplemental Security Income (SSI), a means-tested monthly income benefit provided by the Social Security Administration to persons who are aged (at least age 65), blind, or disabled.

Individuals might, of course, also have access to individual retirement savings or pensions as they age which can boost economic security. On average, however, Social Security accounts for about one-third of older adults' income. Certain subpopulations, including older women, minorities, and poorer older adults are much more dependent on Social Security (Carr 2019). Among lower-income households for example, Social Security benefits account for more than three-quarters of monthly income. This contrasts with the percentages of household income provided by Social Security for middle-income households (52 percent) and higher-income households (21 percent) (Carr 2019).

Higher levels of Social Security income have been found to lead to improvements in health including significant improvements in functional limitations (e.g., bathing, eating, preparing meals) and cognitive function (Ayyagari 2015). Workers in fair or poor health have been found to accelerate retirement by one to two years (Coe and Goda 2014), as ease of access to health care before Medicare eligibility at age 65 influences retirement decisions. Those that have experienced disadvantage over their life courses can experience higher health care costs as they age (Garcia and Reyes, 2018; Hungerford 2007), which may also accelerate claiming behavior.

Certain individual and household characteristics are tied to financial well-being in old age. Higher educational attainment is tied to higher retirement plan balances and overall financial wealth at retirement (Poterba, Venti, and Wise 2013; 2018). Higher education is also associated with higher

levels of Social Security retirement benefits (Purcell et al., 2015). Being married improves economic stability as well (Lin et al. 2017). Having a disability reduces economic security in old age (Autor et al. 2020; Meyer and Mok 2016). Midlife experiences are relevant as well. For women, midlife workforce participation, income, and rural residence are associated with economic outcomes at age 60 and older (Vartanian and McNamara 2004). Persons who experience chronic hardships such as income deprivation (family income below 150 percent of poverty and family income below 100 percent of poverty) or housing deprivation (being a renter or living in overcrowded housing) in middle age are significantly more likely to experience adverse old-age outcomes such as poverty, poor health, and owning few assets (Hungerford 2007).

The PSID offers an opportunity to examine food insecurity for older adults as they receive Social Security benefits in retirement. At the aggregate, Social Security receipt has been found to reduce income poverty for older adults in the U.S. (Engelhardt et al. 2005; Engelhardt and Gruber 2006; Marchand and Smeeding 2016). Prior research has found that nutrient intake reduces at retirement, however (Stephens and Thoohey 2018). Individual characteristics such as educational attainment, family status, race/ethnicity, and physical and mental health status as well as household characteristics have been identified as key correlates of food insecurity among older adults (Bishop and Wang 2018; Brewer et al. 2010; Brucker and Coleman-Jensen 2017; Do et al. 2015; Gundersen and Ziliak 2015; Himmelgreen and Romero-Daza 2010; Jih et al. 2018; Kregg-Byers 2014; Lee and Frongillo 2001b; Ziliak et al. 2008; Ziliak and Gundersen, 2017; Ziliak and Gundersen 2016; Wolfe et al. 1996).

While these correlates are all important, we are interested here in examining the relationship between receipt of Social Security income and household level food insecurity, a correlate of poverty. While for many households, receipt of Social Security benefits is associated with increases in income, aging is often associated with increased medical expenses which may offset any income gains seen

from Social Security. In addition, aging is often accompanied by increasing limitations in activities of daily living (ADLs) including the ability to travel outside the home or prepare food, which may restrict the ability to access food and move more elderly into lower levels of food security status.

Methods

Data

To address the impact of Social Security on food security, we rely on the Panel Study of Income Dynamics (PSID). The PSID began in 1968 as a nationally representative sample of US households and has since sampled original respondents and their descendants annually or biennially (PSID 2018). PSID further includes the full 18-item Household Food Security Module (HFSM), an instrument developed by the U.S. Department of Agriculture (USDA) that is key to understanding food security. Each of the responses to the 18 questions is coded a one if it indicates some degree of food insecurity and zero otherwise. Responses to each binary question are used to develop a raw score, ranging from zero to eighteen. The first 10 questions are specific to adults in the household and the last eight questions pertain to children if any are present in the household. Families with a raw score of zero to two are considered to have high or marginal food security. Families with a score of three or more are considered low food secure and families with a score of six or more (for childless households) or eight or more (for households with children) are considered very low food secure. The HFSM is included in the 1999, 2001, 2003, 2015, and 2017 waves of PSID in the main family file. In the 1999-2003 surveys, HFSM questions relate to the year prior to the survey. In the 2015 and 2017 surveys, the reference period is the prior 12 months (Tiehen, et al. 2018). While rates of food insecurity reported in the PSID are lower than those reported in the Current Population Survey (the primary data source used to provide official annual food security statistics in the U.S.), primarily due to differences in demographics between the two samples, the PSID identifies similar correlates of food security (e.g. being further above the poverty line is associated with lower rates of food insecurity;

higher rates of education, being married, and being white are associated with lower rates of food insecurity) (Tiehen et al. 2018).

The empirical sample consists of households observed in 1999 – 2003 or 2015 – 2017 where the head is at least 64 years old, but less than 67 years old. Only five waves of data are used because food security status was only observed in these waves. The limited age range focuses on heads who are eligible for early retirement benefits or those who are at, or nearing, the Full Retirement Age. Female-headed households who are currently or previously married (N = 11 and 304, respectively) are excluded from the main sample[2], but retained in sensitivity analyses. The final sample has 926 household-wave observations and is analyzed as a repeated cross section. In the PSID, coupled households default to male-headed households. Only a third of households are observed twice. All analyses utilize PSID cross-sectional weights and account for the complex survey design.

Measures

[2] Women in these birth cohorts spent more time out of the labor market in midlife and can have less consistent earnings histories to form the basis of individual Social Security Retirement benefits. Because Social Security benefits are a function of previous earnings, women's benefits may differ from men's, and induce sex-based heterogeneity of the main effect. Sample sizes are insufficient to stratify or interact sex, marriage, and benefits.

In the main specification, households that were food secure included those who had high or marginal food security. We include one model where we restrict the definition of 'food secure' to just high food security. Receipt of Social Security retirement income was measured at the family unit level. Social Security income might include retirement income or income from Social Security disability benefit programs (Social Security Disability Insurance or Supplemental Security Income) and may represent receipt by other family unit members (i.e., an older co-resident parent or child with a disability).

Covariates included age, marital status (single males or single females vs. married households), level of education (the head's educational attainment), minority status (if anyone in the household was a minority), living in a metropolitan area, average household health[3], and whether anyone in the household was without health insurance.

Empirical Strategy

We start with a simple Linear Probability Model (LPM) of Social Security income and household food security for seniors as in equation 1.

(1)
$$Food\ Secure_{ht} = \beta_0 + \beta_1 ln\ (SS\ \ )ht + \sum\ \ \beta_j X_{ht} + \varepsilon_{ht}$$

β_1 is the coefficient of interest, with $ln(SS\ \ )ht$ being the natural log of household (h) Social Security receipt at time t. We include a collection of household-head and household control variables (X_{ht}) suspected as jointly correlated with food security and Social Security receipt: household head's age

[3] Each wave household heads and partners report their overall health status on a 5-point Likert scale ranging from "excellent" health to "poor" health. To measure average household health, we transform this scale into the HALex health measure that captures quality of life (Erickson 1998; Erickson, Wilson, & Shannon 1995; Johnson & Schoeni 2011) on a scale of zero to one hundred where zero corresponds to a state of health near death and one hundred corresponds to perfect health. Following previous literature, "poor" health receives a score of 15, "fair" health is 50, "good" health is 77.5, "very good" health is 90, and "excellent" health is 97.5.

(normalized to 60 years old) and education (reference: less than high school, high school, some college, and 4+ years college), household's race/ethnicity (binary indicator for any minority in the household), sex and marital status (reference: married, single males, and single females), household's metro-area residence, the average health[4] of the household, and an indicator for whether a household member is without health insurance. ε is a random error term.

The household or individual's decision to apply for Social Security may in part be driven by one's economic situation, including by one's food security status. This makes the β_1 coefficient in equation (1) endogenous. The results of estimates based on equation (1) may show a correlation between food security and Social Security receipt, but not an impact of Social Security receipt on food security. We address this endogeneity by instrumenting $ln(SS\ )ht$ with the Social Security Administration's Full Retirement Age (FRA). A similar design has been employed in a few previous studies examining the impact of retirement on health and cognition (Bonsang, Adam, & Perelman 2012; Calvo, Sarkisian, & Tamborini 2013; Rohwedder & Willis 2010)[5]. Amendments to the Social Security Act in 1983 phased in a shift in the FRA from age 65 to age 67 based on birth cohort (Purcell 2020). The decision to begin Social Security benefits is likely influenced by the individual's FRA, but food security per se is not expected to be impacted by the full retirement age. These amendments

[4] Health is reported as excellent, very good, good, fair, or poor. We follow previous literature transforming this Likert scale to HALex, which approximates quality of life on a scale of one to one hundred (e.g., Erickson 1998; Erickson, Wilson, & Shannon 1995; Johnson & Schoeni 2011), prior to averaging health among all household members.

[5] Note: these studies typically also instrument the retirement decision with the full retirement age plus minimum retirement age (Bonsang, Adam, & Perelman 2012; Rohwedder & Willis 2010) or early retirement offers (Calvo, Sarkisian, & Tamborini 2013) due to data limitations. Bonsang et al. (2012) rely on the 1931-1941 HRS birth cohorts, of which the 1931-1937 cohorts all have the same full retirement age. They focus then more on the age discontinuity rather than variation in the FRA. Rohwedder & Willis (2010) solve a similar issue by using a cross-national sample including European nations with parallel studies (ELSA/SHARE) with more variation in early retirement ages. Calvo et al. (2013) instead add offers of early retirement to their instrument. Our study design by contrast relies only on the FRA; however, the sampled birth cohorts span most of the full transition from age 65 to 67.

introduce exogenous variation in the age eligibility for full Social Security pension benefits, which we exploit in a two-stage least squares instrumental variable (IV) model as per equations (2) and (3) below:

$$(2)\ ln(SS\ \ )ht = \alpha_0 + \alpha_1 FRA_h + \sum\ \ \alpha_j X_{ht} + \varepsilon'_{ht}$$

$$(3)\ Food\ Secure_{ht} = \beta_0 + \beta_1 \widehat{ln(SS)}\ \ ht + \sum\ \ \beta_j X_{ht} + \varepsilon_{ht}$$

where FRA_h is a binary indicator of Social Security eligibility for the head of household *h* depending on age at the interview and birth cohort. We use the same control variables (X_{ht}) as in equation (1) in (2) and (3). In equation (3), $\widehat{ln(SS)}\ \ ht$ is the predicted natural log of Social Security receipt estimated from equation (2). With this model, we can lend a more causal interpretation to results on the impact of Social Security income on food security for older households[6].

Figure 1 highlights the variation in Social Security benefits and receipt for male and never-married female-headed households among birth cohorts entering FRA eligibility at age 65 and 66 (1927-1937 and 1943-1954 cohorts, respectively). There is a clear difference in Social Security claiming behavior on both the extensive and intensive margin. Older cohorts tend to retire earlier while younger cohorts appear to delay retirement. Beyond age 67, cohorts subjected to a later retirement age also begin to receive higher benefits. This is consistent with evidence in Purcell (2020) highlighting dramatic shifts in claiming behavior among cohorts retiring in recent years. We leverage this exogenous variation in claiming behavior to identify a plausibly causal impact of Social Security on food security.

[6] Consistent with Hahn, Todd, and Klaauw (2001), this estimation strategy can also be thought of as a fuzzy Regression Discontinuity model.

INSERT FIGURE 1 HERE

With the instrument defined by birth cohort, we do not include birth cohort fixed effects under the assumption that there is no discernible trend in food security based on birth cohort. The 2015 wave has a convenient clustering of the 1943 – 1954 birth cohorts where about half of cohorts have reached the FRA, while the other half have not. Importantly, all these cohorts reach the FRA at age 66. Figure 2 captures the probability of living in a food secure household (among male - and never-married female-headed households) by birth cohort (1943 to 1954) in the 2015 wave. Although older cohorts appear to have slightly higher probabilities of food security relative to younger cohorts, the older cohorts have all reached the FRA. Notably, within groupings of birth cohorts on either side of the FRA there does not appear to be any systematic difference of food security across birth cohorts.

INSERT FIGURE 2 HERE

Results

Table 1 provides descriptive statistics for the main sample. Ninety-three percent of the sample lived in food-secure households. While 47% of food-secure households had reached the FRA, only 36% of food insecure households had. Marriage is the most common living arrangement in food secure households. Table 1 also highlights a clear education gradient in food security. Household heads with higher education are more prevalent in food secure households, while heads with lower educational attainment are more prevalent in food insecure households. Approximately a quarter of our sample represents households where at least one member is of a minority racial or ethnic group. Among food insecure households, however, that portion rises to over 50%. Overall self-reported health status is another key delineating characteristic between food secure and insecure homes. The average health of food insecure homes is slightly above "fair", while average health in food secure homes is near "good". Over 10% of households had at least one member without health insurance,

and this portion rose to around a quarter of food insecure households. Because we use repeated cross-sections in our multivariate analysis, we also describe, in Table 1, the portion of each sample with one or two observations. Approximately one third of the sample is observed twice, but we do not identify differences in the portion of households with multiple observations by food security status.

INSERT TABLE 1 HERE

Table 2 shows the results of the simple Linear Probability Model (LPM) in column (1) and the IV models in columns (2) through (8). In column (1), where receipt of household Social Security is not instrumented, receipt of Social Security income is not significantly associated with household food security. The point estimate suggests a negligible association where a 10% increase in Social Security income is linked with a 0.04 percentage point increase in the probability of being food secure. Household food security is positively correlated with having higher educational attainment and better health, but negatively correlated with metropolitan areas, having a member without health insurance, and minority households. Single men are less likely to be food secure, while never-married women appear a little more likely to be food secure[7] compared to married couples.

Columns (2) through (8) use an IV model to address the endogeneity of SS receipt. In all cases, the first stage of the IV model has an F statistic above 10 and, as expected, the Social Security Administration's FRA significantly and strongly predicts Social Security receipt (the full set of results of the first stage are in table A1). In contrast with the LPM results of column (1), the IV model in column (2) suggests that a 10% increase in Social Security benefits increases the likelihood of food security by over half a percentage point. Column (3) suggests that grouping marginal food security

[7] Caution should be exercised in drawing conclusions from never-married female-headed households as there are only 55 household-wave observations in the sample.

with food insecurity in the dependent variable elicits a similar effect as in the main specification in column (2). Column (4) replaces Social Security income with a Social Security receipt binary and finds a significant impact of Social Security on food security with a coefficient of 0.54. Additional columns further test the sensitivity of the results by altering the sample under consideration. In columns (5) and (6), wider age bands are used and results suggest a similar effect but there is no longer statistical significance at 5% as in the main specification. Likewise, expanding or contracting the sample to all households (7) or married couples (8) results in a positive coefficient for SS income but estimates are no longer statistically significant. Results for the covariates remain consistent and as expected as with the LPM model. For instance, those with higher levels of education or health typically have higher probabilities of living in a food secure household. We also examine the sensitivity of weighting and repeated observations in the IV-LPMs in Appendix Table A2. An unweighted model results in significantly different results, although since we make use of the SEO, weights are preferable. Clustering errors at the household level (and removing PSID cluster and strata from estimation) results in a slightly wider confidence interval while longitudinal weights (and a correspondingly smaller sample) results in an insignificant point estimate for Social Security benefits. We note that although standard errors can be larger, pointing to imprecise estimates, the estimate itself is robust across these variations. Using a randomly selected observation from households observed twice also produces robust results.

INSERT TABLE 2 HERE

Discussion and concluding remarks

While Social Security pensions have been shown to reduce poverty for older adults in the U.S. (e.g, Engelhardt et al. 2005;), whether Social Security income for seniors impacts food security has

not been investigated and is important for policy. To our knowledge, this paper provides the first analysis of the impact of Social Security income on food security. Using PSID data and an IV model, our results suggest that Social Security might increase the probability of living in a food secure household. This highlights the role Social Security income might play in ensuring that America's older households have access to the food necessary to live a healthy, active life. While our results held when we changed the dependent variable or the endogenous variable, they were sensitive to some of the expansions or contractions of the sample. This suggests that the results found in this paper should be corroborated in further research.

Social Security benefits may have heterogeneous effects across demographic and socioeconomic groups and the effects of receiving Social Security benefits are expected to be more pronounced for more disadvantaged groups. The small sample size of the PSID limits our ability to fully explore this. This research could be continued with larger datasets, including those that can be matched to administrative Social Security data. The Current Population Survey (CPS) could be used to continue to study the impact of Social Security income on food security, perhaps using the same IV model as in this paper. Using the CPS would also allow for distinguishing among those receiving Social Security retirement income, Social Security Disability Insurance, or Supplemental Security Income which is important as the characteristics of these beneficiaries vary on many dimensions.

In addition, this paper is so far silent on the mechanisms whereby Social Security benefit receipt may help with household food security. Social Security benefits may have direct impacts on food security by boosting income or reducing income volatility and thus allowing households to consistently acquire more healthy food. Social Security benefits may also impact food security through indirect channels, for instance through time, physical, and/or mental health. The premise of receiving Social Security benefits is that an individual leaves the labor market – thereby potentially increasing time available for healthy food preparation. As Ayyagari (2015) noted, higher Social Security benefits

are also tied to significant improvements in functional limitations as well as cognitive function (Ayyagari & Frisvold 2016) for some populations. These improvements could impact access to food, as those with fewer functional limitations may be better able to obtain and prepare necessary food. As our results indicated, households that included at least one person with a limiting health condition had reduced probabilities of living in a food secure household. Future research which includes more detailed information about health and functional limitations and Social Security benefit receipt could also explore more closely the exact nature of the relationship among benefits, health, and food security for seniors, and more broadly on the pathways whereby Social Security benefits may impact food security.

Bibliography

Autor, D., Maestas, N. and Woodbury, R. Disability policy, program enrollment, work and well-being among people with disabilities. Social Security Bulletin, 80, 1. Available: https://www.ssa.gov/policy/docs/ssb/v80n1/v80n1p57.html.

Ayyagari, P. and Frisvold, D. (2016). The impact of Social Security income on cognitive function at older ages. *American Journal of Health Economics*, 2, 4, 463-488.

Ayyagari, P. (2015). Evaluating the impact of Social Security benefits on health outcomes among the elderly. Boston, MA: Center for Retirement Research. Available: https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2669699.

Behaghel, L. and Blau, D.M. (2012). Framing Social Security reform: Behavioral responses to changes in the full retirement age. *American Economic Journal: Economic Policy,* 4, 4, 41-67.

Bishop, N. and Wang, K. (2018). Food insecurity, comorbidity, and mobility limitations among older U.S. adults: Findings from the Health and Retirement Study and Health Care and Nutrition Study. *Preventive Medicine*, 114, 180-187.

Bonsang, E., Adam, S., & Perelman, S. (2012). Does retirement affect cognitive functioning? *Journal of Health Economics*, *31*(3), 490–501.

Brewer, D.P, Catletter, C.S., Porter, K.N., Lee, J.S., Hausman, D.B., Reddy, S. and Johnson, M.A. (2010). Physical limitations contribute to food insecurity and the food insecurity-obesity paradox in older adults at senior centers in Georgia. *Journal of Nutrition for the Elderly*, 29, 2, 150-169.

Brostow, D.P., Gunzburger, E., and Thomas, K.S. (2017). Food insecurity among veterans: Findings from the Health and Retirement Study. *The Journal of Nutrition, Health and Aging*, 21, 10, 1358-1364.

Brown, J., Choi, J., Coile, C., and Woodbury, R. (2020). Social security and financial security at older ages. *Social Security Bulletin*, 80, 1.

Brucker, D.L. and Coleman-Jensen, A. (2017). Food insecurity across the adult life span for persons with disabilities. *Journal of Disability Policy Studies*, 28, 2, 109-118.

Calvo, E., Sarkisian, N., & Tamborini, C. R. (2013). Causal effects of retirement timing on subjective physical and emotional health. *Journals of Gerontology Series B: Psychological Sciences and Social Sciences*, *68*(1), 73–84.

Carr, D. (2019). *Golden years? Social inequality in later life.* New York: Russell Sage Foundation.
Center on Budget and Policy Priorities. (2017). SNAP helps millions of low-income seniors www.cbpp/research/food-assistance/snap-helps-millions-of-low-income-seniors.

Coe, N. and Goda, G.S. (2014). How much does access to health insurance influence the timing of retirement? RRC paper no. NB14010. Cambridge, ME: NBER.

Do, D., Rodgers, R., and Drew, J. A. R. (2015). Multigenerational families and food insecurity in the United States, 1998-2013. University of Minnesota.
www.ihis.us/ihis/resources/IHIS_Data_Brief_No_1.pdf

Engelhardt, G.V. and Gruber, J. (2006). Social Security and the evolution of elderly poverty. In Public Policy and the Income Distribution, edited by Alan J. Auerbach, David Card, and John M. Quigley. New York: Russell Sage Foundation.

Engelhardt, G.V., Gruber, J. and Perry, C.D. (2005). Social Security and elderly living arrangements: Evidence from the Social Security notch. *Journal of Human Resources*, 40, 2, 354-72.

Erickson, P. (1998). Evaluation of a population-based measure of quality of life: the Health and Activity Limitation Index (HALex). *Quality of Life Research*, *7*(2), 101–114.

Erickson, P., Wilson, R., & Shannon, I. I. (1995). Years of healthy life. *Healthy People 2000 Stat Notes.* April, 7, 1-15. Doi: 10.1037/e583992012-001.

Garcia, M.A. and Reyes, A.M. (2018). Prevalence and trends in morbidity and disability among older Mexican Americans in the Southwestern United States, 1993-2013. *Research on Aging*, 40, 4, 311-339. doi: 10.1177/0164027517697800.

Goldberg, S.L. and Mawn, B.E. (2014). Predictors of food insecurity among older adults in the United States. *Public Health Nursing*, 32, 5, 397-407.

Gundersen, C. and Ziliak, J.P. (2015). Food insecurity and health outcomes. *Health Affairs*, 34, 11, 1830-1839.

Hahn, J., Todd, P., & Klaauw, W. V. D. (2001). Identification and estimation of treatment effects with a regression discontinuity design. *Econometrica, 69*, 201-209.

Himmelgreen, D.A., and Romero-Daza, N. (2010). Eliminating 'hunger' in the U.S.: Changes in policy regarding the measurement of food security. *Food and Foodways: History and Culture of Human Nourishment*, 18, ½, 96-113. DOI: 10.1080/07409711003708611.

Hungerford, T.L. (2007). The persistence of hardship over the life course. *Research on Aging*, 29. 6, 491-511. 10.1177/0164027507305736.
Huang, J., Guo, B. and Kim, Y. (2010). Food insecurity and disability: Do economic resources matter? *Social Science Research*, 39, 111-124.

Jih, J., Stijacic-Cenzer, I., Seligman, H.K., Boscardin, W.J., Nguyen, T.T. and Ritchie, C.S. (2018). Chronic disease burden predicts food insecurity among older adults. *Public Health Nutrition*, 21, 9, 1737-1742.

Johnson, R. C., & Schoeni, R. F. (2011). The influence of early-life events on human capital, health status, and labor market outcomes over the life course. *The BE Journal of Economic Analysis & Policy*, *11*(3).

Kopczuk, W. and Song, J. (2008). Stylized facts and incentive effects related to claiming of retirement benefits based on Social Security administration data. Michigan Retirement Research Center Paper No. 2008-200. Available: https://papers.ssrn.com/sol3/papers.cfm?abstract_id=1338222.

Kregg-Byers, C.M. (2014). Predictors of food security status in older adults living in the Northeast United States. Pittsburgh, PA: University of Pittsburgh. Dissertation. https://drive.google.com/drive/folders/1kZkKd29pAN1o2auaMa8TOZ4L5tKSYxmf .

Lee, J.S. and Frongillo, E.A. (2001). Factors associated with food insecurity among U.S. elderly persons: Importance of functional impairments. *Gerontol B Psychol Sci Soc Sci,* 56, 2, S94-9. doi: 10.1093/geronb/56.2s94.

Lin, I-F., Brown, S.L. and Hammersmith, A.M. (2017). Marital biography, Social Security receipt, and poverty. *Research on Aging*, 39, 1, 86-110. doi: 10.1177/0164027516656139.

Marchand, J. and Smeeding, T. (2016). Poverty and aging. In *The Handbook of the Economics of Population Aging*, vol 1B, edited by J. Piggott and A. Woodland. New York: Elsevier.

Meyer, B. and Mok W.K.C. (2016). "The Material Well-Being of Disabled Retirees: Evidence from the PSID." NBER DRC Working Paper No. NB16-06. Cambridge, MA: National Bureau of Economic Research.

Poterba, J., Venti, S. and Wise, D.A. (2013). The financial crisis and saving in personal retirement accounts. RRC Paper No. NB13-02. Cambridge, MA: National Bureau of Economic Research.

Purcell, P. J. (2020). *Employment at Older Ages and Social Security Benefit Claiming, 1980–2018*.

Purcell, P.J., Iams, H.M., & Shoffner, D. (2015). Education, earnings inequality, and future Social Security microsimulation analysis. Social Security Bulletin, 75, 3. Available: https://www.ssa.gov/policy/docs/ssb/v75n3/v75n3p15.html.

Rohwedder, S., & Willis, R. J. (2010). Mental retirement. *Journal of Economic Perspectives*, *24*(1), 119–38.

Social Security Administration. (2020). Benefits planner: Retirement. Benefits by year of birth. Available: https://www.ssa.gov/planners/retire/agereduction.html.

SSA. (2021). Disability benefits: How you qualify. Washington, DC: SSA. Available: https://www.ssa.gov/benefits/disability/qualify.html.

Song, J. and Manchester, J. (2008). Have people delayed claiming Social Security benefits? Responses to changes in Social Security rules. *Social Security Bulletin*, 67, 2: 1-23.

Stephens, M., Jr. and Toohey, D. (2018). Changes in nutrient intake at retirement. NBER Working pager 24621. www.nber.org/papers/w24621. Cambridge, MA: National Bureau of Economic Research. May 2018.

Tiehen, L., Vaughn, C., and Ziliak, J.P. (2018). Food insecurity in the PSID: A comparison with the levels, trends, determinants, and correlates in the CPS 1999-2017. Paper presented at APPAM, November 2018.

Vartanian, T.P. and McNamara, J.M. (2004). Older women in poverty: The impact of midlife factors. *Journal of Marriage and Family*, 64, 2, 532-548.

Venti, S.F. and Wise, D.A. (2014). The long reach of education: Early retirement. NBER Working Paper No. 20740. Cambridge, MA: National Bureau of Economic Research.

Wolfe, W.S., Olson, C.M., Kendall, A. and Frongillo, E.A. (1996). Understanding food insecurity in the elderly: A conceptual framework. *Journal of Nutrition Education*, 28, 2, 92-100.

Ziliak, J., Gundersen, C. and Haist, M. (2008). The causes, consequences, and future of senior hunger in America. Special report by the University of Kentucky Center for Poverty Research for the Meals on Wheels Association of America Foundation.

Ziliak, J. and Gundersen, C. (2016). Multigenerational families and food insecurity. *Southern Economic Journal*, 82, 1147-1166.

Ziliak, J. and Gundersen, C. (2017). *The health consequences of senior hunger in the United States: Evidence from the 1999-2014 NHANES*. Report submitted to Feeding America.

Ziliak, J. and Gundersen, C. (2020). *The state of senior hunger in America in 2018. Report submitted to Feeding America.* https://hungerandhealth.feedingamerica.org/wp-content/uploads/2020/05/2020-The-State-of-Senior-Hunger-in-2018.pdf

Table 1: Descriptive statistics of the main sample
(Male and never-married female heads between the ages of 64 and 67 in 1999-2003 or 2015-2017)

Characteristic	Full Sample	Food Insecure	Food Secure
% Food Secure	93.1		
FRA	65.6	65.7	65.6
% Above FRA	46.4	35.9	47.2+
% with SS income	68.8	65.4	69.1
SS income	12460	10499	12606
Age	65.5	65.5	65.5
% Married couple	72.6	48.7	74.4**
% Single Men	20.4	51	18.2**
% Single Women	6.9	0.3	7.4**
% < HS	10.4	38.4	8.3**
% HS/GED	26.6	23.2	26.8
% Some college	23.3	12.7	24+
% College	39.8	25.6	40.9*
% Minority	24	53.2	21.9**
% Metro	76.4	85.1	75.8+
Self-Reported Health	74	56.3	75.3**
% No Health Insurance	10.8	25.1	9.7**
% Observed once	65.4	68.8	65.1
% Observed twice	34.6	31.2	34.9
N	926	74	852

Source: Authors' calculations using PSID data.
Notes: Food secure households comprise both high and marginal food security while food insecure households combine low and very low food security. Self-reported health is the HALex adjusted index where "poor" = 15, "fair" = 50, "good" = 77.5, "very good" = 90, and "excellent" = 97.5 (Erickson et al. 1995, 1995; Johnson & Schoeni 2011). *** $p<0.001$, ** $p<0.01$, * $p<0.05$, + $p<0.1$ in the final column (Food Secure) signifies if the mean or portion of individuals with a particular characteristic differs across food security status.

Table 2: The effect of Social Security on food security

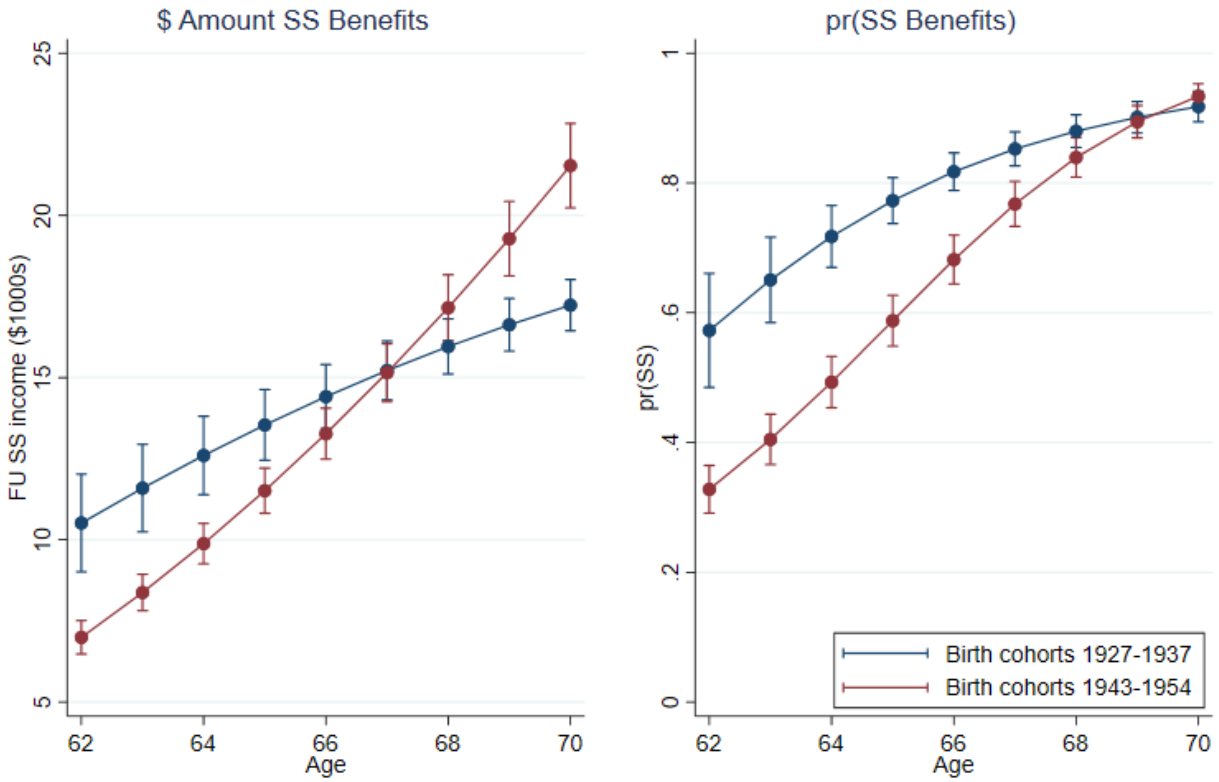
	(OLS) (1)	(IV-LPM) (2)	(IV-LPM) (3)	(IV-LPM) (4)	(IV-LPM) (5)	(IV-LPM) (6)	(IV-LPM) (7)	(IV-LPM) (8)
		(Main results)	(Diff. dep. variable)	(Diff. endo. variable)	(Different samples)			
	LPM Age 64-67	IV-LPM Age 64-67	High Food Security	Any SS	IV-LPM Age 64-68	IV-LPM Age 62-67	All Households	Married Only
ln(SS)	0.004	0.061*	0.078*		0.039+	0.048	0.043	0.051
	(0.003)	(0.030)	(0.037)		(0.021)	(0.040)	(0.034)	(0.038)
Any SS				0.540*				
				(0.250)				
Age (- 60)	-0.015	-0.077*	-0.079+	-0.068*	-0.037	-0.061	-0.048	-0.075
	(0.009)	(0.038)	(0.046)	(0.033)	(0.023)	(0.046)	(0.038)	(0.053)
HS (ref. < HS)	0.127*	0.093	0.117+	0.105+	0.086	0.100*	0.078	0.109
	(0.058)	(0.061)	(0.070)	(0.056)	(0.052)	(0.046)	(0.049)	(0.070)
Some College (ref. < HS)	0.162**	0.156*	0.213**	0.165**	0.126*	0.141**	0.129**	0.191*
	(0.057)	(0.061)	(0.070)	(0.058)	(0.050)	(0.045)	(0.048)	(0.076)
4+ yrs. college (ref. < HS)	0.154**	0.225**	0.290***	0.226**	0.162***	0.184*	0.180*	0.253*
	(0.055)	(0.072)	(0.083)	(0.068)	(0.046)	(0.070)	(0.073)	(0.117)
Single Males (ref. married couple)	-0.102**	-0.125***	-0.120***	-0.129***	-0.081**	-0.090*	-0.119***	
	(0.033)	(0.032)	(0.031)	(0.033)	(0.027)	(0.034)	(0.032)	
Single Females (ref. married couple)	0.073***	0.176*	0.118	0.152*	0.130*	0.024	-0.006	
	(0.020)	(0.076)	(0.109)	(0.064)	(0.059)	(0.084)	(0.035)	
Minority (ref. nH White)	-0.056*	-0.028	-0.072	-0.040	-0.048+	-0.054*	-0.041	-0.027
	(0.027)	(0.035)	(0.048)	(0.032)	(0.028)	(0.025)	(0.030)	(0.046)
Metro Area	-0.038+	-0.003	0.025	0.001	-0.009	0.020	0.007	-0.022
	(0.021)	(0.033)	(0.043)	(0.032)	(0.024)	(0.037)	(0.033)	(0.032)
FU Health (0 = "Good")	0.002**	0.003**	0.005***	0.003***	0.003***	0.003*	0.003**	0.002
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Any FU Member without Insurance	-0.081*	-0.070	-0.065	-0.069	-0.050	-0.048	-0.066	-0.056

	(0.035)	(0.054)	(0.072)	(0.051)	(0.048)	(0.035)	(0.043)	(0.053)
Constant	0.962***	0.867***	0.657***	0.844***	0.820***	0.858***	0.846***	0.928***
	(0.064)	(0.095)	(0.134)	(0.089)	(0.065)	(0.061)	(0.105)	(0.094)
Observations	926	926	926	926	1187	1618	1241	720
First-Stage F		13.06	13.06	12.38	17.85	40.12	17.59	14.12
First-Stage FRA		1.435*	1.435*	0.163*	1.289**	0.678+	0.896*	1.124
First-Stage se		(0.586)	(0.586)	(0.062)	(0.457)	(0.381)	(0.427)	(0.685)

Source: Authors' calculations using PSID data.

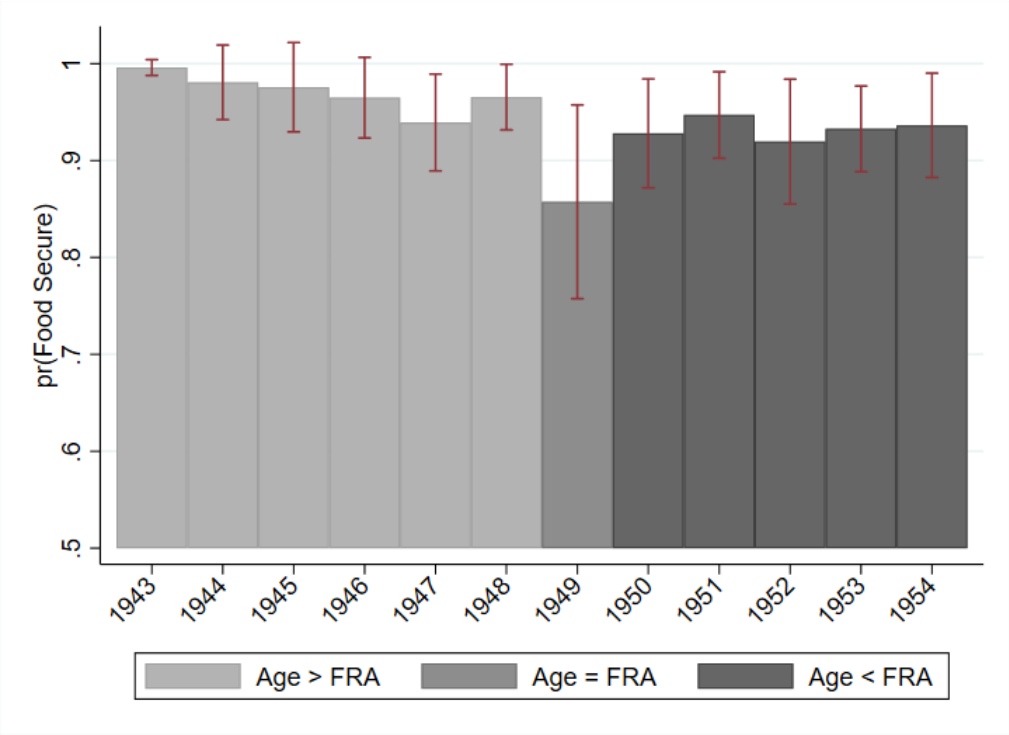
Notes: Food secure households (observed 1999-2003 or 2015-2017) comprise both high and marginal food security while food insecure households combine low and very low food security. Self-reported health is the HALex adjusted index where "poor" = 15, "fair" = 50, "good" = 77.5, "very good" = 90, and "excellent" = 97.5 (Erickson et al. 1995, 1995; Johnson & Schoeni 2011). Column (1) is the LPM without instrumenting ln(SS). All remaining columns instrument ln(SS) with the FRA, except column (8) which instruments any SS (0 = none, 1 = any) with the FRA. 1st stage coefficients and standard errors are in second two rows. Columns (5) – (8) use the same age restrictions from columns (1) and (2). High food security in column (5) groups marginal food security with food insecure households. Male & Female households adds 315 households headed by currently (n = 11) or previously (n = 304) married women in column (6). Column (7) restricts the sample to married households. Standard errors in parentheses. *** p<0.001, ** p<0.01, * p<0.05, + p<0.1

Figure 1: Social Security receipt by birth cohort



Source: Authors' calculations using PSID.
Notes: Birth cohorts 1927-1937 reach FRA at 65 while cohorts 1943-1954 reach the FRA at age 66. The household Security benefits received is on the left panel, while the probability of any Social Security benefits is on the right pan never-married female-headed households are depicted in any wave, not just those with valid food security status.

Figure 2: Average food security by birth cohort in 2015



Source: Authors' calculations using PSID.
Notes: Male- and never-married female-headed households are depicted (N = 1,006). The sample size differs from the main sample as many households in this figure are not between ages 64 and 67.

Table A1: First Stage Regression Results

	(2) Main	(3) High Food Security	(4) Binary SS	(5) Age 64-68	(6) Age 62-67	(7) All Households	(8) Marri Onl
FRA	1.435*	1.435*	0.163*	1.289**	0.678+	0.896*	1.124
	(0.586)	(0.586)	(0.062)	(0.457)	(0.381)	(0.427)	(0.685
Age (- 60)	0.440	0.440	0.033	0.547**	0.968***	0.579*	0.759+
	(0.355)	(0.355)	(0.037)	(0.206)	(0.112)	(0.264)	(0.393
HS (ref. < HS)	0.501	0.501	0.035	0.642	0.163	0.302	0.084
	(0.455)	(0.455)	(0.049)	(0.427)	(0.412)	(0.414)	(0.517
Some College (ref. < HS)	0.038	0.038	-0.013	0.036	-0.329	-0.269	-0.698
	(0.585)	(0.585)	(0.060)	(0.482)	(0.512)	(0.524)	(0.655
4+ yrs college (ref. < HS)	-1.324*	-1.324*	-0.152*	-0.872	-1.353*	-1.421*	-2.165
	(0.635)	(0.635)	(0.067)	(0.523)	(0.590)	(0.535)	(0.751
Single Males (ref. married couple)	0.441	0.441	0.058	0.343	0.687*	0.491	
	(0.399)	(0.399)	(0.042)	(0.380)	(0.339)	(0.400)	
Single Females (ref. married couple)	-1.717*	-1.717*	-0.151+	-2.149**	-1.163+	-0.424	
	(0.764)	(0.764)	(0.078)	(0.664)	(0.594)	(0.326)	
Minority (ref. nH White)	-0.539	-0.539	-0.040	-0.443	-0.282	-0.374	-0.780
	(0.390)	(0.390)	(0.040)	(0.351)	(0.295)	(0.360)	(0.462
Metro Area	-0.541	-0.541	-0.068+	-0.586+	-0.825*	-0.886**	-0.293
	(0.385)	(0.385)	(0.040)	(0.334)	(0.333)	(0.292)	(0.417
FU Health	-0.030**	-0.030**	-0.003**	-0.025**	-0.037***	-0.027**	-0.025
	(0.011)	(0.011)	(0.001)	(0.009)	(0.009)	(0.009)	(0.012
Any FU Member without Insurance	-0.199	-0.199	-0.025	-0.715	-0.286	-0.219	-0.667
	(0.615)	(0.615)	(0.063)	(0.529)	(0.488)	(0.478)	(0.699
Constant	4.728*	4.728*	0.579**	4.174**	2.303**	4.492**	3.818+
	(1.894)	(1.894)	(0.193)	(1.213)	(0.733)	(1.461)	(2.164
Observations	926	926	926	1187	1618	1241	720
F-stat	13.06	13.06	12.38	17.85	40.12	17.59	14.12

Source: Authors' calculations using PSID data.
Notes from Table 2 apply. Column (1) missing such that column numbers correspond to those in Table 2. Standard errors in parentheses. *** p<0.001, ** p<0.01, * p<0.05, + p<0.1

Table A2: Robustness of the IV-LPM

	(1)	(2)	(3)	(4)	(5)
	Main	No weights	Clustered S.E.	Long Weights	Single obs per hh
ln(SS)	0.061*	0.003	0.061+	0.061	0.060*
	(0.030)	(0.036)	(0.036)	(0.039)	(0.030)
Age (- 60)	-0.077*	-0.006	-0.077+	-0.066+	-0.091*
	(0.038)	(0.040)	(0.042)	(0.040)	(0.041)
HS (ref. < HS)	0.093	0.137**	0.093	0.004	0.103+
	(0.061)	(0.053)	(0.069)	(0.077)	(0.055)
Some College (ref. < HS)	0.156*	0.162***	0.156*	0.075	0.165**
	(0.061)	(0.048)	(0.068)	(0.065)	(0.054)
4+ yrs college (ref. < HS)	0.225**	0.149*	0.225**	0.147*	0.222***
	(0.072)	(0.061)	(0.083)	(0.063)	(0.057)
Single Males (ref. married couple)	-0.125***	-0.060+	-0.125**	-0.152**	-0.119***
	(0.032)	(0.033)	(0.048)	(0.055)	(0.034)
Single Females (ref. married couple)	0.176*	0.081	0.176+	0.174+	0.207**
	(0.076)	(0.084)	(0.090)	(0.091)	(0.077)
Minority (ref. nH White)	-0.028	-0.058*	-0.028	-0.022	-0.030
	(0.035)	(0.029)	(0.039)	(0.040)	(0.033)
Metro Area	-0.003	-0.017	-0.003	-0.018	-0.020
	(0.033)	(0.028)	(0.036)	(0.038)	(0.029)
FU Health (0 = "Good")	0.003**	0.002	0.003*	0.002+	0.004**
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Any FU Member without Insurance	-0.070	-0.077+	-0.070	-0.141+	-0.067
	(0.054)	(0.040)	(0.056)	(0.081)	(0.055)
Constant	0.867***	0.854***	0.867***	0.919***	0.935***
	(0.095)	(0.080)	(0.100)	(0.123)	(0.117)
Observations	926	926	926	634	774
First-Stage F	13.06	12.41	11.09	8.198	12.76
First-Stage coef	1.435*	0.099+	0.163*	0.143+	1.490*
First-Stage se	(0.586)	(0.056)	(0.066)	(0.075)	(0.629)

Source: Authors' calculations using PSID data.

Notes from Table 2 apply. The unweighted model (column 2) does not incorporate PSID weights, cluster, or strata. Column (3) retains PSID cross sectional weights, but does not incorporate the complex survey design (i.e., clusters and strata). Errors are instead clustered at the household level. Column (4) replaces cross sectional weights with longitudinal weights. Longitudinal weights are only assigned to PSID-gened sample members, resulting in a slightly smaller sample. Column (5) selects a random observation wave for households that are observed twice. Probit models follow a similar pattern. Standard errors in parentheses. *** p<0.001, ** p<0.01, * p<0.05, + p<0.1