Aging into Medicare among a senior food pantry population:
An assessment of food security, health, and food pantry use over time

Erline E. Martinez-Miller
Social & Scientific Systems

Tammy Leonard
University of Texas Southwestern Medical Center

Sandi L. Pruitt
University of Dallas

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Author Correspondence
erline.miller@utsouthwestern.edu

ABSTRACT

We examined the association of Medicare eligibility with food security and food pantry visiting patterns among senior (aged ≥60 years) food pantry clients in Dallas, Texas. We used data from the pantry linked to electronic health records (EHR) from a safety-net healthcare system. Log-binomial regression was employed to calculate prevalence ratios of food insecurity by Medicare eligibility for all clients and separately for clients with various chronic conditions. We examined the impact of Medicare eligibility on food pantry visiting patterns among a non-disabled sample of clients using regression discontinuity. A member of each eligible household can visit once a month. Data from 604 households with 2,636 visits were analyzed for food security assessments. The majority were female (63%), average age was 68.5, many had less than a high school education (39%), and the majority were Black (60%) or Latino/a (29%). Of those with linked EHR data, 75% had at least one chronic condition. Medicare eligibility was associated with improved food security; this association was consistent among clients diagnosed with any chronic condition, but not among clients without any chronic condition. Additionally, we analyzed 119 households with 457 visits for the regression discontinuity analyses and observed that frequency of food pantry visits increased after becoming Medicare eligible. Overall, our findings highlight how Medicare eligibility may improve food security among seniors, potentially attributable to increased food pantry use after aging into Medicare. Future studies should examine underlying pathways of food pantry visiting patterns and their contributions to senior food security.

EXECUTIVE SUMMARY

Our study sought to identify how Medicare eligibility shapes food security and food pantry visits among food pantry clients aged ≥60 years in Dallas, TX. Food insecurity occurs when household access to adequate, nutritious, and safe food is inconsistent due to limited financial and social resources (Economic Research Service 2018). In 2018, 7.3% of the US population experienced low or very low food security and 2.7% experienced very low food security. *Feeding America* has now projected a food insecurity rate of 20% for Texas in 2020 (Hake et al. 2020). Older adults, herein "seniors", who are food insecure face worse health outcomes than those who are food secure, including lower nutrient intakes and higher risks of chronic conditions and depression (Ziliak, Gundersen, and Haist 2008). The US senior population is growing and by 2050, is projected to reach 83.7 million, twice that of 2012 (Ortman, Velkoff, and Hogan 2014).

Low-income seniors are more likely to have chronic health ailments and challenges obtaining food, such as mobility limitations (Calderón-Larrañaga et al. 2019, McMaughan, Oloruntoba, and Smith 2020). Research demonstrates that people who are food insecure are less likely to be insured compared to those who are food secure (Berkowitz et al. 2018, Pruitt et al. 2016). For example, in a nationally representative US study, 41% of those who were food insecure were uninsured and 31% had no source of usual healthcare (Pruitt et al. 2016). However, seniors who are US citizens or permanent legal residents for at least five continuous years prior become eligible for Medicare at age 65, providing new health resources which carry further downstream benefits. Yet, the impact of eligibility for Medicare on food security among low-income seniors is unknown.

Among senior clients (aged ≥60 years) of a food pantry in Dallas, TX, we aimed to: (1) describe food security and sociodemographic and chronic health (socio-health) characteristics; (2) describe how the prevalence of food insecurity varies by Medicare eligibility status, overall and for seniors with and without chronic conditions; and (3) assess whether Medicare eligibility impacts the frequency at which older adults seek out charitable food assistance.

RESEARCH METHODS

Data. We used data from the Crossroads ClientCare Longitudinal Database (CCLD) in Dallas County, TX. Dallas County is the ninth most populous and one of the most racially and ethnically diverse US counties (Billimek and Sorkin 2012, Lee, Iceland, and Sharp 2012). CCLD consists of data from clients of Crossroads Community Services (hereafter "Crossroads") food distribution centers (2013-ongoing) and linked electronic health records (EHRs) from Parkland Health and Hospital System (Parkland; 2009-ongoing). In Dallas County, Crossroads is the largest nonprofit food distributor and client households had income <185% of the federal poverty level. Clients in our study come from 61 of 86 (71%) Dallas County ZIP Codes.

Analyses. First, we characterized socio-health characteristics of all senior clients and analytic sub-samples and described food security by Medicare eligibility status with descriptive statistics (hereafter, Part 1: *Socio-Health and Food Security Description*). Second, in a visit-level analysis, we described how prevalence of food insecurity among older adults with and without chronic health conditions varied according to Medicare eligibility status with log-binomial regression (Part 2: *Prevalence Ratio Analysis).* Third, we conducted a regression discontinuity (RD) analysis of client food pantry visiting frequency to assess whether use of food assistance changed after Medicare eligibility (Part 3: *RD Analysis*).

From 2015-2018, 7,907 households visited Crossroads with 92,931 visits. We restricted the analytic sample to senior clients, leaving 2,703 senior households with 37,499 visits. For our

objectives, senior clients were divided into sub-samples: (1) all senior clients; (2) all observations with food security assessments (604 households, 2,636 visits); (3) observations in which food security status was assessed and a household client was linked to Parkland EHRs (389 households, 1,818 visits); and (4) for the RD analysis, households with a non-disabled head of household (HOH) with complete covariates, and two pantry visits, one of which was before age 65 years and one on or after turning 65 years of age (199 households, 457 visits). Of the households meeting this criteria, we excluded households with disabled members because individuals with certain disabilities can be eligible for Medicare prior to age 65 (Huffman and Upchurch 2018). Of seniors with food security assessments, 36% reported disability.

Measures. Medicare eligibility begins at age 65 and US citizenship or permanent legal residency is required for at least five continuous years prior to eligibility. We determined Medicare eligibility based on the birth date for the HOH, which was collected from the client at the initial visit: if the HOH was aged ≥65 years at a visit then that visit was defined as a Medicare eligible visit. If the HOH was aged <65 years then the visit was defined as Medicare ineligible. Food security for prevalence ratio analyses was measured at every other visit using the validated, 10-item US Department of Agriculture Adult Food Security Survey Module (Economic Research Service 2017). We categorized food security as high, marginal, low, and very low; and in alternative approaches, we combined low and very low into an "any low" category; and marginal, low, and very low into an "any insecurity" category.[1] Pre-existing chronic conditions were collected via linked EHRs and defined using International Classification of Diseases (ICD)-9 and 10 codes. Pre-existing was defined with a date of diagnosis before initial food pantry visit in the study period. We selected one client per household, beginning with head of household. We examined seven conditions: anxiety, depression, hypertension, chronic obstructive pulmonary disease, diabetes, heart disease, and cancer. Food pantry visits were assessed within the following study periods for RD analyses: 12 months pre- and post-65th birthday and then 6 months pre- and post-65th birthday. Covariates included client and household sociodemographic measures and residential ZIP-code level percentages of US citizenship, Medicare coverage, and foreign-born residents via linked American Community Survey data

RESULTS

Socio-Health and Food Security Description

Among all senior clients, mean age was 70 years, and the majority were non-Hispanic (64%) women (67%) who were unmarried (82%) and had US identification (97%). Forty-one percent were retired, one-third were disabled, and 73% were insured. Food security was assessed at every other visit beginning at the initial visit. Compared to all senior clients, fewer seniors with food security assessments were women (63% vs. 67%), more were Latino/a (29% vs. 15%) and married (25% vs. 15%), and they had lower educational attainment (39% vs. 28% less than high school education). Additionally, fewer were retired (34% vs. 41%) and more were insured (79% vs. 73%), and received Supplemental Nutrition Assistance Program benefits (44% vs. 26%). Differences are likely reflective of differences between analytic populations. The all seniors sample includes clients who visited at least one time, and because food security was measured at every other visit, the clients with food security assessments typically were more frequent visitors. Chronic conditions. Among all households with a food security assessment, 75% had at least one of the seven measured chronic conditions. Sixty-eight percent had hypertension, 32% had diabetes, 23% had depression, and 21% had COPD. The prevalence of

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[1] For most reporting purposes, USDA describes households with high or marginal food security as food secure and those with low or very low food security as food insecure.

anxiety and heart disease was 13% and 11%, respectively, and 6% had cancer. Food security. During the study period, among visits where the HOH was ineligible for Medicare, 26% had high food security, 17% had marginal food security, 27% had low and 30% had very low food security. Among all visits where the HOH was eligible for Medicare, 35% had high food security, 23% had marginal food security, 25% had low and 19% had very low food security. For Medicare ineligible visits, households reported any insecurity in 86% of visits, and for eligible visits, households reported any insecurity in 75% of visits.

Prevalence Ratio Analysis

In adjusted models, though not statistically significant, results suggested visits where the HOH was Medicare eligible had lower prevalence of any low food security and any food insecurity (vs. high food security) when compared to Medicare ineligible visits (0.92 [0.83, 1.02] and 0.91 [0.83, 1.00], respectively). Among households with chronic conditions, Medicare eligible visits had a lower prevalence of any insecurity (vs. high security) when compared to ineligible visits (0.87 [0.77, 0.99]). Among households with no chronic conditions, we did not identify statistically significant associations. Among households with depression, marginal and very low security (vs. high food security) were less common among Medicare eligible visits compared to ineligible visits (0.45 [0.28, 0.70] and 0.61 [0.42, 0.88], respectively). Similarly, among those with COPD, marginal (0.54 [0.30, 0.97]) and very low food security (0.75 [0.56, 0.99]) as well as any insecurity (0.74 [0.63, 0.87]; vs. high security) were less common among Medicare eligible visits than ineligible in adjusted models.

RD Analysis

We estimated 11 different models with different adjustment sets, bandwidths around the 65th birthday, and visiting frequency restrictions among our non-disabled sample. Through our different specifications, we found a robust result that visits to the food pantry increased after age 65. For example, when adjusting for only individual-level covariates, the odds of a monthly visit among households after Medicare eligibility was 6.78 (2.48, 18.53) times that of households before Medicare eligibility. Notably, the association was attenuated when we expanded the bandwidth to 18 or 24 months (Models 4 and 5).

DISCUSSION and CONCLUSIONS

To our knowledge, ours is the first study to examine the association between Medicare eligibility and food security and food pantry use among seniors. Medicare eligibility was associated with improved food security, and associations were consistent among clients with chronic conditions, but not among clients without any chronic conditions. Additionally, we found that for non-disabled seniors, food pantry visits, which are designed to improve food security, increased after becoming Medicare eligible. Overall, our findings highlight how Medicare eligibility may improve food security among seniors, potentially attributable to increased food pantry use after aging into Medicare. Medicare eligibility may improve food security through a variety of underlying health and monetary pathways, including, but not limited to decreased healthcare costs for chronic disease management, referrals to other social services; greater social and health support; and/or improved health which may directly enhance capacity to access food assistance, thereby enhancing functional food security. Future studies should examine underlying pathways of food pantry visiting patterns and their contributions to senior food security. Our work provides evidence for the potential of Medicare eligibility to lessen socioeconomic disparities. With further evidentiary support, our findings could inform policy makers considering extensions for Medicare and can inform policies designed to meet changing food needs among seniors aging into Medicare.

INTRODUCTION

Food insecurity occurs when household access to adequate, nutritious, and safe food is inconsistent due to limited financial and social resources (Economic Research Service 2018). In 2019, 10.5% of the U.S. population experienced food insecurity, and some states experienced above this average: in Texas, 13.1% of households were food insecure (Coleman-Jensen et al. 2020). With the COVID-19 pandemic, *Feeding America* projected that food insecurity could reach 20% among Texas residents in 2020 (Hake et al. 2020). U.S. adults aged ≥60 years, herein termed "seniors", have seen an alarming 38% increase in food insecurity over the past two decades (Ziliak and Gundersen 2020). Households can cope with food insecurity by receiving federal assistance through programs like the Supplemental Nutrition Assistance Program (SNAP), charitable assistance from community food banks and pantries or meal programs, re-allocating funds to food from other necessities like medical care, or a combination of approaches (Gundersen, Engelhard, and Hake 2017, Feeding America and Hunger 2014). An increase in food insecurity among seniors is therefore particularly troubling as the prevalence of chronic conditions, multimorbidity, and other health challenges become more common with age (National Center for Health Statistics 2009).

Food insecure seniors have worse health outcomes compared to food secure seniors (e.g. lower nutrient intake, more and multiple chronic conditions) (Ziliak, Gundersen, and Haist 2008, Feeding America and Hunger 2014). *Feeding America* found that 63% of seniors receiving food assistance have had to choose between medical care or food (Weinfield et al. 2014), of which the adverse impact can be lasting as timely medical management of chronic conditions is critical. In further detriment to those who are food insecure, studies have shown 41% lack insurance, they are less likely to be insured than those who are food secure, and almost one-third has no usual

source of healthcare (Berkowitz et al. 2018, Pruitt et al. 2016). Food insecure seniors are economically unique as they become eligible for "senior benefits" at age 65, including income (i.e. Social Security) and Medicare health insurance, which likely provide a host of new advantageous resources (U.S. Department of Health and Human Services 2014). Medicare, a national health insurance program for those aged ≥65 years with some exceptions, can directly benefit the health and financial status of food insecure seniors as they may have been uninsured or under-insured by private insurance before aging into Medicare (Pruitt et al. 2016, Dugan and Booshehri 2021). Sudden improvements in healthcare access can increase primary care use and improve management of chronic conditions, which can lead to decreased medical expenditures, improved health, and more funds available for other purposes (McWilliams et al. 2007a, McWilliams et al. 2007b).

Despite a theorized beneficial link between Medicare and food insecurity among low-income seniors, whether food security is better among those Medicare-eligible (≥65 years) than those ineligible (<65 years) is unknown. Further, the role of charitable food provision in this transitional age cohort is unclear. Among seniors seeking charitable food assistance in Dallas, TX and using linked electronic health records (EHRs) from Dallas County's safety net healthcare system, we aimed to: (1) assess whether Medicare eligibility is associated with the frequency of which older adults seek charitable food assistance (i.e. food pantry visits); and (2a) describe food security status by Medicare eligibility and (2b) determine whether that association varies by chronic condition status.

RESEARCH METHODS

Analysis and study population overview.

Our goal was to understand the food security and health of senior food pantry clients in Dallas, TX during the transition into Medicare eligibility, and our analysis occurred in three steps. We began by characterizing the socio-health characteristics of all senior clients and analytic sub-samples and then, described food security at visits by Medicare eligibility status using descriptive statistics (hereafter, Part 1: *Socio-Health and Food Security Description*). Next, we described how prevalence of food insecurity among older adults with and without chronic health conditions varied according to Medicare eligibility status (Part 2: *Prevalence Ratio Analysis).* Finally, we conducted a regression discontinuity (RD) analysis of client food pantry visiting frequency to assess whether use of food assistance changed after Medicare eligibility (Part 3: *RD Analysis*).

We used data from the Crossroads ClientCare Longitudinal Database (CCLD) in Dallas County, TX. Dallas County is the ninth most populous and one of the most racially and ethnically diverse US counties (Billimek and Sorkin 2012, Lee, Iceland, and Sharp 2012). CCLD consists of data from clients of Crossroads Community Services (hereafter "Crossroads") food distribution centers (Crossroads; 2013-ongoing) and linked EHRs from Parkland Health and Hospital System (Parkland; 2009-ongoing).

From 2015-2018, 7,907 households visited Crossroads with 92,931 visits. We restricted the analytic sample to senior clients aged ≥60 years, leaving 2,703 senior households with 37,499 visits. For our objectives, senior clients were divided into sub-samples: (1) all senior clients; (2) all observations[2] with food security assessments (604 households, 2,636 visits); (3) observations in which food security status was assessed and a household client was linked to Parkland EHRs (389 households, 1,818 visits); and (4) for the RD analysis, households that had

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[2] Observations are defined as food pantry visits because all data are collected when clients visit the food pantry to obtain food.

complete data for covariates and had two pantry visits, one of which was before age 65 years and one of which was on or after turning 65 years of age (199 households, 457 visits). Of the households meeting this criteria, we excluded households with disabled members because individuals with certain disabilities can be eligible for Medicare prior to age 65 (Huffman and Upchurch 2018). Of seniors with food security assessments, 36% reported disability.

We conducted multiple analyses to address our aims, as briefly summarized here:

(1) Socio-Health and Food Security Description: To describe sociodemographic and health characteristics and food security among senior food pantry clients with food security assessments and all four analytic sub-populations.

(2) Prevalence Ratio Analysis: To identify the association between Medicare eligibility and food security among seniors, we conducted a *visit-level* analysis among all seniors with food security assessments and then among those with linked EHRs, including subgroups with full adjustment sets and different chronic condition subgroups.

(3) RD analysis: To determine the impact of aging into Medicare on food pantry visits among senior households, we conducted a *household-level* analysis in which we restricted the sample to households with food pantry visits in both the time periods before and after becoming Medicare eligible (i.e. turning 65 years).

DATA

In Dallas County, Crossroads is the largest nonprofit food distributor and all client households have income <185% of the federal poverty level. Clients in our study come from 61 of 86 (71%) different Dallas County ZIP Codes. Parkland is an integrated, safety-net healthcare system that provides almost complete coverage of low-income and under- or uninsured adult

residents in Dallas County, including 80% of Crossroads clients (Leonard, Hughes, and Pruitt 2017). Crossroads collects data using Spanish or English language surveys from all clients at each visit (>75% response rate). A household is able to visit Crossroads a maximum of once per month, and all clients are assigned an identification number. Each household has a designated primary Crossroads client, and secondary household members are also able to fulfill the monthly visit. More information on the data linkage is described in the <u>pre-existing chronic conditions section below.</u> Our CCLD study population was restricted to client pantry visits from 2015-2018 due to data completeness and availability; Parkland EHRs were linked from 2009 and onward. This study was approved by University of Texas Southwestern's Institutional Review Board (#022016-003).

Measures

     <u>Medicare eligibility.</u> Medicare eligibility, the independent variable for both analyses, was characterized at different levels for the *prevalence ratio analysis* (at the visit level) and *RD analysis* (at the household level). As outlined by the US Department of Health and Human Services, eligibility for Medicare begins at age 65, and US citizenship or permanent legal residency is required for at least five continuous years prior to eligibility. We determined Medicare eligibility based on the birth date for the head of household (HOH), which was collected from the client at the initial visit: if the HOH was aged ≥65 years at a visit, then that visit was defined as a Medicare eligible visit. If the HOH was aged <65 years, then the visit was defined as Medicare ineligible.

Prevalence Ratio Analysis measures

     <u>Food security assessments.</u> Food security over the last 30 days was measured at every other visit using the validated, 10-item US Department of Agriculture (USDA) Adult Food

Security Survey Module (Economic Research Service 2017). We categorized food security according to the USDA's definitions (Economic Research Service 2018): high, marginal, low, and very low. We also applied alternative categorizations of food security. First, we combined low and very low into an "any low" category. Second, we combined marginal, low, and very low into an "any insecurity" category.[3] For descriptive statistics, we reported the proportion of food insecurity experienced by clients over time defined as the proportion of visits to the food pantry in which the client reported marginal, low, or very low food security. For example, if food insecurity was reported at four of five visits the proportion would be 0.80.

Pre-existing chronic conditions were collected via linked EHRs from Parkland and defined using International Classification of Diseases (ICD)-9 and 10 codes. The ICD system is used to code and classify morbidity data from the inpatient and outpatient records, physician offices, and most National Center for Health Statistics surveys (National Center for Health Statistics 2020). We searched all available EHR data, from inpatient, outpatient, and emergency department encounters. Pre-existing was defined as having a date of diagnosis in the EHR before the initial food pantry visit in the study period. We selected one client per household for the analysis, beginning with the HOH and linking accordingly using personal identifiers if an EHR existed. If HOH did not have a Parkland record, then we determined whether a secondary client from that household, beginning with the first non-HOH client with the earliest visit in the study period, had an EHR and linked accordingly. We completed this process until either we made a linkage, or we exhausted all available clients from a household during the study period. Chronic conditions included anxiety, depression, hypertension, chronic obstructive pulmonary disease (COPD), diabetes, heart disease, and cancer (see supplemental table 1 for ICD-9 and 10 codes).

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[3] For most reporting purposes, USDA describes households with high or marginal food security as food secure and those with low or very low food security as food insecure.

RD Analysis measures

    <u>Food pantry visits.</u> Frequency of food pantry visits were assessed within the following study periods: 12 months pre- and post-65th birthday and then 6 months pre- and post-65th birthday. For this analysis, a visit date was treated as present and no visit as absent.

All covariates

    Covariates included sociodemographic measures for the HOH. Age, sex, official US identification, race/ethnicity, marital status, education level, and veteran status were collected at the initial visit. Employment, including disability status; income; household size; transportation used to get to food pantry; insurance status; and monthly Supplemental Nutrition Assistance Program (SNAP) benefits use were collected at each visit. We also recorded whether clients received food from the main walk-in pantry, or one of the satellite food distribution sites. We additionally linked client residential ZIP Code to American Community Survey data for percentages of residents who were US citizens; residents ≥65 years who had Medicare coverage alone or jointly with other coverage; and residents who were foreign-born.

Analyses

    For the *Socio-Health and Food Security Description*, we described sociodemographic and chronic condition characteristics of senior clients and analytic sub-samples. We reported total N and percentages or means and minimum and maximum values. We then described food security among visits stratified by Medicare eligibility. We reported level of food security at the most recent visit as well as the proportion of household visits at which the household reported being food insecure.

    For the *Prevalence Ratio Analysis* where we examined the association between Medicare eligibility and food security, we conducted a *visit-level* analysis with log-Poisson regression to

produce prevalence ratios (PR) and 95% confidence intervals (95% CI) (Zou 2004). We treated Medicare ineligible visits as the referent category and Medicare eligible visits as the exposure of interest. High food security was treated as the referent level. To account for clustering by household, we used general estimating equations with an autoregressive correlation matrix. We completed an unadjusted analysis and an adjusted analysis. Full adjustment included HOH sex; race/ethnicity; marital status; education; employment; monthly household income; household size; transportation use; SNAP receipt; official US identification; and percentage of ZIP Code residents that were US citizens, insured with Medicare, and foreign-born.

To examine whether the association was modified by chronic conditions, we then conducted the same analyses among those with EHRs, separately among those with and without any chronic condition. Fourth, we conducted the same analyses by type of chronic condition. Unadjusted and adjusted analyses were completed for all analyses among those with EHRs.

For the *RD analysis* investigating the impact of Medicare eligibility on food pantry visiting patterns, we used sharp RDs to produce odds ratios (OR) and 95% CIs in a *household-level* analysis. We first intended to use fuzzy RD using the client's self-report of whether they are insured with Medicare. However, we found a large amount of error in this variable. Considering all Crossroads clients' visits in the 2 years before and after turning 65, only 13% report participating in Medicare, well below expected. However, 43% of all Crossroads clients were over aged 65. Considering only clients who visit in the 24 months after turning 65, 8% report having Medicare; among clients who visit in the 24 months before turning 65, 15% report having Medicare.

One reason for the apparent inconsistencies in our data could be that our population has a high degree of disability. However, examining only the non-disabled population within the 24

month bandwidth, we see that only 6% report having Medicare before age 65 and 3% report having Medicare after age 65. In short, we see the same poor data quality among the non-disabled population that we see among the disabled population. An additional explanation, is that respondents may have some confusion between Medicaid and Medicare. When you combine these two categories of health insurance, we see that 78% of households report having Medicaid or Medicare after age 65, compared to only 56% of respondents who report participating in these federal health insurance programs before age 65 years. Due to these findings, we used sharp RD while restricting the sample to non-disabled clients; the analysis implicitly assumes that clients are eligible to participate in Medicare upon turning 65. Medicare eligibility at age 65 can be considered a sharp, exogenous cutpoint for non-disabled individuals (Lee and Lemieux 2010).

To assess the validity of model assumptions, we tested for balanced covariates pre- and post-65 years of age. We restricted analyses to those who visited at least once in the 24 months before turning 65. We examined the following for adjustment: HOH sex, official US identification, race/ethnicity, marital status, education, number of employed adults in the household, monthly household income, household size, binary indicator for presence of children in the household, and SNAP receipt. We additionally adjusted for whether clients received food at the main pantry or a satellite pantry; mode of transportation for food; and percentages of ZIP Code residents who were US citizens, Medicare insured, or foreign-born.

We then completed multiple robustness checks for the RD analysis. We compared 24 month, 18 month, 12 month, and 6 month periods pre- and post-65th birthday. We also compared models with different covariate adjustment sets and functional forms. Of note, additional stratification by pre-existing conditions was intended, but we lacked sufficient sample size.

Descriptive and log-Poisson regression were completed in SAS 9.4 (SAS Institute Inc., Cary, NC). RD analyses were completed in Stata 15.1 (StataCorp LLC, College Station, TX)

RESULTS

Socio-Health and Food Security Description

All senior clients. We first described sociodemographic characteristics at the most recent visit of all senior clients that visited during the study period (table 1). The mean age was 70 years, 67% were women, 97% had US identification, 64% were non-Hispanic Black, and 82% were unmarried. Forty-one percent were retired, 33% were disabled, 80% of households had income greater than >$1,000 per month, and 73% were insured. Households resided in ZIP Codes where, on average, 86% of residents were US citizens, 20% were foreign-born, and 78% of age-eligible residents were insured with Medicare.

Seniors with food security assessments. Compared to all senior clients, fewer seniors with food security assessments were women (63% vs. 67%), more were Latino/a (29% vs. 15%), more were married (25% vs. 15%), and more had lower educational attainment (39% vs. 28% less than high school education). Additionally, fewer were retired (34% vs. 41%), income was lower (20% vs. 11 % <$500 per month), and more used car transportation (66% vs. 53%), were insured (79% vs. 73%), and received SNAP benefits (44% vs. 26%). These differences are likely reflective of differences between analytic populations. We then described the sub-set of seniors with food security assessments with a full adjustment set. When compared to all seniors with food security assessments, covariates varied by <~3% overall.

Seniors with food security assessments and linked EHRs. Among seniors with food security assessments and linked EHRs, there were some notable differences when compared to seniors with food security assessments overall. Those with EHRs were more likely to report

disability (40% vs. 36%); fewer used transportation categorized as other (e.g., use of taxis or rideshare was 4% vs. 8%); and fewer received SNAP benefits (50% vs. 56%). We additionally described the full adjustment set of covariates among seniors with food security assessments and linked EHRs who had complete data for covariates; differences in covariates when compared to seniors with food security and linked EHRs without complete covariate data were negligible (<3%).

RD seniors. The non-disabled RD sample differed from the larger sample of seniors with food security assessments in several ways. Seventy percent were women (vs. 63%); 50% were non-Hispanic Black (vs. 60%) and 18% identified as being of other race/ethnicity (vs. 1%); and 61% were unmarried (vs. 76%). For education, 55% had less than a high school level education (vs. 39%) and 14% were employed (vs. 8%). Thirty-three percent had monthly income <$500 (vs. 20%), 93% were veterans (vs. 88%), 75% used car transportation (vs. 66%), and 60% were insured (vs. 79%).

Pre-existing chronic conditions. We linked to EHRs and identified pre-existing chronic conditions diagnosed before the household's initial food pantry visit during the study period (table 2). Among all food security households, 75% had at least one of the aforementioned chronic conditions. Sixty-eight percent had hypertension, 32% had diabetes, 23% had depression, and 21% had COPD. The prevalence of anxiety and heart disease was 13% and 11%, respectively, and 6% had cancer. The prevalence of all conditions was comparable among those with and without complete adjustment sets.

Food security. We described food security at the most recent visit and over time by strata of Medicare eligibility: 1,090 visits were Medicare ineligible and 1,546 were eligible (table 3). During the study period, among visits where the HOH was ineligible for Medicare, 26% had

high food security, 17% had marginal food security, 27% had low and 30% had very low food

security. Among all visits where the HOH was eligible for Medicare, 35% had high food

security, 23% had marginal food security, 25% had low and 19% had very low food security.

The prevalence of any food insecurity (marginal, low, or very low) was lower among Medicare

eligible visits compared to ineligible visits (66% vs. 74%). We then examined the proportion of

visits a household had where any food insecurity was reported among all the food security

assessment visits of the household during the period. For Medicare ineligible visits, households

reported any insecurity in 86% of visits, and for eligible visits, households reported any

insecurity in 75% of visits (table 3 and figure 1).

Prevalence Ratio Analysis

In unadjusted models (table 4), Medicare eligible visits had lower prevalence of any low

food security and any food insecurity (vs. high food security) when compared to Medicare

ineligible visits (PR [95%CI]: 0.86 [0.78, 0.94] and 0.88 [0.83, 1.00]). However, after adjusting

for covariates, both associations were attenuated, though any insecurity remained statistically

significant (any low security: 0.92 [0.83, 1.02]; any insecurity: 0.91 [0.83, 1.00]). To examine

the role of chronic conditions, we completed the same analyses among households with and

without chronic conditions. After full adjustment, among households with pre-existing

conditions, Medicare eligible visits had a lower prevalence of any insecurity (vs. high security)

when compared to ineligible visits (0.87 [0.77, 0.99]). Among households with no chronic

conditions, we did not identify statistically significant associations using unadjusted models, and

we were unable to complete adjusted analyses due to small sample sizes.

We then completed the same analyses separately by the seven types of chronic conditions

(table 5). In adjusted models, among households where the HOH had depression, marginal and

very low security (vs. high food security) were less common among Medicare eligible visits compared to ineligible visits (0.45 [0.28, 0.70] and 0.61 [0.42, 0.88], respectively). Additionally, among those with COPD, marginal (0.54 [0.30, 0.97]) and any low food security (0.75 [0.56, 0.99]) as well as any insecurity (0.74 [0.63, 0.87]; vs. high security) were less common among Medicare eligible visits than eligible in adjusted models. Notably, for many of the remaining chronic conditions, adjusted models were limited by sample size as models failed to converge. For each condition, estimates for unadjusted models were largely consistent with previous findings whereby Medicare eligible visits were associated with better food security (i.e., lower prevalence of insecurity) compared to ineligible visits.

RD Analysis

RD analysis focuses on the non-disabled population for which Medicare eligibility begins sharply at age 65. Before beginning RD analysis, we investigated the dynamics of both Medicare reporting and visiting frequency among the RD analysis sub-sample. First, Figure 2 illustrates the likely error in the Medicare self-report data. There is no apparent discontinuity in Medicare reporting at age 65. If we consider both self-reported Medicare and Medicaid, a discontinuity emerges, and we conclude that the self-reported Medicare usage may not be reliable. A potential explanation is clients could mistakenly interchange Medicare and Medicaid, but given that the discontinuity is still not extremely strong, there may be other sources of error plaguing our self-report Medicare data. We avoid this source of measurement error in the sharp RD analysis by assuming that all non-disabled clients become eligible for Medicare at age 65.

It is also important to consider temporal trends in pantry visiting behavior for this population. Figure 3 presents the total number of clients who visited Crossroads during our study period for each month-age cohort. Panel (a) illustrates the full trend including all age-cohorts,

and Panel (b) presents a closer look at cohorts between the ages of 60 and 70. There are clear life-cycle patterns in the data, with some ages associated with a higher likelihood of seeking pantry services than others. Of relevance to our focal age group, it appears that visits peak among clients in the year before turning 65 and then begin a downward trajectory. The RD analysis will take into account this trend, and ascertain there is a shift in the slope at the 65 age cut point.

We were also interested in the impact of new clients on our data. It is possible that the likelihood of newly visiting a food pantry may change around age 65, and this would not be considered by the RD analysis since it is based only on existing clients. Figure 4 plots the number of new clients for each month-age cohort. The number of new clients appears to be unrelated to age.

In order for an RD design to be reliable, three assumptions must be satisfied. First, there must be a strong and significant discontinuity in eligibility for Medicare around the 65 year cutpoint. Second, clients must not be able to easily manipulate their age. Medicare policy ensures that these requirements are satisfied. Third, the age cut-off must impact households' visiting frequency only through its impact on Medicare, which is more difficult to assess. Sixty-five is a common retirement age and Social Security benefits as well as other transitions that occur with retirement could occur at the same time as Medicare eligibility. However, it is likely that these factors are less significant for our study population. Low-income workers and/or those more likely to be unemployed are more likely to begin receiving Social Security benefits at early retirement age (62 years) (Altmann 1982). Figure 5 presents a visual description of how the main time-varying covariates change across the Medicare eligibility transition. In almost all cases, sample means of variables vary widely with age. We saw a leveling-off trend in household income that appeared to begin before the threshold at age 65, suggestive of the transition to

Social Security as a main source of income. Nevertheless, when taking into account confidence levels around the trend lines, variables generally transition smoothly through the cutpoint.

We estimated 11 different models where we used different adjustment sets, bandwidths around the 65th birthday, and visiting frequency restrictions (table 6). Through our different specifications, we found a robust result that visits to the food pantry increased after age 65. For example, results from our model adjusting for only individual-level covariates were as follows (12-month bandwidth, Model 2 OR [95% CI]: 6.78 [2.48, 18.53]). Notably, the association was attenuated when we expanded the bandwidth to 18 or 24 months (Models 4 and 5).

We also included controls for neighborhood demographics (Model 6). Using a linear function for the running variable resulted in estimation of a statistically insignificant relationship between Medicare eligibility and visiting frequency (Model 7). About 50% of our sample visited Crossroads three or fewer times in the 24 months before their 65th birthday. In this infrequent visitors subsample, we do not see a statistically significant increase in visiting frequency after Medicare eligibility (Model 8: 5.82 [0.19, 183.32]). Moreover, the strongest increase in visiting frequency was observed among those who were moderately frequent visitors, visiting 3-12 times in the 24 months before turning 65 (Model 9: 26.35 [4.73, 146.89]). Looking at only households that visited every month or every other month in the 24 months before Medicare eligibility, we estimated a positive but insignificant relationship between Medicare eligibility and visiting frequency (Model 10). Notably, the uncensored model (i.e., everyone's first visit was on or before their 64th birthday, Model 11) produced results similar to the model of moderately frequent visitors (Model 9).

DISCUSSION

To our knowledge, ours is the first study to examine the association between Medicare eligibility and food security and food pantry use among seniors. Medicare eligibility was associated with improved food security, particularly for those with pre-existing chronic conditions. Additionally, we found that for non-disabled individuals, food pantry visits, which are designed to improve food security, increased after becoming Medicare eligible. Overall, our findings highlight how Medicare eligibility may improve food security among seniors, potentially attributable to increased food pantry use after aging into Medicare. Future studies should examine the underlying pathways that lead to increased food pantry use among seniors, as well as the role food pantry visits may play in improving food security.

Medicare eligible visits had higher food security compared to Medicare ineligible visits, even after adjustment for covariates. This was further supported when examining pre- and post-Medicare eligible visits within households over time, where we observed lower proportions of any food insecurity among Medicare eligible vs. ineligible visits. As previously stated, Medicare insurance benefits among low-income populations, whom are often previously uninsured, have been linked to improved health and financial outcomes (McWilliams et al. 2007a, McWilliams et al. 2007b, 2009, Kaplan and Hayes 2020). These beneficial changes can improve food security in multiple ways. For example, health improvements (e.g. via medication adherence) can free up income that was previously spent to maintain health for food or enhance one's ability to seek income if they are no longer unable to work due to medical conditions, both of which may increase food security. Resulting improvements in symptom control could improve physical functioning, increasing independence and ability to travel to food pantries in order to obtain food assistance, improving food security (Caouette, Boss, and Lynn 2020).

Food insecurity is common among individuals living with chronic conditions (Leung et al. 2020, Madden et al. 2020, Eicher-Miller 2020). In our study, the vast majority of seniors (78%) had one or more of the aforementioned pre-existing chronic conditions. When examining food security exclusively among those with chronic conditions, any food insecurity remained less common among Medicare eligible visits. However, the same association among those without any pre-existing chronic condition was null, indicating that Medicare eligibility may specifically benefit food pantry clients with chronic conditions. One explanation is that clients with chronic conditions, compared to those without, were spending more money on healthcare visits and prescriptions required to manage their condition; once insured with Medicare, these costs were reduced, and clients could reallocate their resources to purchase food. For specific conditions, evidence among those with depression and COPD further supported this. Moreover, for diabetes and hypertension, though limited by power, estimates were suggestive of the same. In corroboration of these findings, previous literature has found improvements in screening, medication adherence, spending, and other health outcomes for patients with chronic diseases like cancer and diabetes upon Medicare eligibility (Lipton 2020, Myerson et al. 2020, Kaplan and Hayes 2020)

We examined the impact of aging into Medicare on food pantry visits among non-disabled clients and found that food pantry visits increased after age 65 years (i.e., Medicare eligibility). Food pantry visits are indicative of need for food assistance so this result is somewhat surprising in light of our results related to food insecurity (Bazerghi, McKay, and Dunn 2016). We hypothesized that we would see improvements in food security with Medicare eligibility, and an increase in food pantry visits may seem contrary as visits might indicate greater need and insecurity (Bazerghi, McKay, and Dunn 2016). However, the relationship

between receipt of food assistance and food security is complex as the process of seeking food assistance itself is a mechanism to improve food security. Food pantries may only have limited or partial capacity to improve food security and households often obtain assistance from multiple avenues (Bazerghi, McKay, and Dunn 2016). For example, almost one-third of participants received SNAP assistance in addition to assistance from the food pantry. Rather than an indicator of worse food security, an increase in visits could instead be interpreted as an increased capacity to improve household food security, particularly when coupled with our finding of better food security among Medicare eligible visits. For example, the process of enrolling in Medicare may introduce individuals to other social safety-net services such as food pantries or senior meal programs, or upon receiving Medicare individuals may receive additional social and health supports—such as more frequent healthcare visits—which increase their capacity for seeking additional services.

Previous work identified barriers to food pantry attendance, including transportation, standing in long lines, and limited pantry schedules (Bigand et al. 2020). Medicare insurance among low-income populations, many of whom were previously uninsured, can increase capacity to seek food assistance and overcome these barriers in myriad ways. Medicare enrollment among these populations has been linked to improved health and financial outcomes (McWilliams et al. 2007a, McWilliams et al. 2007b, 2009, Kaplan and Hayes 2020). For example, improved health may lead to enhanced physical functioning and greater independence, which may also increase one's capacity to travel to a food pantry, identify transportation, and withstand wait times (Caouette, Boss, and Lynn 2020). Importantly, at age 65, many seniors may be able to retire, and 43% of our senior population was retired. Upon retirement, seniors may have more time to take long transportation routes, stand in line, and meet the food pantry

schedule, which may also partially explain our results. Notably, when we examined periods longer than a year before and after the 65th birthday, the association attenuated and when examining the 2 years before and after the odds of a visit were comparable. Future research should delve deeper into what aspects of aging into Medicare contribute to increased visits, as well as what may change over time to ultimately balance visit frequencies before and after Medicare eligibility.

Food security often vacillates between different gradients (e.g. very low to low) over time, and though often recurrent, it is usually not chronic (Coleman-Jensen et al. 2018). For example, in a Canadian study, 91% of food bank members were transitional, disengaging after weeks or months; though reasons for disengagement were unknown, authors hypothesized that economic or other personal circumstances may have improved and reduced the need for further charitable food assistance (Black and Seto 2020). Because Medicare may fuel this transition out of food insecurity among seniors, this may partially explain higher marginal food security among Medicare eligible visits compared to ineligible at the most recent visit. As expected, low and very low security were less common among Medicare eligible visits. Higher marginal food security at Medicare eligible visits may exemplify how Medicare works to improve food insecurity over time, and longitudinal studies may capture that transition towards food security after reaching Medicare eligibility. Improvements in food security may contribute to the larger capacity of Medicare to reduce health disparities among low-income minority populations (Eichner and Vladeck 2005).

We had several limitations. First, Medicare eligibility was based on age as we lacked information about eligibility criteria or enrollment. However, we adjusted for ZIP Code factors that constrain eligibility and in RD analyses, restricted to non-disabled clients for greater

confidence in the eligibility cutpoint. Still, as age-related life transitions may occur around age 65, though not necessarily precisely at age 65, these transitions may still be a source of endogeneity bias. Second, we restricted the analysis to clients of one food pantry and food security assessments were restricted to visits where it was assessed, reducing the generalizability. However, food pantries are a leading source of food assistance in the US, and we filled key knowledge gaps about Medicare eligibility and senior food security and food pantry use. Third, functional limitations and disability are prevalent among food insecure seniors (Petersen et al. 2019); RD analyses among non-disabled seniors may not be representative of all food pantry clients. Fourth, food security analyses examined visits by age, rather than within households; we clustered by household to partially account for this. Fifth, chronic condition assessments were limited to one healthcare system, and conditions elsewhere were not documented. Still, EHR linkage included 64% of seniors because Parkland is the only integrated safety-net system in Dallas County. Sixth, due to limited sample size, power was limited to detect some chronic condition associations.

Our study also had strengths. First, we utilized rich data from CCLD, which allowed us to follow seniors, their visiting patterns, and food security over time. Second, as mentioned, we had access to client EHRs, allowing for a robust assessment of how chronic conditions may moderate observed associations. Third, we employed an RD analysis, a robust econometric method for quantifying the impact of Medicare eligibility. Fourth, we adjusted for individual and ZIP Code level variables, some of which varied over time, providing confidence in our findings. Fifth, our strategy to assess both food security and pantry visits concurrently allowed us to draw unique conclusions about the impact of Medicare eligibility on these outcomes.

CONCLUSION

We examined how Medicare eligibility is associated with food security and food pantry visits among senior clients of a Dallas, Texas food pantry. Visits where the head of household was Medicare eligible were associated with higher food security, while households that aged into Medicare had more food pantry visits after Medicare eligibility. Associations between Medicare and food security were consistent among clients with chronic conditions, but not among clients without any chronic conditions. Medicare eligibility may improve food security through a variety of underlying health and monetary pathways, including, but not limited to decreased healthcare costs for chronic disease management and an increased client capacity to access food assistance, thereby enhancing food security. Future studies should examine underlying pathways of visiting patterns and their contributions to senior food security. Our work provides evidence for the potential of Medicare eligibility to lessen socioeconomic disparities. With further evidentiary support, our findings could inform policy makers considering extensions for Medicare and can inform policies designed to meet changing food needs among seniors aging into Medicare.

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Table 1. Description of sociodemographic characteristics of households from most recent visit: Crossroads ClientCare Longitudinal Database (2015-2018).

	All senior clients		Seniors with FS assessments		Seniors with FS assessments and full adjustment set		Seniors with FS assessments and linked EHRs		Seniors with FS assessments and linked EHRs and full adjustment set		Seniors for RD analysis	
	N (column %) or mean (standard deviation)											
Number of households[a]	2,703	(100.0)	604	(22.3)	543	(20.1)	389	(14.4)	360	(13.3)	119	(4.4)
Number of visits[a]	37,499	(100.0)	2,636	(7.0)	2,404	(6.4)	1,818	(4.8)	1,690	(4.5)	457	(1.2)
Age	70.1	(8.9)	68.5	(10.2)	67.8	(8.3)	66.7	(6.4)	66.5	(5.7)	65.0	(1.4)
Sex												
Women	1822	(67.4)	380	(62.9)	337	(62.1)	240	(61.7)	219	(60.8)	83	(69.8)
Men	881	(32.6)	224	(37.1)	206	(37.9)	149	(38.3)	141	(39.2)	36	(30.3)

Official US

identification

Yes	2624	(97.1)	555	(95.4)	526	(96.9)	370	(97.1)	353	(98.1)	110	(92.4)
No	56	(2.1)	27	(4.6)	17	(3.1)	11	(2.9)	7	(1.9)	9	(7.6)

Ethnicity

NH White	471	(17.5)	60	(10.0)	55	(10.1)	35	(9.0)	33	(9.2)	8	(6.7)
NH Black	1734	(64.2)	363	(60.2)	344	(63.4)	242	(62.4)	231	(64.2)	60	(50.4)
Latino/a	391	(14.5)	175	(29.0)	139	(25.6)	107	(27.6)	92	(25.6)	30	(25.2)
Other	72	(2.7)	5	(0.8)	5	(0.9)	4	(1.0)	4	(1.1)	21	(17.7)

Marital status

Married	412	(15.2)	147	(24.5)	124	(22.8)	93	(23.9)	82	(22.8)	47	(39.6)
Not married	2208	(81.7)	453	(75.5)	419	(77.2)	296	(76.1)	278	(77.2)	72	(60.5)

Education level

Less than high school	753	(27.9)	221	(39.1)	207	(38.1)	151	(40.5)	141	(39.2)	65	(54.7)
High school	1099	(40.7)	209	(37.0)	204	(37.6)	134	(35.9)	132	(36.7)	27	(22.7)
Some college	271	(10.0)	101	(17.9)	98	(18.1)	68	(18.2)	67	(18.6)	24	(20.0)

College degree or higher	205	(7.6)	34	(6.0)	34	(6.3)	20	(5.4)	20	(5.6)	3	(2.7)
Employment												
Disability	893	(33.0)	214	(35.6)	209	(38.5)	154	(39.8)	153	(42.5)	0	(0.0)
Employed	226	(8.4)	49	(8.1)	36	(6.6)	21	(5.4)	16	(4.4)	16	(13.6)
Other	140	(5.2)	74	(12.3)	61	(11.2)	50	(12.9)	44	(12.2)	35	(29.7)
Retired	1108	(41.0)	203	(33.7)	183	(33.7)	121	(31.3)	110	(30.6)	38	(32.2)
Unemployed	223	(8.3)	62	(10.3)	54	(9.9)	41	(10.6)	37	(10.3)	22	(18.6)
Income												
<$500	286	(10.6)	120	(19.9)	108	(19.9)	80	(20.6)	73	(20.3)	39	(32.8)
>$500-$1000	243	(9.0)	270	(44.7)	238	(43.8)	184	(47.3)	169	(46.9)	41	(34.5)
>$1000	2174	(80.4)	214	(35.4)	197	(36.3)	125	(32.1)	118	(32.3)	39	(32.8)
Veteran status												
Veteran	239	(8.8)	71	(11.9)	69	(12.8)	35	(9.1)	35	(9.8)	8	(6.7)
Not a veteran	2295	(84.9)	526	(88.1)	470	(87.2)	350	(90.9)	323	(90.2)	111	(93.3)
Household size	1.5	(1.2)	2.1	(1.7)	2.0	(1.6)	2.0	(1.7)	2.0	(1.6)	2.5	(1.9)

Transportation to food pantry												
Car	1440	(53.3)	398	(65.9)	361	(66.5)	261	(67.1)	241	(66.9)	89	(74.8)
Bus/train	196	(7.3)	100	(16.6)	96	(17.7)	70	(18.0)	67	(18.6)	16	(13.4)
Walk	770	(28.5)	55	(9.1)	48	(8.8)	43	(11.1)	39	(10.8)	12	(10.1)
Other	296	(11.0)	51	(8.4)	38	(7.0)	15	(3.9)	13	(3.6)	2	(1.7)
Insurance												
Yes	1981	(73.3)	474	(79.3)	438	(81.1)	306	(79.1)	287	(79.9)	68	(57.1)
No	557	(20.6)	124	(20.7)	102	(18.9)	81	(20.9)	72	(20.1)	51	(42.9)
SNAP benefits												
Yes	696	(25.8)	268	(44.4)	249	(45.9)	194	(49.9)	183	(49.2)	38	(31.9)
No	2007	(25.8)	335	(55.6)	294	(54.1)	195	(50.1)	177	(50.8)	81	(68.1)
ZIP-code level percentage of US citizens	0.86	(0.1)	0.82	(0.1)	0.83	(0.1)	0.83	(0.1)	0.83	(0.1)	0.86	(0.1)

ZIP-code level percentage of Medicare enrollees	0.78	(0.1)	0.80	(0.1)	0.80	(0.1)	0.80	(0.1)	0.80	(0.1)	0.81	(0.1)
ZIP-code level percentage of foreign-born residents	0.20	(0.1)	0.23	(0.1)	0.22	(0.1)	0.22	(0.1)	0.22	(0.1)	0.19	(0.1)

Abbreviations: EHR, electronic health record, FS, food security; NH, non-Hispanic; RD, regression discontinuity, SNAP, Supplemental Nutrition Assistance Program.

[a]Percentages are sub-population percent of all senior clients.

Table 2. Prevalence of diagnosed pre-existing chronic conditions among households with a visiting client with a linked Parkland health record: Crossroads ClientCare Longitudinal Database (2015-2018).

	Seniors with FS assessments and linked EHRs N=389 households 1,818 visits		Seniors with FS assessments and linked EHRs and full adjustment set N=360 households 1,690 visits	
Pre-existing chronic conditions	N (%) or mean (standard deviation)			
Anxiety	52	(13.4)	50	(13.9)
Depression	89	(22.9)	82	(22.8)
Hypertension	265	(68.1)	245	(68.1)
Chronic obstructive pulmonary disease	80	(20.6)	75	(20.8)
Diabetes	123	(31.6)	112	(31.1)
Heart disease	43	(11.1)	42	(11.7)
Cancer	24	(6.2)	22	(6.1)
Total chronic conditions	1.7	(1.4)	1.7	(1.4)
Any chronic condition	292	(75.1)	270	(75.0)
All chronic conditions	0	(0.0)	0	(0.0)

Abbreviations: FS, food security; EHR, electronic health record.

Table 3. Description of food insecurity over the study period among visits and households[a]:

Crossroads ClientCare Longitudinal Database (2015-2018).

	Seniors with FS assessments			
	Medicare ineligible visits		Medicare eligible visits	
	N=297 households		N=338 households	
	1,090 visits		1,546 visits	
	N (%) or mean (standard deviation)			
Household visit frequency over study period, mean (SD)	5.2	(4.3)	5.9	(4.4)
Food security across all visits				
High	280	(25.7)	520	(33.6)
Marginal	186	(17.1)	350	(22.6)
Low	295	(27.1)	379	(24.5)
Very low	329	(30.2)	297	(19.2)
Any low security[b]	624	(57.3)	676	(43.7)
Any insecurity[c]	810	(74.3)	1026	(66.4)
Proportion of any food insecurity among visits by household[d], mean (SD)	0.86	(0.3)	0.75	(0.4)

Abbreviations: FS, food security; SD, standard deviation.

[a]2,636 visits total; Households can be in Medicare ineligible and Medicare eligible strata as they can have visits before and after age 65.

[b]Any low security=low or very low.

[c]Any insecurity=marginal, low, or very low.

[d]Proportion=total visits where food security was assessed with any food insecurity/total visits where food security was assessed.

Table 4. Prevalence ratios (95% confidence intervals) for food insecure visits among seniors by Medicare eligibility status at visit: Crossroads ClientCare Longitudinal Database.[a]

	PR (95%CI) for Medicare eligible (vs. ineligible)			
	Seniors with food security assessments			
	Unadjusted		Adjusted[c]	
	2636 visits		2404 visits	
	604 households		543 households	
Food security (vs. high security)				
Marginal security	0.95	(0.77, 1.17)	1.01	(0.83, 1.21)
Low security	0.83	(0.72, 0.96)*	0.88	(0.76, 1.03)
Very low security	0.82	(0.68, 1.00)*	N/A	
Any low[e]	0.86	(0.78, 0.94)*	0.92	(0.82, 1.02)
Any insecurity[f]	0.88	(0.81, 0.95)*	0.91	(0.83, 1.00)*

Seniors with food security assessments and linked EHRs[b]

	Any chronic conditions		No chronic conditions	
	Unadjusted	Adjusted[c,d]	Unadjusted	Adjusted[c,d]
	1293 visits	1194 visits	525 visits	496 visits
	292 households	270 households	97 households	90 households
Food security (vs. high security)				
Marginal security	0.89 (0.66, 1.20)	1.00 (0.75, 1.32)	1.37 (0.71, 2.62)	N/A
Low security	0.84 (0.68, 1.05)	0.84 (0.65, 1.08)	0.90 (0.72, 1.12)	N/A
Very low security	0.66 (0.52, 0.84)*	N/A	0.87 (0.71, 1.07)	N/A
Any low[e]	0.85 (0.73, 0.99)*	0.87 (0.73, 1.03)	0.91 (0.80, 1.02)	N/A
Any insecurity[f]	0.85 (0.76, 0.96)*	0.87 (0.77, 0.99)*	0.94 (0.77, 1.15)	N/A

Abbreviations: CI, confidence interval; FS, food security; EHR, electronic health record, PR, prevalence ratio.

[a]General estimating equations used to cluster for household with an autoregressive correlation matrix.

[b]Any and no chronic condition populations: unadjusted = 389 households; 1,818 visits and adjusted=360 households; 1,690 visits.

[c]Adjusted for head of household gender, race/ethnicity, marital status, education, employment, monthly household income, household size, transportation use, SNAP receipt, official US identification, and census-level percentages of US citizen, Medicare eligibility, and foreign-born residents.

[d]Adjusted population is subset of seniors with FS assessments and linked EHRs and full adjustment set.

[e]Any low security=low or very low.

[f]Any insecurity=marginal, low, or very low.

Table 5. Prevalence ratios (95% confidence intervals) for food insecure visits by Medicare eligibility status among seniors at visit by pre-existing chronic condition: Crossroads ClientCare Longitudinal Database.[a]

	PR (95%CI) for Medicare eligible (vs. ineligible) among seniors with FS assessments and linked EHRs							
	Anxiety				Depression			
	Unadjusted		Adjusted[b,c]		Unadjusted		Adjusted[b,c]	
	248 visits		245 visits		381 visits		338 visits	
	52 households		50 households		89 households		82 households	
Food security (vs. high security)								
Marginal security	0.82	(0.41, 1.66)	N/A		0.98	(0.70, 1.37)	0.45	(0.28, 0.70)*
Low security	0.89	(0.53, 1.49)	N/A		0.80	(0.61, 1.06)	0.91	(0.65, 2.38)
Very low security	0.70	(0.52, 0.93)*	N/A		0.66	(0.46, 0.97)*	0.61	(0.42, 0.88)*
Any low security[d]	0.87	(0.62, 1.22)	N/A		0.83	(0.69, 1.00)*	0.86	(0.71, 1.04)
Any insecurity[e]	0.81	(0.60, 1.10)	0.81	(0.60, 1.10)	0.90	(0.79, 1.01)	0.90	(0.79, 1.03)
	Hypertension				Chronic obstructive pulmonary disease			

	Unadjusted 1154 visits 265 households		Adjusted[b,c] 1071 visits 247 households		Unadjusted 310 visits 80 households		Adjusted[b,c] 286 visits 75 households	
Food security (vs. high security)								
Marginal security	0.93	(0.69, 1.24)	1.07	(0.80, 1.44)	0.64	(0.43, 0.95)*	0.54	(0.30, 0.97)*
Low security	0.89	(0.70, 1.12)	0.86	(0.64, 1.16)	0.61	(0.41, 0.91)*	N/A	
Very low security	0.62	(0.46, 0.83)*	N/A		0.69	(0.48, 0.98)*	N/A	
Any low security[d]	0.88	(0.75, 1.04)	0.89	(0.73, 1.09)	0.74	(0.58, 0.95)*	0.75	(0.56, 0.99)*
Any insecurity[e]	0.88	(0.78, 0.99)*	0.89	(0.78, 1.02)	0.78	(0.64, 0.94)*	0.74	(0.63, 0.87)*

	Diabetes				Heart conditions			
	Unadjusted 599 visits 123 households		Adjusted[b,c] 570 visits 113 households		Unadjusted 193 visits 43 households		Adjusted[b,c] 182 visits 42 households	
Food security (vs. high security)								
Marginal security	0.74	(0.48, 1.15)	N/A		0.62	(0.43, 0.90)*	0.92	(0.79, 1.08)

Low security	0.78	(0.58, 1.06)	0.76	(0.55, 1.06)	0.77	(0.50, 1.18)	N/A
Very low security	0.74	(0.56, 0.97)*	N/A		0.88	(0.57, 1.35)	0.87	(0.45, 1.69)
Any low security[d]	0.83	(0.67, 1.02)	0.84	(0.66, 1.06)	0.88	(0.68, 1.13)	1.01	(0.73, 1.40)
Any insecurity[e]	0.84	(0.69, 1.01)	0.84	(0.69, 1.02)	0.88	(0.74, 1.04)	0.98	(0.84, 1.13)

	Cancer	
	Unadjusted	Adjusted[b,c]
	140 visits	131 visits
	24 households	22 households
Food security (vs. high security)		
Marginal security	0.45 (0.16, 1.22)	N/A
Low security	0.47 (0.13, 1.68)	N/A
Very low security	0.32 (0.15, 0.72)*	N/A
Any low security[d]	0.37 (0.19, 0.73)*	3.42 (0.25, 47.44)

Any insecurity[e]   0.72   (0.43, 1.21)   0.57   (0.16, 1.99)

Abbreviations: CI, confidence interval; FS, food security; EHR, electronic health record; PR, prevalence ratio.

[a]General estimating equations used to cluster for household with an autoregressive correlation matrix.

[b]Adjusted for head of household gender, race/ethnicity, marital status, education, employment, monthly household income, household size, transportation use, SNAP receipt, official US identification, and census-level percentages of US citizen, Medicare eligibility, and foreign-born residents.

[c]Adjusted population is subset of seniors with FS assessments and linked EHRs and full adjustment set.

[d]Any low security=low or very low.

[e]Any insecurity=marginal, low, or very low.

Table 6. Odds ratios (95% confidence intervals) for food pantry visits by Medicare eligibility pre- and post-65th birthday among households: Crossroads ClientCare Longitudinal Database (2015-2018).

	Model 1		Model 2		Model 3		Model 4	
Bandwidth around 65th birthday	12 months		12 months		6 months		18 months	
Polynomial function	polynomial		polynomial		polynomial		polynomial	
Sample Restrictions	Full Sample		Full Sample		Full Sample		Full Sample	
Covariates	None		Basic[a]		Basic[a]		Basic[a]	
Households	119		119		111		121	
Observations	2,636		2,636		1,413		3,740	
Medicare eligible OR (95% CI)	6.92	(2.92, 16.40)***	6.78	(2.48, 18.53)***	5.61	(1.12, 28.01)**	2.76	(1.23, 6.19)**
	Model 5		Model 6		Model 7		Model 8	
Bandwidth around 65th birthday	24 months		12 months		12 months		12 months	
Polynomial function	polynomial		polynomial		linear		polynomial	
Sample Restrictions	Full Sample		Full Sample		Full Sample		≤3 visits in 24 months	
Covariates	Basic[a]		Extended[b]		Basic[a]		Basic[a]	
Households	121		21		119		58	
Observations	4,693		319		2,636		1,308	

Medicare eligible OR (95% CI)	1.02	(0.55, 1.89)	100.79	(18.21, 557.97)***	0.91	(0.57, 1.46)	5.82 (0.19, 183.32)

	Model 9	Model 10	Model 11	
Bandwidth around 65th birthday	12 months	12 months	12 months	
Polynomial function	polynomial	polynomial	polynomial	
Sample Restrictions	>3 & ≤12 visits in 24 months	>12 visits in 24 months	Uncensored	
Covariates	Basic[a]	Basic[a]	Basic[a]	
Households	41	14	34	
Observations	968	350	673	
Medicare eligible OR (95% CI)	26.35 (4.73, 146.89)***	2.75 (0.55, 13.67)	18.37 (2.60, 129.72)***	

Abbreviations: OR, odds ratio; CI, confidence interval.

***p<0.01, **p<0.05, *p<0.10.

[a]Models with Basic covariates adjusted for head of household sex, race/ethnicity, marital status, education, employment, monthly household income, household size, transportation use, presence of kids in the household, Supplemental Nutrition Assistance Program (SNAP) receipt, and presence of kids in the household.

[b]Models with Extended covariates adjusted all Basic covariates and ZIP code percentages of US citizen, Medicare eligibility, and foreign-born residents.

Figure 1.

a. Medicare ineligible visits

Proportion of any food insecurity among all visits over the study period

b. Medicare eligible visits

Proportion of any food insecurity among all visits over the study period
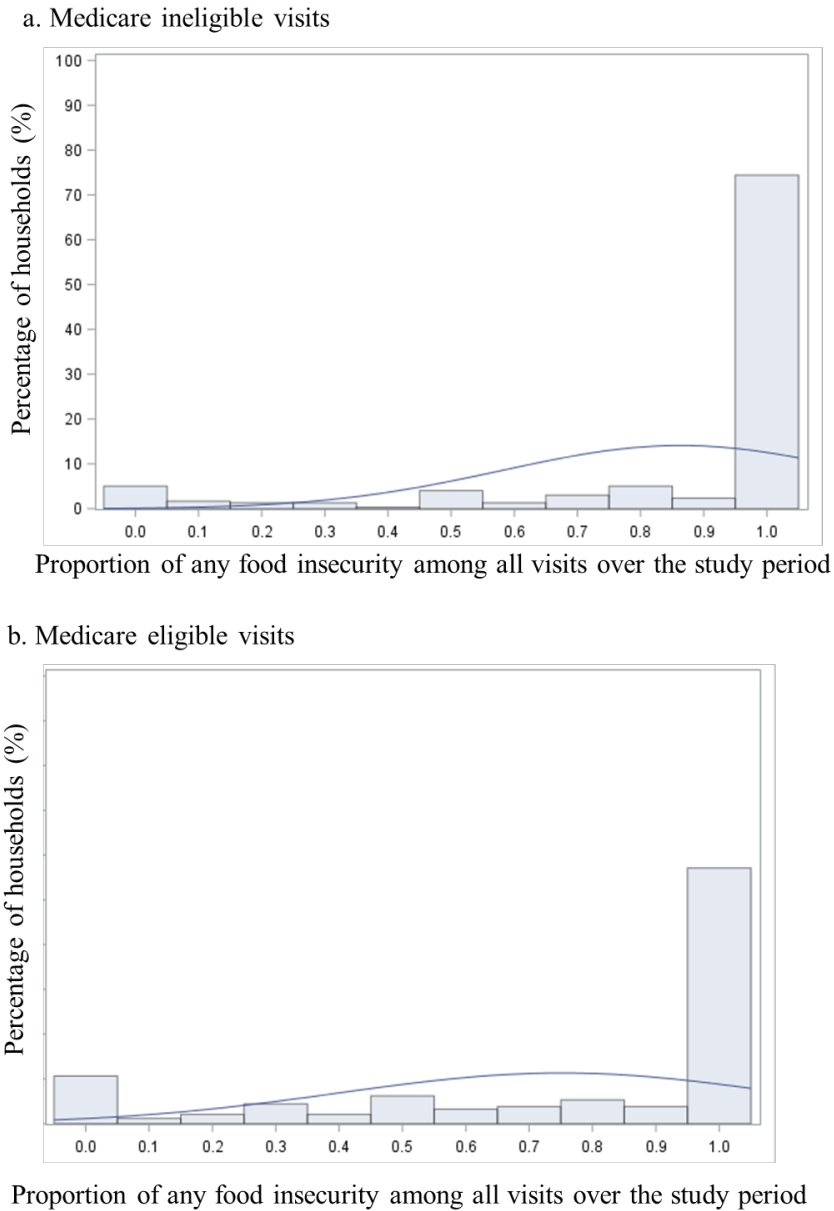
Figure 1. Household proportion of any food insecurity among all visits of the household during the study period by Medicare eligibility: Crossroads ClientCare Longitudinal Database (2015-2018). Medicare eligibility status based on age of head of household at visits: ineligible visits were <65 years of age and eligible visits were ≥65 years of age.
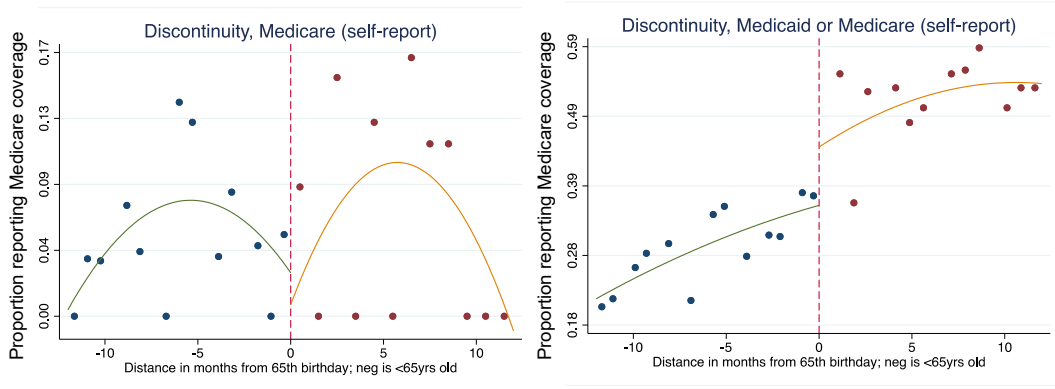
Figure 2.

Figure 2. Self-report of Medicare uptake by month-age cohort: Crossroads ClientCare Longitudinal Database (2015-2018). Clients were often less likely to report Medicare uptake after age 65. However, considering both Medicare and Medicaid, clients were more likely to report uptake after age 65.
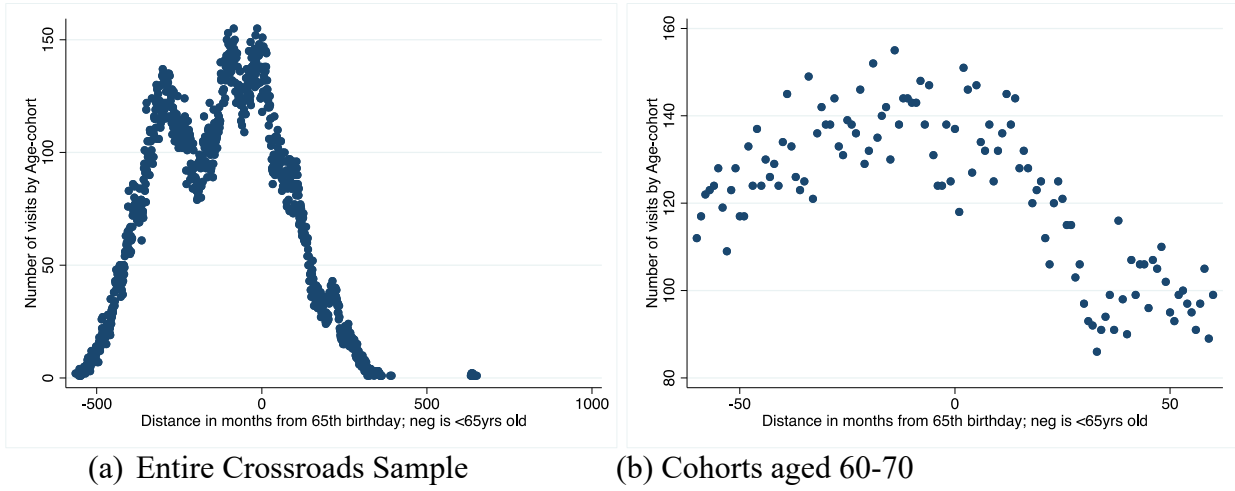
Figure 3.

(a) Entire Crossroads Sample   (b) Cohorts aged 60-70

Figure 3. Total pantry visits by month-age cohort: Crossroads ClientCare Longitudinal Database (2015-2018).
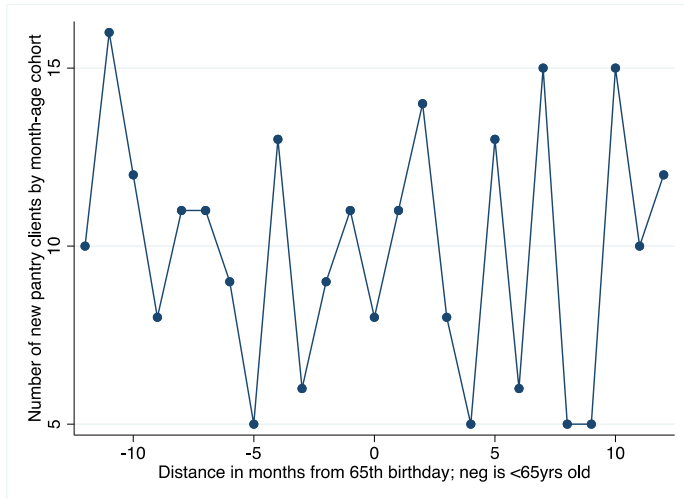
Figure 4.

Figure 4. Number of new pantry clients by month-age cohort: Crossroads ClientCare Longitudinal Database (2015-2018).
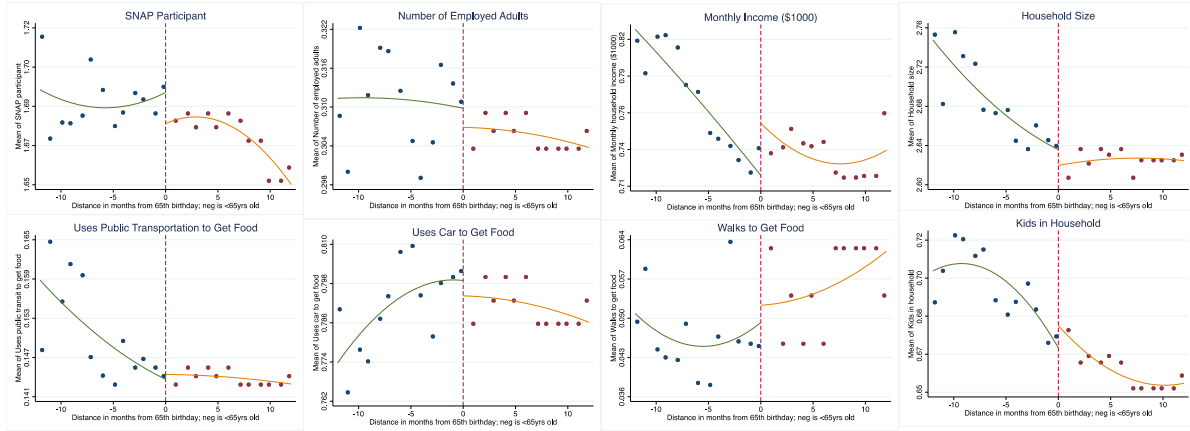
Figure 5.

Figure 5. Covariate transitions around age 65 for regression discontinuity analysis: Crossroads ClientCare Longitudinal Database (2015-2018). Dots represent the average within each month bin. Smoothed lines were estimated using a 2nd order polynomial.

Supplemental Table 1. ICD-9 and ICD-10 codes for chronic conditions.[a]

Conditions	Conditions in Charlson Comorbidity	Charlson Comorbidity Index ICD-9	Charlson Comorbidity Index ICD-10
Heart Conditions	Myocardial Condition	410,412	I21, I22, 125.2
	Congestive Heart Failure	398.81,425.4, 425.5, 425.7, 425.8, 425.9, 428.	I09, I11.0, I13.2, I25.5, I42.0, I42.5-I42.9, I43, I50, P29.0
Cancer	Any malignancy including Lymphoma, and Leukemia, except malignant neoplasm of skin.	140-172, 174-195.8, 200-208, 238.6	C00-C97
COPD/Asthma	-	490, 505, 506.4	I27.8, I27.9, J40-J47, J60-J67, J68.4, J70.1, J70.3
Diabetes	Diabetes without complication	250.0-250.3, 250.8, 250.9	E10.0-E14.9
	Diabetes with complications	250.4-250.6	E10.0-E14.9
Hypertension	-	401-405	I10-15
Depression	-	296.2, 296.3,300.4,311, V79.0	F32, F33 , F34.1,F32.9, Z13.31

		308, 293.84,300,	
Anxiety	-	(300,300.1,	F43.0, F06.4, (F40-F48)
		300.2,300.89)	

Abbreviations: COPD, chronic obstructive pulmonary disease; ICD, International Classification of Disease.

[a]ICD system is used to code and classify morbidity data from the inpatient and outpatient records, physician offices, and most National Center for Health Statistics surveys (National Center for Health Statistics 2020). Listed codes were used to identify specific chronic conditions among linked electronic health records.