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Accounting for the Rise in Senior Food Insecurity in the District of Columbia

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January 2023

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Acknowledgements

This publication was prepared for the National Foundation to End Senior Hunger with the support of a grant from the D.C. Department of Aging and Community Living. The analyses, conclusions, and opinions are solely those of the author and do not represent the views and opinions of the sponsors.

Executive Summary

Using two decades of data from the 2001-2021 Household Food Security Supplements to the Current Population Survey—the source of official USDA food insecurity statistics in the United States—I document the evolution of food insecurity among the senior population in the District of Columbia in comparison to seniors in the nation overall and among a select group of cities of comparable population size. I then examine trends across these areas on the leading socioeconomic risk factors of food insecurity, both factor by factor and jointly in a multiple regression framework to better understand the determinants of food insecurity. Using the estimated parameters from the regression model I then predict food insecurity in the District based on its mix of socioeconomic characteristics and how this differs relative to the nation and the set of comparison cities. Finally I relate whether any remaining "excess food insecurity" can be accounted for by city-level differences in macroeconomic forces such as the strength of local labor markets and earnings levels and inequality.

The results indicate that seniors residing in the District have experienced a sustained increase in food insecurity since 2001, especially in the decade after the Great Recession of 2007-2009. This increase in senior food insecurity in the District stands out from the national average and the comparison cities in that the District had the lowest rate of food insecurity among older persons at the start of the sample period, but for every year since 2017 it had the highest rate of senior food insecurity. The comparison cities collectively scored much worse on the metric of senior food insecurity in the early 2000s, and experienced a substantial increase in the years surrounding the Great Recession, but then had a sharp reduction such that by 2021 food insecurity in the comparison cities was similar to the rate there at the onset of the Great Recession in 2007, whereas the rate in the District remained 32 percent higher.

Using the estimated parameters, the predicted gap in food insecurity between the District and both comparison groups widened over time, suggesting a deteriorating situation facing seniors in the District. I conduct a number of counterfactual predictions on how senior food insecurity in the District would change under alternative socioeconomic conditions, and find that in recent years rising rates of poverty and near poverty, declines in the share of seniors who are married, and the rising share of seniors residing in rental housing account for about 60 percent of the food insecurity gap between District seniors and those nationally and in the narrower set of comparison cities. The implication is that policies that address falling incomes and financial hardship from rising rents could substantively improve the food security of District seniors.

I. Introduction

Food insecurity is a condition in which households lack access to adequate food because of limited resources. Nationally 11.8 percent of the population experienced food insecurity at some point in 2020, and among older persons ages 60 and over this rate stood at 6.8 percent (Coleman-Jensen et al. 2021; Ziliak and Gundersen 2022). While the rate is lower among older persons, it has increased at a much faster pace than the general population over the past two decades (Ziliak and Gundersen 2022).

Experiencing food insecurity is a concern in and of itself regardless of age, but among older persons it is magnified by evidence suggesting that it is associated with a host of negative health consequences including inadequate nutrient intakes, depression, cardiovascular disease, asthma, and limitations in activities of daily living (Afulani et al. 2015; Bengle et al., 2010; Bhargava & Lee, 2016a; Champagne et al, 2007; Gundersen et al. 2011; Oemichen & Smith, 2016; Sattler & Lee, 2013; Sattler et al., 2014; Temple, 2006; Ziliak and Gundersen 2022). Because the number of seniors is projected to increase dramatically in the coming years, this means that even if the proportion of seniors who are food insecure stays the same or even falls slightly there will be a rising number of seniors experiencing food insecurity, placing a substantial cost burden on our health care system (Berkowitz et al. 2018).

The reasons for food insecurity and subsequent health problems among older Americans are complex and varied. The leading risk factor is low incomes, but even controlling for income, prior research suggests that older persons are at greater risk of food insecurity if they have lower education attainment, are younger, are a member of a racial or ethnic minority group, are not currently married, do not own a home, are disabled, or are raising grandchildren (Lee and Frongillo, 2001; Ziliak, et al., 2008; Brewer et al., 2010; Kregg-Byers, 2014; Ziliak and

Gundersen, 2016; Brucker and Coleman-Jensen, 2017; Malani et al., 2020). This suggests that combating food insecurity requires a nuanced policy response beyond income redistribution that will depend on the mix of confounding factors underlying food insecurity at the local community level.

This report focuses on understanding the trends in and determinants of food insecurity among older persons in the District of Columbia in comparison to the overall older adult population in the US and among a select group of similarly sized cities. The aim is to isolate to the greatest extent possible whether any divergence in the food security of seniors in the District relative to the nation overall and to comparison cities can be accounted for by observed differences in socioeconomic conditions.

The organization of the report is as follows. In Section II I describe the data used in the report along with key details on the measurement of food insecurity and selection of comparator cities. Section III presents trends in food insecurity, and in Section IV I document the associated trends in primary socioeconomic risk factors of food insecurity as established in the prior research literature. This is then followed in Section V by the specification and estimation of a formal regression model that jointly estimates the determinants for food insecurity using data from the national sample of older persons. The attendant regression parameters are used to predict what we would expect food insecurity to be in the District and the comparison cities based on the demographic composition of those communities. The difference between actual food insecurity and predicted food insecurity—aka "excess food insecurity"—is then related to city-level unemployment rates, median income, and income inequality to help isolate how much of the excess food insecurity can be captured by local economic conditions. Section VI concludes with a summary of the results and possible policy recommendations.

II. Data and Measurement of Food Insecurity

The data come from the 2001-2021 Household Food Security Supplement (HFSS) of the Current Population Survey (CPS). The CPS is a monthly, nationally representative stratified random sample of approximately 60,000 households collected by the Census Bureau on behalf of the Bureau of Labor Statistics.[1] Each month respondents are asked about their labor market activity in the survey week, which is then used to produce official employment and unemployment statistics. Throughout the year a number of supplements are fielded after the monthly labor force questionnaire, and in December of each year since 2001 the USDA sponsors the food security supplement. The HFSS asks about behaviors and experiences associated with difficulty in meeting food needs due to financial constraints in both the prior 12 months and the last 30 days. Households are asked a series of 18 questions if children are present, and a subset of 10 of these for households without children. The conditions range from worrying about running out of food, to adults or children in the household going for a whole day without food. In order to reduce respondent burden, not all CPS households are fielded the HFSS. Specifically, they are screened out of the food security questions entirely if they have income above 185% of the federal poverty line (FPL) and show no indication of problems obtaining food for the household in response to two screener questions on food hardships (Tiehen, Vaughn, and Ziliak 2020).

Based on responses to the HFSS the USDA has established four categories for food security, as summarized in Box 1; namely, (1) high food security occurs when all household members had access at all times to enough food for an active, healthy life; (2) marginal food security occurs when households report problems at times, or anxiety about, accessing adequate food, but the quality, variety, and quantity of their food intake were not substantially reduced;

[1] The CPS does not include information on individuals living in group quarters, including nursing homes or assisted living facilities.

Box 1: Categories of Food Security from 18-Item Scale		
	USDA Classification	Number of Affirmative Responses to HFSS
	High Food Security	0
	Marginal Food Security	1 or 2
	Low Food Security	3 to 5 (households without children) 3 to 7 (households with children)
	Very Low Food Security	6 or more (households without children) 8 or more (households with children)

(3) low food security occurs when households reduced the quality, variety, and desirability of their diets, but the quantity of food intake and normal eating patterns were not substantially disrupted; and (4) very low food security occurs when at times during the year, eating patterns of one or more household members were disrupted and food intake reduced because the household lacked money and other resources for food. Households responding in the affirmative to at least three questions, i.e. reporting low food security or very low food security, are classified as "food insecure." The USDA uses the responses to the 12-month HFSS for their official statistics on food insecurity, and this is the definition used in this report.

The principal sample for the analysis is those individuals ages 60 and older. The age of 60 is selected as the USDA uses this cutoff for expanded access to and generosity of benefit levels from the Supplemental Nutrition Assistance Program (SNAP). Although food insecurity is measured at the household level—meaning all members of the household share the same food security status—the Census Bureau provides person-level weights that vary within the household to weight the sample up to the national population and thus I conduct all analyses at the individual level using these person weights. The unweighted sample size in a typical year across the 21 years is 21,424, which weights up to represent about 59.5 million seniors per year.

From the main national sample of people 60 and older, I use geographic identifiers in the CPS to isolate sample respondents residing in the central city portion of the District of Columbia

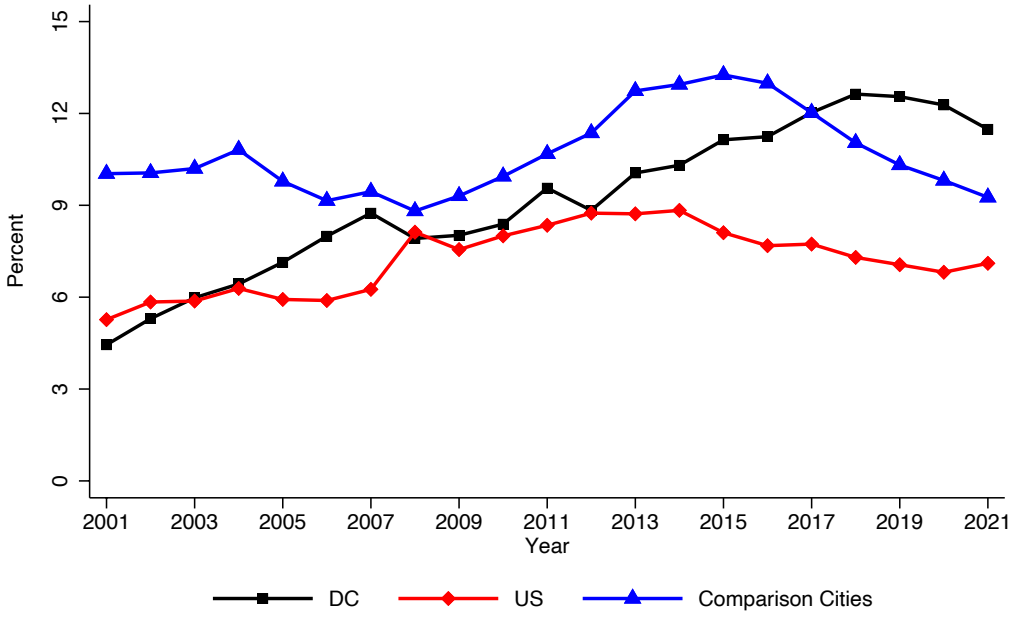
(DC). Using those same sets of identifiers, I select seniors from a subset of central cities based on the 2020 Decennial Census to serve as a comparison group to DC, which has a population of 689,545.[2] These cities, some of which are larger and some smaller, include residents of Atlanta (498,602), Baltimore (585,708), Boston (676,216), Charlotte (874,541), Columbus (905,672), Detroit (639,614), Indianapolis (887,752), Jacksonville (949,577), Louisville (632,689), Memphis (632,207), and Nashville (689,504). While the MSAs of these cities vary greatly, the central city portion is more closely aligned. Because the sample sizes of DC and the comparison cities in the CPS are much smaller than the national sample, I construct 5-year moving averages of all statistics for DC and the comparison cities in order to minimize sample variation from one year to the next.

III. Food Insecurity among Seniors

Figure 1 presents estimated trends in food insecurity for DC, the US, and the average from the set of comparison cities. The figure shows that senior food insecurity in DC stands out from the national average and the comparison cities in that in 2001 it had the lowest rate of food insecurity among older persons but for every year since 2017 it had the highest rate of senior food insecurity. Indeed, the trajectory over most of the past two decades has been toward increasing food insecurity in the District, with the period after the Great Recession of 2007-2009 notable with the widening gap between DC's food insecurity rate and the nation. The comparison cities collectively scored much worse on the metric of senior food insecurity in the early 2000s, and experienced a substantial increase in the years surrounding the Great Recession, but then had a sharp reversal such that by 2021 food insecurity in the comparison cities was similar to the rate at the onset of the Great Recession in 2007, whereas the rate in DC was still 32 percent higher.

[2] Population estimates obtained from the U.S. Census Bureau, URL: https://www.census.gov/data/tables/time-series/demo/popest/2020s-total-cities-and-towns.html#tables

Figure 1. Trends in Food Insecurity



Note: DC and Comparison Cities based on 5–year moving average
Source: Author's calculations from December Current Population Survey 2001–2021

An obvious puzzle that emerges from the figure is why food insecurity among DC seniors did not decline after the Great Recession, and indeed got worse relative to the nation overall and the set of comparison cities. The US macroeconomy was quite strong in the six years prior to the Covid-19 pandemic, and while there is evidence that food insecurity among seniors in DC was starting to decline just before the pandemic hit, it was still substantially elevated suggesting that the recovery in the local DC economy was not as strong, or perhaps another underlying risk factor changed disproportionately for DC seniors such as greater instability in housing or family structure. The next sections aim to uncover the leading factors underlying this puzzle.

IV. Risk Factors for Food Insecurity among Seniors

A number of studies have explored the socioeconomic determinants of food insecurity among older persons (Schoenberg 2000; Lee and Frongillo, 2001; Ziliak, et al., 2008; Brewer et

al., 2010; Kregg-Byers, 2014; Ziliak and Gundersen, 2016; Brucker and Coleman-Jensen, 2017; Malani et al., 2020). An advantage of the December CPS is it contains the vast majority of the risk factors found in the literature, and in this section I explore trends in these socioeconomic characteristics across DC, the US, and the comparison cities.

The extant research literature has established that the poverty status of the household is a leading risk factor for food insecurity (Gundersen et al. 2011). This makes intuitive sense because the questions underlying the measure of food insecurity adopted by the USDA all relate to inadequate access to food because of lack of economic resources.

Figure 2. Trends in Poverty and Near Poverty Rates

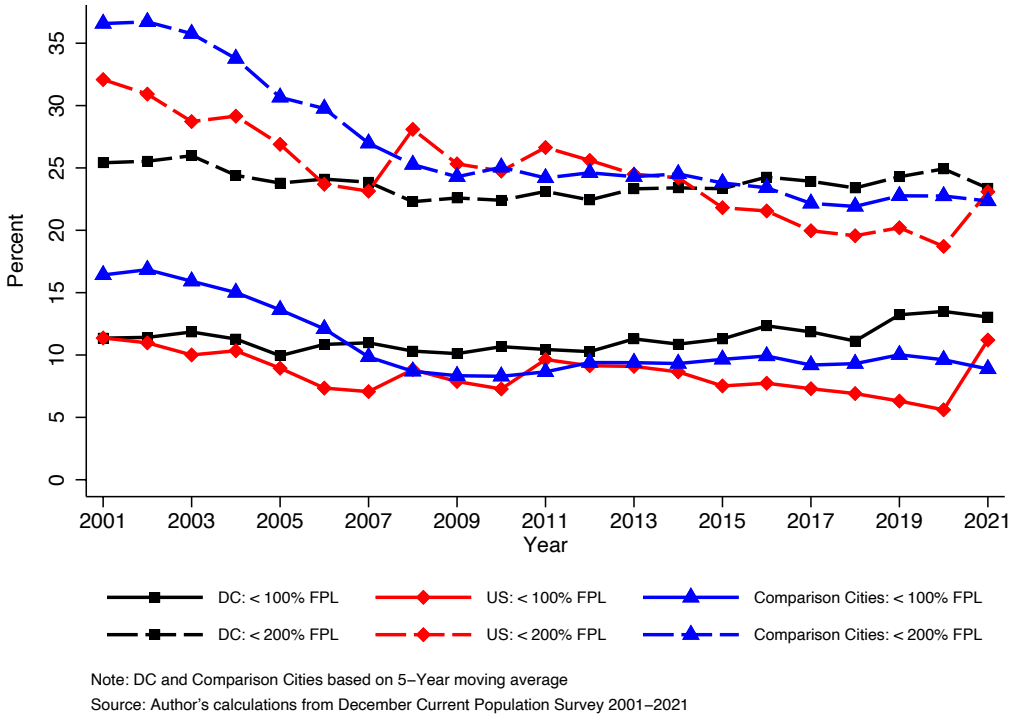


Figure 2 presents trends in the share of seniors residing in households with annual income below the federal poverty line (FPL) as well as those with incomes below twice the poverty line,

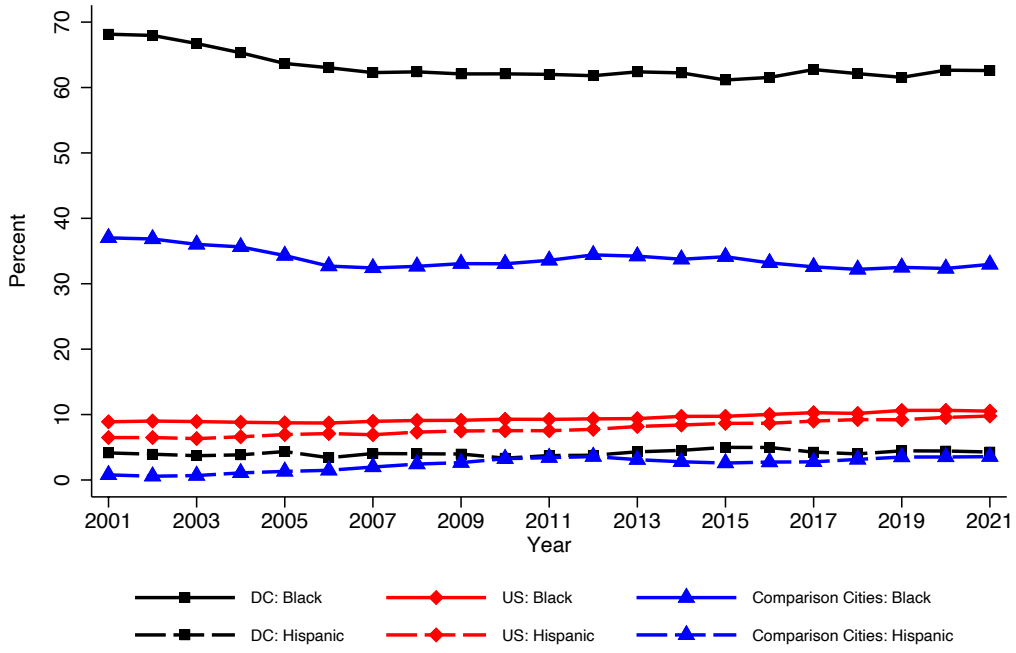
sometimes known as near-poverty status.[3] The figure suggests that the worsening income status of DC seniors is a likely contributor to the deteriorating food security status after the Great Recession. From 2007 to 2021 the poverty rate of DC seniors increased over two percentage points to 13 percent of seniors living below the poverty line (this is a 20 percent increase). Over this same period the poverty rate among comparison cities actually fell a percentage point to 8.9 percent in 2021. The national poverty rate fell even more from 2007-2020, but then increased sharply in 2021, which helps explain the uptick in national senior food insecurity in 2021 seen in Figure 1. Because I take 5-year moving averages for DC and the comparison cities the 2021 increase is smoothed over, but presumably will show up in future years.

Examining near poverty status, Figure 2 suggests that in a typical year about 1 in 4 seniors has annual income below twice the poverty line. This ratio has been remarkably stable in DC over the past two decades, whereas there were big declines in near poverty rates from 2001 to 2021 in the nation overall from 32 to 23 percent (19 percent in 2020) and in the comparison cities from 36 to 22 percent. Much of the decline in the latter groups occurred in the years before the Great Recession, but notably the trend decline continued such that after 2014 (2015) near poverty rates in DC overtook that of seniors in the nation overall (comparison cities).

The prior research literature suggests that even controlling for income older persons are at greater risk of food insecurity across a host of demographic characteristics. One of these factors is membership in a racial or ethnic minority group, and in particular those seniors identifying as African American or Hispanic are at greater risk of food insecurity than those seniors identifying as White or not Hispanic. Figure 3 depicts trends in the shares of seniors in

[3] The December CPS reports income in bins and not the actual dollar amount. Thus I assign households the midpoint of the bin where their incomes lie, and compare that to the household-size and year-specific weighted average poverty threshold established by the Census Bureau https://www.census.gov/data/tables/time-series/demo/income-poverty/historical-poverty-thresholds.html .

Figure 3. Trends in Share of African Americans or Hispanics



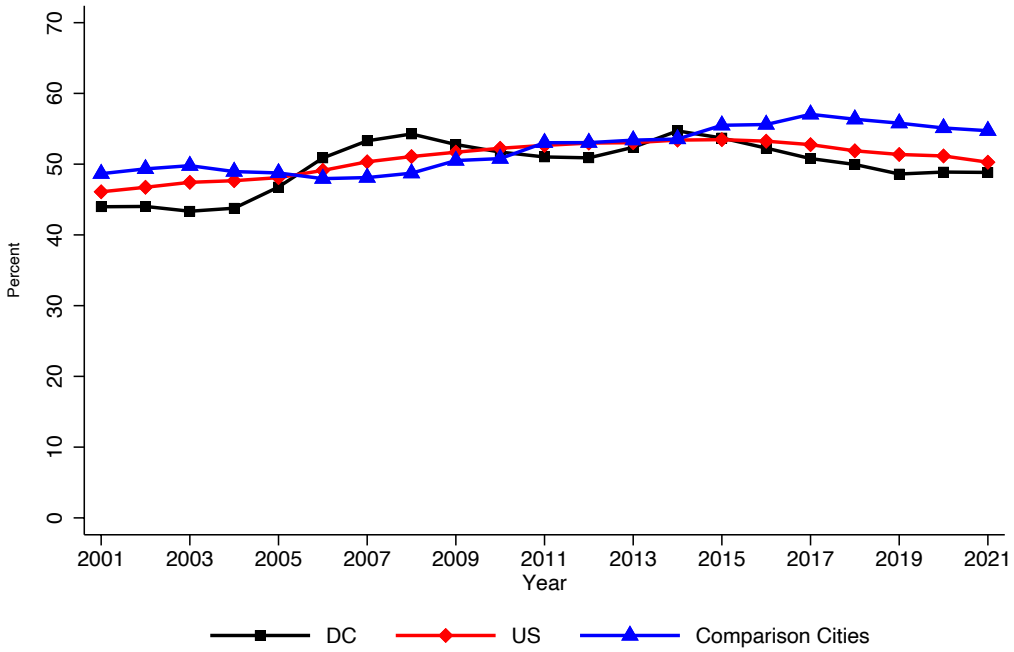
Note: DC and Comparison Cities based on 5–year moving average
Source: Author's calculations from December Current Population Survey 2001–2021

each of those racial or ethnic groups. The District has a substantially larger share of African Americans relative to the share in the nation or the comparison cities. However, these shares have been stable over the last two decades, especially after 2005.[4] This suggests that all else equal we expect DC senior food insecurity to be elevated relative to the comparison groups on average, but there is no expectation that racial composition is affecting the trend over time. The share of seniors who are Hispanic has been trending upward nationally, and in the comparison cities, but not in DC, suggesting that if anything this should pull up food insecurity nationally and in the comparison cities relative to DC.

[4] Across all ages there has been a substantial decline in the African American population in DC since 2000. The fact that it is stable among older persons suggests that much of that shifting racial composition is occurring among younger people.

A striking finding in the literature has been a declining age gradient for food insecurity among older individuals; that is, older ages are protective against food insecurity. Ziliak et al. (2008) suggest a number of possible reasons for this outcome, including the targeting of senior meal services to the oldest old, the presence of time-tested strategies to meet basic needs, and declining emotional and physiological need for caloric intake. This suggests that the age composition of the population is likely to affect the level of food insecurity.

Figure 4. Trends in the Share of Seniors Ages 60-69

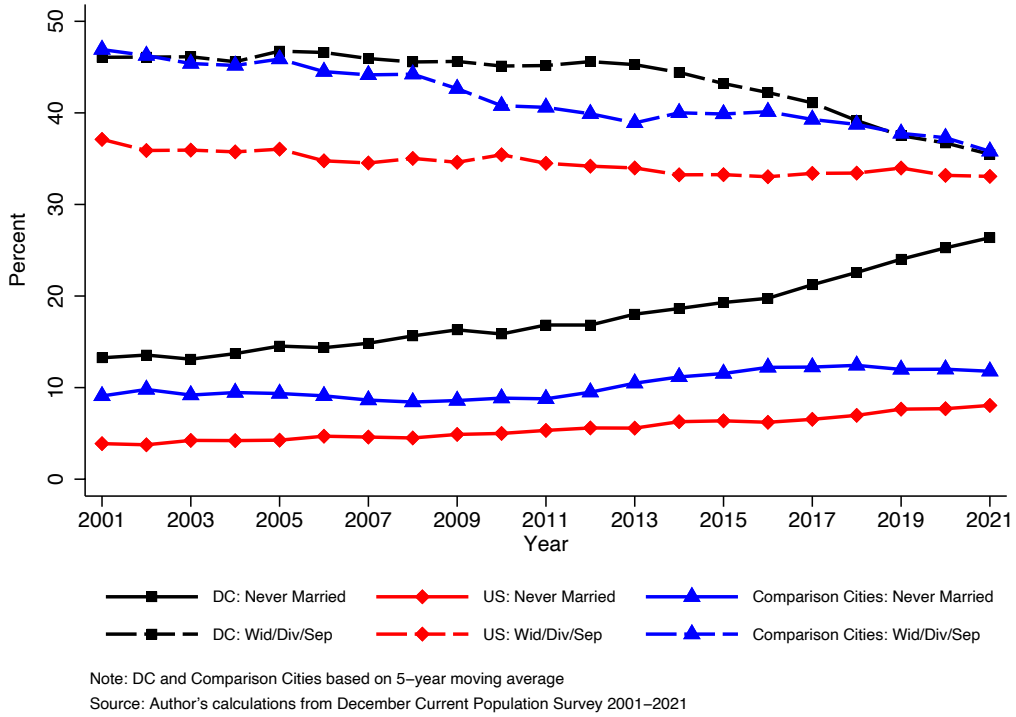


Note: DC and Comparison Cities based on 5–year moving average
Source: Author's calculations from December Current Population Survey 2001–2021

Figure 4 presents trends in the share of individuals ages 60-69 among the population of persons 60 and older in each of the three locations. While there was growth in the share 60-69 in DC in the years leading up to the Great Recession, that share has declined slightly in the subsequent period after the recession. On the other hand, there was steady growth in the share 60-69 in the comparison cities over that same period. Estimates from the literature suggest that if

anything there would be downward pressure on food insecurity in DC relative to the nation and comparison cities given the relative aging among the senior population in DC.

Figure 5. Trends in Share Never Married or Widowed, Divorced, or Separated



Another factor found in the literature that is associated with higher risk of food insecurity is being unmarried. That is, those currently married have greater food security, perhaps because married couples on average are wealthier than unmarried individuals, or because of the emotional support of shared experiences, including preparing and eating food. Figure 5 separates the population of unmarried into those ages 60 and older who have never married, and those who are either widowed, divorced, or separated. Across the entire sample period the District had the highest share of never married seniors, and this rate doubled from 13 percent in 2001 to 26 percent in 2021. Nationally the rate also doubled, but at the much lower level from 4 percent to 8 percent. On the other hand the share never married only increased from 9 to 12 percent among the comparison cities. Interestingly much of the growth in never married over the past decade

came from reductions in the share widowed, divorced, or separated. Because it was not completely offsetting, there is a secular reduction in the share married which was most pronounced in the DC. Thus, the changing composition of household marital status could contribute to some of the differential growth in food insecurity in the District.

Education is also identified as a factor the affects the risk of food insecurity, with lower education attainment exposing households to greater risk, especially among those with less than a four-year college degree. Given that this education-food insecurity relationship holds even after controlling for income differences suggests that higher education confers knowledge on the production of good health and nutrition behaviors that potentially translate into greater food security.

Figure 6. Trends in Education Attainment

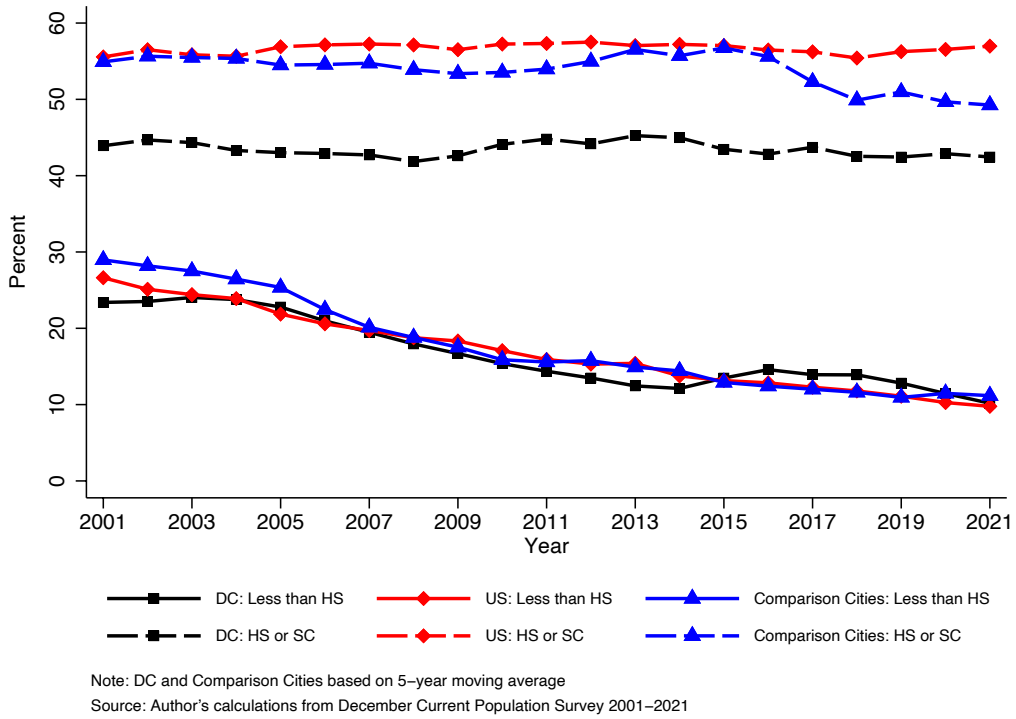
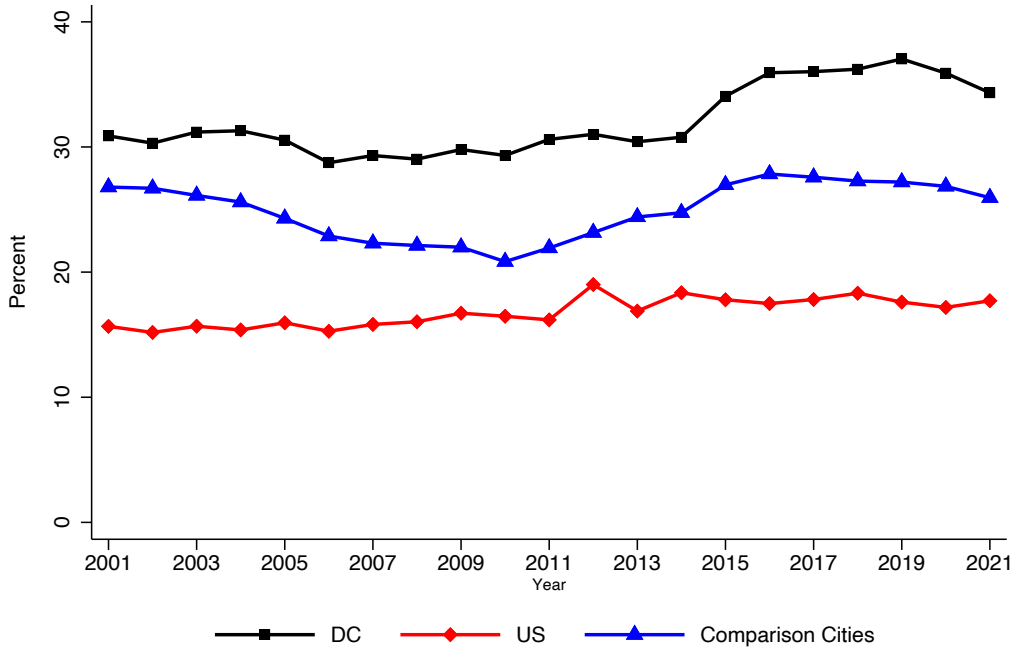


Figure 6 presents the share of seniors who have less than a high school diploma, and those with a high school diploma or some college (which includes those with associates degrees.)

The figure shows that in all three areas there has been a strong secular decline in those who drop out of high school, with a 17-point decline nationally and in the comparison cities, and a 13-point decline in the District. Because high school dropouts are at greater risk of disadvantage this drop is a positive development, though it was less in evidence in the District. The share with high school or some college was stable across the period in DC and nation, and with the rate lower in the District, the fall in high school dropouts means an increase in the share of seniors with at least four years of college. This gain was again quite pronounced in the comparison cities, which aligns with the strong decline in poverty and food insecurity there relative to DC.

Figure 7. Trends in Share Who Live in Rental Housing

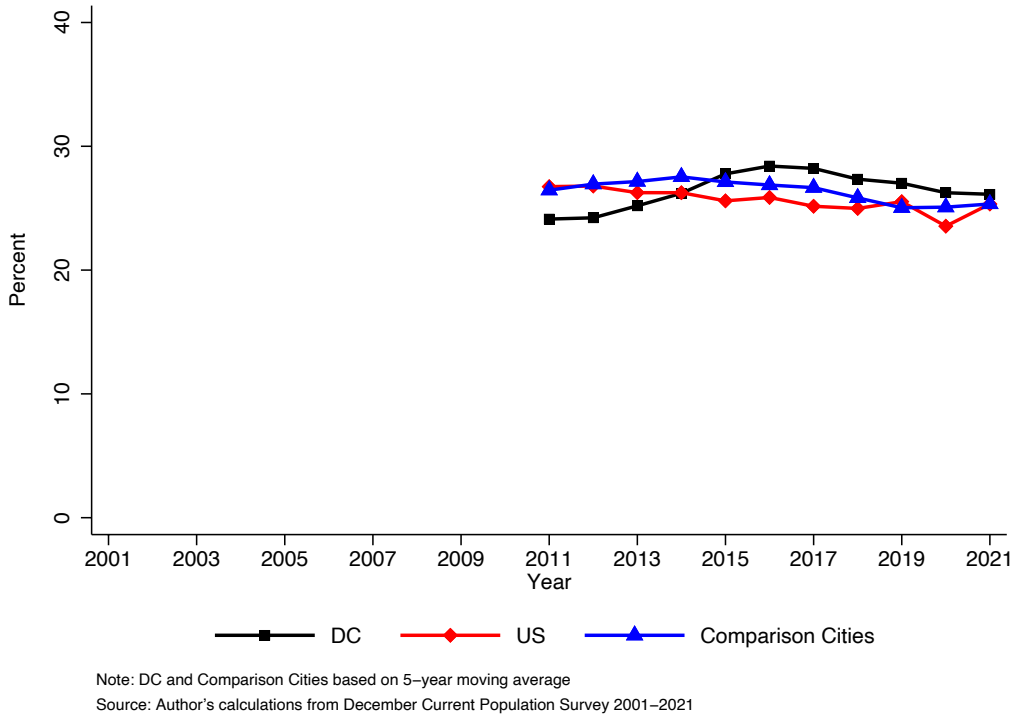


Note: DC and Comparison Cities based on 5–year moving average
Source: Author's calculations from December Current Population Survey 2001–2021

Home ownership is the primary form of wealth for most Americans, and the equity in the home can be accessed to provide short-run liquidity to cover both planned and unplanned expenditures, thereby mitigating the risk of food insecurity (Loibl et al. 2022). Figure 7 presents the share of seniors living in rental housing. The figure shows a sharp increase in the aftermath

of the Great Recession among seniors in DC living in rental housing.[5] There was also a sizable increase in seniors residing in rental housing in the comparison cities, but it is notable that the widening gap between DC and the comparison cities after 2013 overlaps with the widening gap in food insecurity in Figure 1.

Figure 8. Trends in Share with Disability

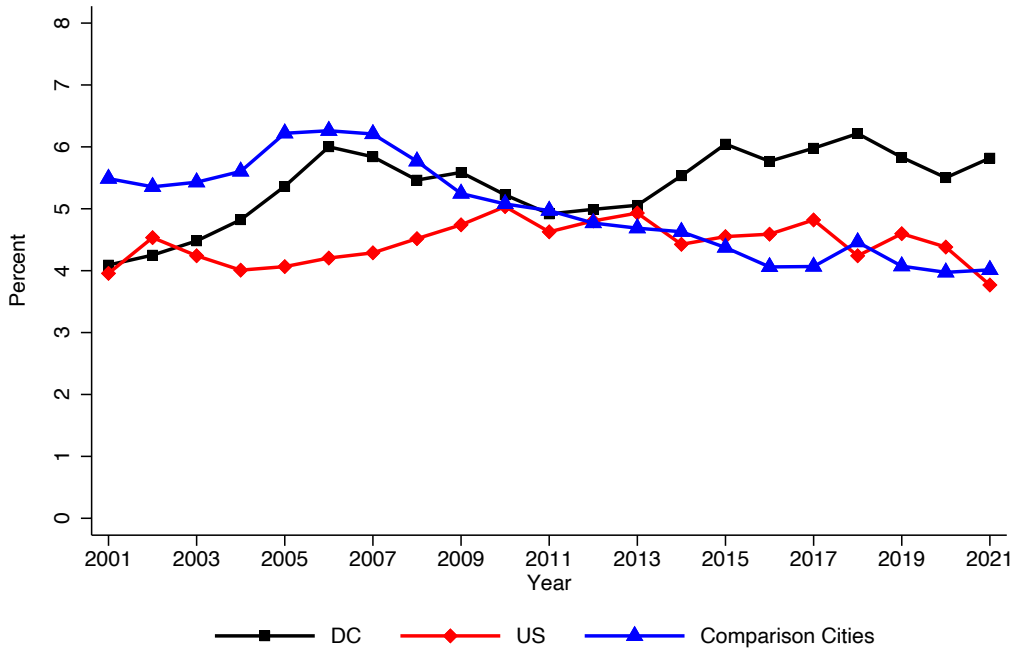


The extant literature notes that seniors living with disabilities are at heightened risk of food insecurity, again a relation that holds even after controlling for income differences. The CPS began asking questions on disability status in 2009, including any physical or emotional issues that interfere with activities of daily living such as dressing, bathing, shopping, cooking, visiting a doctor, etc…. The share reporting these difficulties is depicted in Figure 8, though because of the 5-year moving average the first year that is relevant to examine DC and the

[5] The temporary increase in 2012 in the national rental rate is due to a spike in the share not reporting housing status in that particular survey year.

comparison cities is 2011. Over the past decade about 1 in 4 seniors report difficulties in these basic daily functions, and while the rates are similar across all areas, DC seniors reported an increase in disabilities over time, whereas seniors overall and in the comparison cities had slightly lower rates by the 2021, suggesting that disability status could differentially exacerbate food insecurity in DC, though this effect is likely small given the similar rates.

Figure 9. Trends in Multigenerational Households



Note: DC and Comparison Cities based on 5–year moving average
Source: Author's calculations from December Current Population Survey 2001–2021

The last risk factor examined is another form of household composition; namely, whether a grandchild resides in the same household as the senior, resulting in a multigenerational household. Ziliak and Gundersen (2016) show that households with grandchildren present are more than twice as likely to have incomes below the poverty line, and have rates of food insecurity that are more than twice as high, compared with families with no grandchildren present. Figure 9 shows the share of seniors living a with a grandchild, with or without the grandchild's parent. Although this is a fairly rare occurrence—affecting only about 5 percent of

seniors in a typical year—there is suggestive evidence that doubling up is a more acute challenge for seniors in DC compared to seniors overall or residing in the comparison cities. This is most acute in the last decade where doubling up fell nationally and in the comparison cities, but increased in DC and remained elevated.

In sum, several socioeconomic characteristics of seniors in DC are potential candidates for the elevated rates of food insecurity in the years after the Great Recession, especially higher rates of income poverty, not being married, renting instead of owning a home, and caring for a grandchild. These effects are likely reinforcing, and thus in the next section I bring these together in a regression framework to examine in more detail the risk factors of senior food insecurity.

V. Regression Framework for Senior Food Insecurity

In this section I conduct a regression analysis along the lines of that found in earlier research (Ziliak et al. 2008; Ziliak and Gundersen 2009, 2016). The statistical models help us determine which factors are associated with food insecurity, such as the effect of age on the probability of food insecurity holding income, race, and other factors constant. That is, we are able to estimate the probability that households with specific demographic profiles are food insecure. I use standard social science methods for models where the dependent variable takes only one of two values—0 or 1—i.e. is the household food insecure—no or yes.

Formally, I estimate the following probit maximum likelihood model:

(1) $$\mathrm{FS_{it}} = \mathrm{X_{it}p} + \delta_t + \mathrm{v_{it}},$$

where $\mathrm{FS_{it}}$ takes on a value of 1 if senior i in year t is food insecure and 0 otherwise; $\mathrm{X_{it}}$ is a vector of socioeconomic characteristics; p is a vector of unknown parameters to estimate; δ_t is a set of year fixed effects; and $\mathrm{v_{it}}$ is a normally distributed random error term. The demographic

Box 2: Socioeconomic Factors in Regression Models of Food Insecurity	
Income Level	Less than 100% of Poverty Line 100-200% of Poverty Line > 200% of Poverty Line (omitted) Missing Income
Race	African American Other (Asian; Pacific Islander; Native American) White (omitted)
Ethnicity	Hispanic Non-Hispanic (omitted)
Age	60-69 70-79 80+ (omitted)
Marital Status	Never Married Widowed/Divorced/Separated Married (omitted)
Education	High School Dropout High School Graduate Some College College Degree or more (omitted)
Employment Status	Employed Unemployed Out of Labor Force: Disabled/Other Retired (omitted)
Housing Status	Renter Homeowner (omitted)
Gender	Male Female (omitted)
Household Size	Lives with Others Lives Alone (omitted)
Multigenerational Household	Resident Grandchildren No Resident Grandchildren (omitted)

factors in *X* include many of those discussed in the prior section as summarized in Box 1 with some modifications (the reference group is noted in parentheses as "omitted"). Specifically I expand racial categories to include Asian, Pacific Islander, and Native Americans in the "other race" category; I separate out the high school graduate and some college group; and because disability status as defined in Figure 8 above is not available until 2009, I instead use detailed employment status (employed, unemployed, out of the labor force due to disability or some other

non-retirement reason, and retirement). The year fixed effects serve as controls for any aggregate year-specific shocks that affect all seniors the same in any given year, e.g. price spike in food, natural gas, etc...

A. Estimation Results

Table 1 presents the estimates of the regression model in equation (1) using the national sample of individuals age 60 and older from the 2001-2021 December CPS. The first column contains the coefficients from the probit regression along with the robust standard errors adjusted for heteroskedasticity, but because the probit coefficients only reveal the direction of the association between a risk factor and food insecurity and not the magnitude, the second column contains the marginal effects and the associated standard errors that provide estimated magnitude and direction of effects.

The estimates in Table 1 indicate that holding other factors constant, seniors with incomes that place them below the poverty line have a 13.7 percentage point increase in the risk of food insecurity relative to those with incomes above two times the poverty line. Given that the average food insecurity rate across the sample period is 7.3 percent, it becomes clear that poverty status is the leading risk factor for food insecurity among seniors. Looking down the column of marginal effects, we confirm the prior literature's estimated relationships in that the risk of food insecurity is higher among African American seniors who are on average 3.8 percentage points more likely to be food insecure than White seniors; younger seniors age 60-69 have a risk 3.8 percentage points higher than those age 80 and older; those who are widowed, divorced, or separated have a 3.3 percentage point greater risk of food insecurity than those married, which is higher than the risk factor for the never married (2.2 percentage points); those seniors who lack at least a high school diploma have effect sizes double the other education categories; those who

are unemployed or out of the labor force for non-retirement reasons also have very elevated risks of food insecurity compared to retired seniors; renters on average face risks of food insecurity nearly 4 percentage points higher than homeowners; and those raising grandchildren have risks 3.1 percentage points higher than seniors without resident grandchildren.

Table1. The Effect of Socioeconomic Characteristics on Food Insecurity

VARIABLES	(1) Probit Coefficients	(2) Marginal Effects
Income <= 100% FPL	0.887***	0.137***
	(0.011)	(0.002)
Income > 100% & <= 200% FPL	0.651***	0.080***
	(0.009)	(0.001)
Missing Income	0.167***	0.015***
	(0.010)	(0.001)
Black	0.348***	0.038***
	(0.010)	(0.001)
Other Race	0.160***	0.015***
	(0.014)	(0.001)
Hispanic	0.234***	0.024***
	(0.012)	(0.001)
Age 60-69	0.449***	0.038***
	(0.011)	(0.001)
Age 70-79	0.278***	0.026***
	(0.011)	(0.001)
Never Married	0.216***	0.022***
	(0.015)	(0.002)
Widowed, Divorced, or Separated	0.356***	0.033***
	(0.009)	(0.001)
Less Than High School	0.461***	0.052***
	(0.012)	(0.002)
High School	0.273***	0.025***
	(0.010)	(0.001)
Some College	0.268***	0.026***
	(0.011)	(0.001)
Employed	0.002	0.000
	(0.009)	(0.001)
Unemployed	0.574***	0.078***
	(0.023)	(0.004)
OLF: Disability or Other	0.470***	0.056***
	(0.010)	(0.002)
Renter	0.362***	0.038***
	(0.008)	(0.001)
Male	0.014**	0.001**
	(0.007)	(0.001)
Lives with Others	0.153***	0.012***

	(0.010)	(0.001)
Multigenerational Household	0.289***	0.031***
	(0.013)	(0.002)
Constant	-3.221***	
	(0.024)	
Observations	441,587	441,587

Note: Robust standard errors in parentheses. Model also includes controls for year fixed effects. Statistical significance*** p<0.01, ** p<0.05, * p<0.1
Source: Author's calculations from 2001-2022 December Current Population Survey

B. Counterfactual Predictions on Closing the Food Insecurity Gap

With the estimated parameters from the regression model, I conduct a number of counterfactual predictions on how senior food insecurity in the District evolved relative to the nation and the comparison cities over the past two decades, and how those predictions would change under alternative socioeconomic conditions.

Specifically, using the average value of the characteristics in each year and the estimated probit coefficients, I first define the predicted food insecurity gap between DC and the nation (comparison cities) as

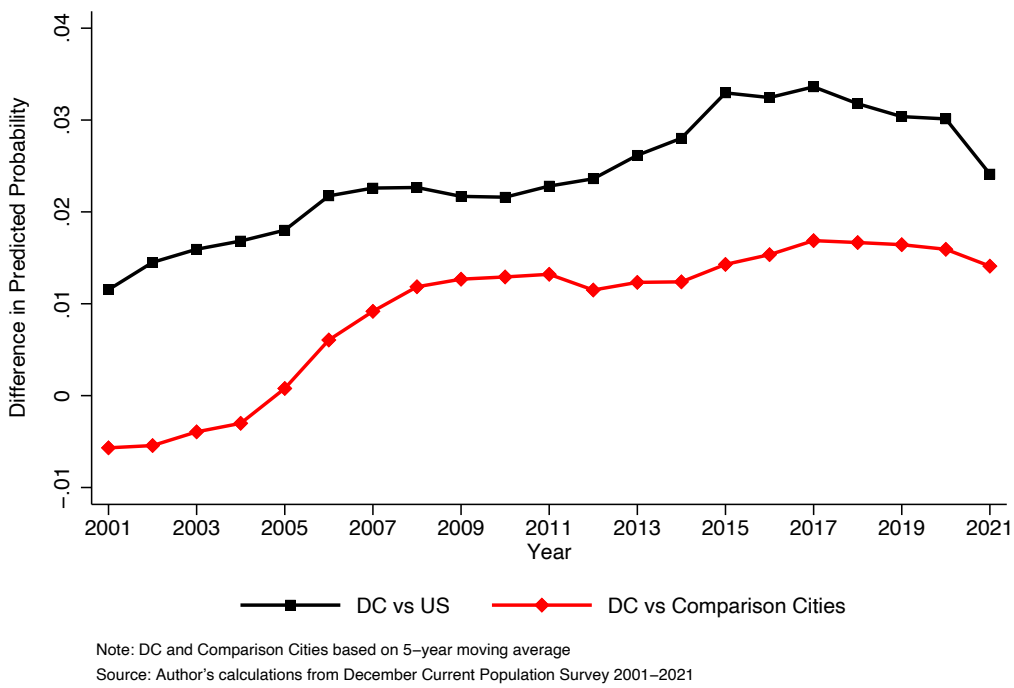
(2) $$\widehat{FI\ gap}_t = \widehat{FI}_t^{DC} - \widehat{FI}_t^{j},$$

where j denotes for the nation (US) or the comparison cities (CC), and the terms on the right hand side are $\widehat{FI}_t^{DC} \equiv \Phi(\bar{X}_t^{DC}\hat{p} + \hat{\delta}_t)$ and $\widehat{FI}_t^{j} \equiv \Phi(\bar{X}_t^{j}\hat{p} + \hat{\delta}_t)$, with Φ is the cumulative normal distribution function. The predicted values are evaluated at the sample averages of the socioeconomic characteristics $\bar{X}_t$ for DC residents and the respective comparison group, and $\hat{p}$ and $\hat{\delta}_t$ are the estimated coefficients and year fixed effects.

Figure 10 depicts trends in the predicted food insecurity gap between DC and nation and DC and the comparison cities. As foreshadowed in Figure 1, the predicted gap in food insecurity between DC and the nation widened over time, from one percentage point in 2001 to over 3

percentage points, while that between DC and the comparison cities went from -0.5 percentage point (meaning DC was predicted to be lower) to just over 1 percentage point.

Figure 10. Predicted Food Insecurity Gap Between DC and Comparison Groups



The counterfactual exercise then is to replace some of the average values of the socioeconomic characteristics in DC with those from the nation or comparison cities to examine how much of the food insecurity gap could hypothetically be closed under different demographic outcomes. That is, I replace the average values of these characteristics in the prediction for DC as follows

(3) $$\widehat{FI}_t^{j,DC} = \Phi(\bar{Z}_t^j \hat{p}_z + \bar{D}_t^{DC} \hat{p}_D + \hat{\delta}_t),$$

where $\bar{Z}_t^j$ are the subset of demographic factors set at values from the US or comparison cities, $\hat{p}_Z$ are the associated estimated probit coefficients on those variables, and the *D* are rest of the risk factors set at the DC values with their associated probit coefficients.

The descriptive figures in Section IV noted some important trend differences in the share of seniors living in poverty or near poverty, the share never married or widowed/divorced/separated, the share renting, and the share raising grandchildren in a multigenerational household. Thus I replace those four variables with the average levels from the US (comparison cities) in equation (3), and then examine how predicted food insecurity in DC changes under the counterfactual compared to the actual prediction in equation (2); that is, I report $\widehat{FI}_t^{j,DC} - \widehat{FI}_t^{DC}$. Values greater than zero indicate a worsening of predicted food insecurity in DC, and negative values indicate improvements.

Figure 11. Change in Predicted Food Insecurity in DC under Counterfactuals

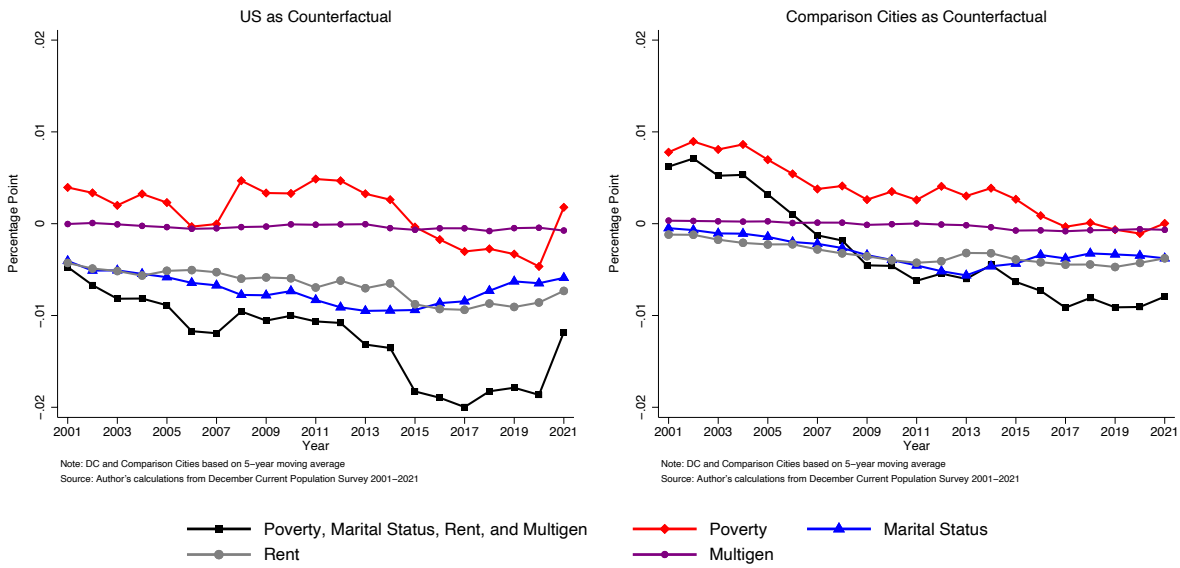


Figure 11 shows that when we replace the DC average values of poverty status (less than 100% FPL, 100-200% FPL, missing income), marital status (never married, widowed/divorced/separated), living in a rental unit, and living in a multigenerational household with either the US values or the comparison cities values then we predict a substantial decline in food insecurity among seniors in the District, especially over the last decade. For example,

Figure 10 indicates that the predicted gap in food insecurity between DC and the US is just over 3 percentage points at the peak gap year of 2017, while Figure 11 indicates that DC food insecurity was predicted to be 2 percentage points lower in 2017 if it had the US values for poverty status, marital status, rental housing, and multigenerational households. In other words, the predicted gap would be about 60 percent lower. A similar percentage closing of the gap is obtained in 2017 if we use the comparison cities values as the counterfactual.

The other lines in Figure 11 depict the reduction in DC food insecurity if we change the four factors one by one. For much of the period, poverty was lower in DC compared to the US overall and the comparison cities and thus predicted food insecurity in DC would be higher under the counterfactual. However, as noted in Figure 2, the last five years of the sample period saw a reversal with poverty in DC exceeding the US and comparison cities, and thus food insecurity would be predicted to be lower if DC's poverty and near poverty rates had been lower like the comparison groups. The two factors that exert the most deleterious influence on DC food insecurity are the lower rates of marriage and the share living in rental housing. Roughly one-third of the predicted food insecurity gap with the nation is accounted for by higher rates of rental housing. However, even though the share of seniors in DC raising grandchildren has increased relative to the comparison groups in recent years, it is such a small portion of households that it has only a negligible effect on predicted food insecurity at average values.

C. Accounting for Excess Food Insecurity

The last part of the empirical analysis is to examine whether local macroeconomic factors omitted from the empirical model of equation (1) and reported in Table 1 can account for some of the unexplained portion of food insecurity. The basic idea is to predict excess food insecurity in location l as

(4) $\widehat{EFI}_{lt} = \overline{FS}_{lt} - \overline{\widehat{FS}}_{lt}$

where $\widehat{EFI}_{lt}$ is the "excess" food insecurity in city *l* in time *t* that is defined as the difference between the 5-year moving average city food insecurity rate ($\overline{FS}_{lt}$) and the 5-year moving average predicted food insecurity rate from the probit regression ($\overline{\widehat{FS}}_{lt}$).[6] Note that if excess food insecurity ($\widehat{EFI}_{jl}$) is negative then the city has macroeconomic or policy factors to pull food insecurity down relative to what would have been expected given the composition of seniors in the city, while if $\widehat{EFI}_{lt}$ is positive then this suggests that city economic outcomes and policy choices are pushing food insecurity above what would be expected.

I then relate city-level economic factors to the predicted excess food insecurity for DC and the set of comparison cities by estimating the following linear regression model:

(5) $\widehat{EFI}_{lt} = W_{lt}q + e_{lt}$

where W_{lt} are city-level factors that include measures of the macroeconomy capturing the labor-market and earnings distribution of each community. These include the unemployment rate, median earnings, and the ratio of the 90th percentile of earnings to the 10th percentile (a ratio of 1 means equality and thus inequality is increasing as the ratio exceeds 1).[7] I also control for the size of the city to adjust for any across-city differences in the potential labor force. If much of the excess food insecurity remains unexplained by local economic factors, then this potentially points to changes in local policies affecting food security of seniors. The focus here will be on DC and how it compares to the other cities of similar size and composition.

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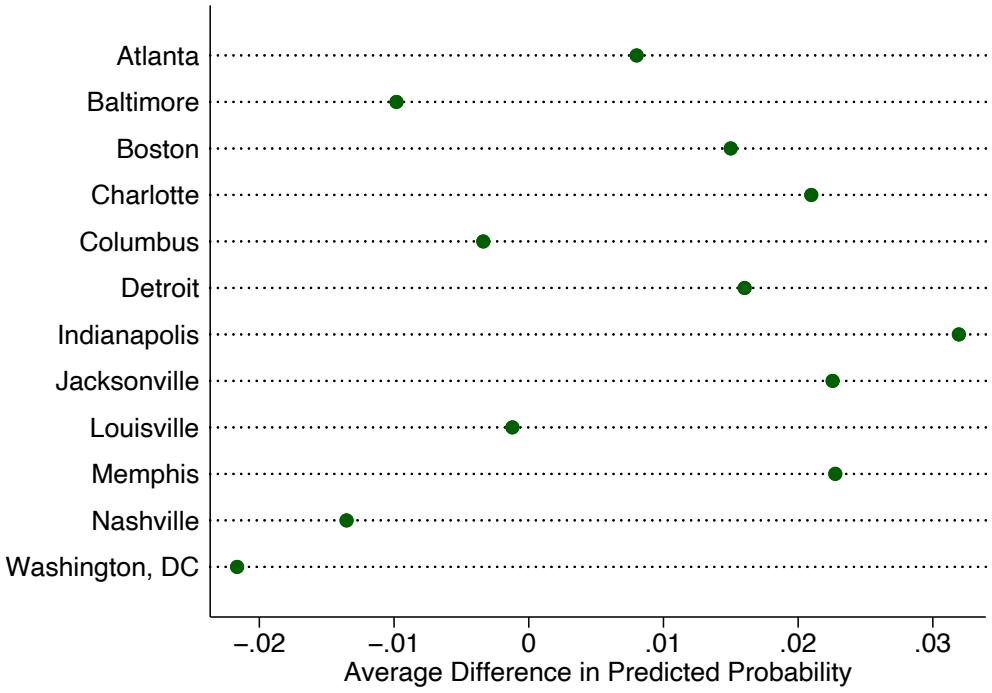
[6] $\overline{\widehat{FS}}_{lt}$ is constructed by taking the five-year moving average of individual predictions instead of predictions of five-year averages as in Figures 10 and 11.

[7] Measures of the city unemployment rate and earnings distribution come from the 2002-2022 Annual Social and Economic Supplement to the Current Population Survey. The supplement is collected in March of each year and is the official source of Census income statistics used in poverty and inequality measurement. To minimize employment and earnings volatility of very young workers, the sample used is those ages 25 and older. Similar to the food insecurity measures, I use 5-year moving averages of the city employment and earnings data.

With the estimated probit coefficients in Table 1 from the national sample and the relationship in equation (4), Figure 12 presents the average excess food insecurity for the District and each of the comparison cities listed in alphabetic order. A value of 0 means that on average the set of socioeconomic characteristics in the city included in the regression model predict what would be the expected level of food insecurity, while negative values indicate that there are macroeconomic or policy factors that decrease food insecurity relative to what the model predicts and positive values of excess food insecurity suggest additional forces pushing up food insecurity relative to what is predicted. The figure indicates that on average the District has omitted macro or policy forces that have pulled down food insecurity relative to predicted expectations, while most of the balance of cities have macro and policy factors working in the opposite direction. The cities of Columbus and Louisville have socioeconomic characteristics that on average effectively predict rates of food insecurity.

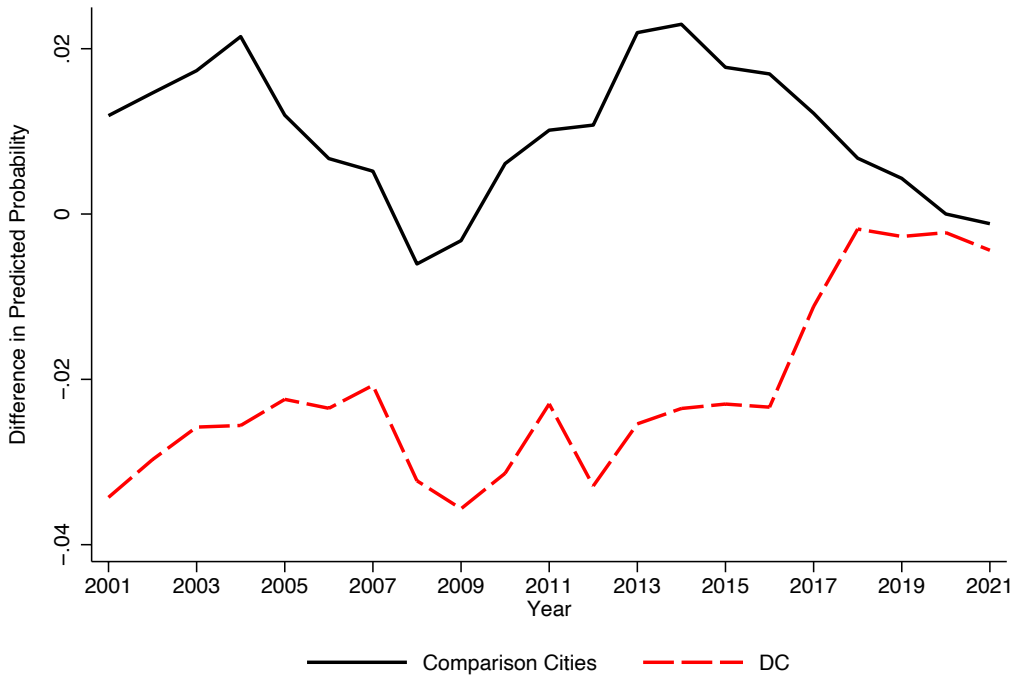
Figure 12. Average Estimated Excess Food Insecurity



Source: Author's calculations from December Current Population Survey 2001–2021

Figure 13 depicts the evolution of excess food insecurity over time instead of the average in Figure 12. For ease of presentation, I show the average across the comparison cities instead of individually. The figure shows that the forces that kept food insecurity in DC below what was expected based on DC's socioeconomic characteristics progressively dissipated over time such that by 2018 estimated excess food insecurity was zero. However, just as DC was losing the benefit of these extra factors, the comparison cities were gaining them, and pulling excess food insecurity toward zero.

Figure 13. Evolution of Excess Food Insecurity



Source: Author's calculations from December Current Population Survey 2001–2021

Because there are many years prior to 2017 where excess food insecurity lies either below zero (DC) or above zero (comparison cities), I next present estimates of equation (5) that relates excess food insecurity to local labor market conditions and the earnings distribution. The first column of Table 2 shows the baseline results of a very parsimonious regression of excess food insecurity from DC and the eleven comparison cities on those locations unemployment rate,

median earnings (in thousands of 2021 inflation-adjusted dollars), the ratio of 90-10 earnings inequality, and population (per 10,000 residents), along with a constant term. Columns (2) – (4) then augment that specification by successively adding additional control variables—first with so-called city fixed effects that control for permanent time-invariant differences across the twelve cities (e.g. Boston is permanently adjacent to water while Indianapolis is permanently land-locked); then in column (3) I add linearly trending city fixed effects which capture slowly trending differences across cities (e.g. perhaps differential economic/housing development or trending differences in health outcomes like life expectancy); and finally in column (4) I include year fixed effects, which control for aggregate factors (business cycle, political, policy) that affect each city the same in each year but differently across years. The latter permit city-level deviations in year effects from the overall regression model estimated in Table 1.

Table 2. The Effect of Local Labor Market Factors on Excess Food Insecurity

VARIABLES	(1)	(2)	(3)	(4)
Unemployment Rate	-0.0036*	-0.0026	-0.0055***	0.0024
	(0.0019)	(0.0024)	(0.0021)	(0.0027)
Median Earnings ($2021 '000s)	-0.0015***	-0.0014***	-0.0005	-0.0006
	(0.0003)	(0.0005)	(0.0007)	(0.0007)
Earnings Inequality (90-10)	0.0041**	0.0028	0.0047**	0.0072***
	(0.0017)	(0.0022)	(0.0021)	(0.0022)
Population (per 10,000)	0.0003**	0.0002	0.0010***	0.0006
	(0.0001)	(0.0002)	(0.0003)	(0.0004)
Observations	252	252	252	252
R-squared	0.1217	0.2304	0.5425	0.5857
City Fixed Effects	No	Yes	Yes	Yes
City Trend Effects	No	No	Yes	Yes
Year Fixed Effects	No	No	No	Yes

Note: Robust standard errors in parentheses. Statistical significance*** p<0.01, ** p<0.05, * p<0.1
Source: Author's calculations from 2001-2022 December Current Population Survey

Column (1) of Table 2 shows a somewhat unexpected result that higher unemployment leads to reductions in excess food insecurity, but based on the specifications in columns (2)-(4) this result is somewhat volatile and ends up switching to the expected positive sign in column

(4), though it is not statistically distinguishable from zero. We do expect higher median earnings to result in lower excess food insecurity, and this is what we find in Table 2, though again statistical significance is lost once we add unrestricted year fixed effects to the model. There is also compelling evidence that widening inequality in the distribution of earnings leads to higher excess food insecurity, and likewise cities with greater population pressures have higher excess insecurity. The R-Squared increases from 0.12 to 0.59, meaning the baseline model only explains 12 percent of the across city variation in excess food insecurity, whereas the model captures 59 percent of the variation once we add city fixed effects and trends and year fixed effects. The big increase in explained variation comes between columns (2) and (3), suggesting that much of the unexplained variation in excess food insecurity comes in the form of slowly trending factors at the city level. However, as seen in Figure 13, most of these unexplained differences in food insecurity occurred in the years before the Great Recession, and in recent years most of food insecurity in DC and the comparison cities is well accounted by the observed socioeconomic characteristics in the model.

VI. Conclusion

The District of Columbia has experienced a sustained increase in food insecurity among the older population of adults in the decade after the Great Recession. The evidence in this report points to main three factors contributing to this growth: rising rates of poverty and near poverty; declines in the share of seniors who are married; and the rising share of seniors residing in rental housing. Counterfactual predictions suggest that in recent years about 60 percent of the gap between senior food insecurity in DC and that in the nation overall and among a select group of comparison cities can be accounted for by these three factors. Addressing rising poverty and reliance on rental housing among seniors in DC are amenable to direct action on the part of local

policymakers. The third factor, marriage, is part of a broad secular change affecting all developed economies and is unlikely to be substantively altered by local policy decisions.

District policymakers could consider programs that redistribute income to low-income seniors by providing a monthly top-up to those seniors reliant on Social Security, or expanding the number and amount of supplements to those receiving Supplemental Security Income (SSI). Based on current policy, those over age 65 in the labor force without a qualifying child are not eligible for either the federal or District Earned Income Tax Credit (DC EITC). While DC policymakers cannot change federal policy, they could consider extending DC EITC eligibility to childless seniors. Several communities are experimenting with guaranteed income programs, and DC government could consider implementing such a program, and perhaps augmenting it with a rigorous evaluation to assess whether it substantively affects senior food insecurity.[8] In addition local policymakers could consider a rental subsidy program beyond the federal housing voucher program, which is severely limited in who receives assistance. The District has an affordable housing trust fund that subsidizes the construction of low-income housing, but those benefits are indirect and again limited to a select few. The housing affordability problem in the District is acute, and is particularly difficult to manage among those on fixed and limited incomes like many seniors.

Finally, given the large African American population in the District relative to the population of seniors nationally, additional research is needed to better understand whether the mechanisms and lived experiences of food insecurity differ within the District across seniors of different races and ethnicities.

[8] Guaranteed income programs generally differ from Universal Basic Income programs in that eligibility is restricted to low income households.

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