

The Health Consequences of Senior Hunger in the United States: Evidence from the 1999-2016 NHANES



Dr. James P. Ziliak

University of Kentucky

Dr. Craig Gundersen

Baylor University

Released August 2021



The Health Consequences of Senior Hunger in the United States: Evidence from the 1999-2016 NHANES

Prepared for Feeding America

August 18, 2021

Dr. James P. Ziliak
University of Kentucky

Dr. Craig Gundersen
Baylor University

ACKNOWLEDGEMENTS

This report was made possible in partnership with Feeding America by a generous grant from the Enterprise Rent-A-Car Foundation. The conclusions and opinions expressed herein are our own and do not necessarily represent the views of any sponsoring agency.

CONTENTS

CONTENTS.....	2
EXECUTIVE SUMMARY	4
I. INTRODUCTION.....	5
II. DATA.....	5
III. RESULTS	7
III.A. Health Outcomes across Food Security Status.....	7
III.B. Health Outcomes over Time and Food Security Status.....	8
III.C Demographic Differences in Health Outcomes across Food Security Status	8
III.D. The Association of Food Insecurity with Nutrition and Health Outcomes	9
IV. CONCLUSION.....	11
V. REFERENCES	12
TABLES AND FIGURES	14
Table 1. Nutrition and Health Outcomes by Food Insecurity Status for All Seniors.....	14
Table 2. Nutrition Outcomes by Food Insecurity Status for Married Seniors	15
Table 3. Nutrition and Health Outcomes by Food Insecurity Status for Widowed Seniors	16
Table 4. Nutrition and Health Outcomes by Food Insecurity Status for Unmarried Seniors ...	17
Table 5. Nutrition and Health Outcomes by Food Insecurity Status for Low-Income Seniors	18
Table 6. Nutrition and Health Outcomes by Food Insecurity Status for High-Income Seniors	19
Table 7. Nutrition and Health Outcomes by Food Insecurity Status for Female Seniors	20
Table 8. Nutrition and Health Outcomes by Food Insecurity Status for Male Seniors.....	21
Table 9. Nutrition and Health Outcomes by Food Insecurity Status for Black Seniors	22
Table 10. Nutrition and Health Outcomes by Food Insecurity Status for Hispanic Seniors.....	23
Table 11. Nutrition and Health Outcomes by Food Insecurity Status for White Seniors	24
Table 12. Nutrition and Health Outcomes by Food Insecurity Status for High-Education Seniors.....	25
Table 13. Nutrition and Health Outcomes by Food Insecurity Status for Low-Education Seniors.....	26
Table 14. Nutrition and Health Outcomes by Food Insecurity Status for Seniors, Ages 60-65	27
Table 15. Nutrition and Health Outcomes by Food Insecurity Status for Seniors, Ages 66-70	28
Table 16. Nutrition and Health Outcomes by Food Insecurity Status for Seniors, Ages 71-75	29
Table 17. Nutrition and Health Outcomes by Food Insecurity Status for Seniors, Ages 76-80	30
Table 18. Nutrition and Health Outcomes by Food Insecurity Status for Seniors, Ages 81+ ..	31
Table 19A: Effect of Food Insecurity on Nutrient Intakes, All Seniors	32
Table 19B: Effect of Food Insecurity on Health Outcomes, All Seniors.....	34
Table 20A: Effect of Food Insecurity on Nutrient Intakes, Low-Income Seniors	38

Table 20B: Effect of Food Insecurity on Health Outcomes, Low-Income Seniors	40
Appendix Table 1: Questions on the Food Security Supplement	59
Appendix Table 2. Nutrition and Health Outcomes for All Seniors.....	60
Appendix Table 3: Selected Characteristics of Seniors Age 60 and Older.....	61

Suggested citation: Ziliak, J., Gundersen, C. (August 2021). *The Health Consequences of Senior Hunger in the United States: Evidence from the 1999-2016 NHANES*. Report for Feeding America. Available from Feeding America: <https://www.feedingamerica.org/research/senior-hunger-research>

EXECUTIVE SUMMARY

Millions of seniors are food insecure in the United States, meaning that scores do not have access to enough food at all times for an active, healthy life. In this report we examine the health consequences of food insecurity among seniors. The report updates our earlier studies on this issue by examining how trends in health and nutrition outcomes among food secure and food insecure seniors have changed over the past decade before and after the Great Recession. Using data from the 1999-2016 National Health and Nutrition Examination Survey (NHANES) we considered the following outcomes related to nutrient intakes: energy intake, protein, vitamin A, vitamin C, thiamin, riboflavin, vitamin B6, calcium, phosphorous, magnesium, and iron. The set of health outcomes we analyzed were diabetes, general health, number of days of poor physical health in the past month, number of days of poor mental health in the past month, depression, activities of daily living (ADL) limitations, high blood pressure, hypertension, high cholesterol, congestive heart failure, coronary heart disease, heart attack, cancer, reports of chest pain, gum disease, gum health, psoriasis, and asthma.

Food insecure seniors have lower nutrient intakes. For each of the eleven nutrients, average intakes are statistically significantly lower by between 8 and 24 percent for food insecure seniors in comparison to food secure seniors. After controlling for other confounding factors, the effect of food insecurity is still negative and, with one exception, statistically significant for each of the nutrients. These differences in nutrient intakes held across time as well.

Food insecure seniors have worse health outcomes. For a wide array of health outcomes, food insecure seniors are worse-off than food secure seniors. Namely, they are 74 percent more likely to be diabetic, over twice as likely to report fair or poor general health, almost 3 times more likely to suffer from depression, 20 percent more likely to report at least one ADL limitation, 19 percent more likely to have high blood pressure, 71 percent more likely to have congestive heart failure, 64 more likely to have experienced a heart attack, 89 percent more likely to report having gum disease, and 78 percent more likely to have asthma. Consistent with these worse reports, food insecure seniors report 3 more days a month of being in poor physical or mental health. With a few exceptions, these worse outcomes hold even after controlling for other factors, though attenuated in magnitude.

The effect of food insecurity holds even for a lower-income sample. As shown in Ziliak and Gundersen (2020), food insecurity rates are substantially higher for those with incomes less than two times the poverty line. So, we investigated whether or not the negative association of food insecurity with nutrient intakes and health remain even when we limit our multivariate analyses to this low-income sample. We find that, in the main, the substantive and statistical significance of the results are quite similar to those for the full sample. This further demonstrates the importance of looking at food insecurity as an independent predictor of negative health and nutrition outcomes, even among lower-income seniors.

I. INTRODUCTION

Food insecurity has been associated with a wide array of negative health outcomes across all ages. (See Gundersen and Ziliak (2015) for a review.) In particular, in Ziliak, et al. (2008), Ziliak and Gundersen (2011), Ziliak and Gundersen (2013), and Ziliak and Gundersen (2017) we established that food insecurity is associated with serious consequences for seniors, even controlling for other known health risks. These reports are consistent with other work that has found that food insecurity (or similar measures of food hardship) are associated with negative health outcomes (e.g., since 2010, Afulani et al. (2015), Bengle et al. (2010), Bergmans et al., 2019; Bhargava and Lee (2016a; 2016b) Bhargava et al. (2012), Frith and Loprinzi (2018), Sattler and Lee (2012), Sattler et al. (2014)). In this report, we build on our previous reports on health consequences among seniors with data from 1999 to 2016.

We emphasize three main findings from this report. First, food insecure seniors have lower nutrient intakes than food secure seniors. This relationship is large – nutrient intakes are 8 to 24 percent lower for food insecure seniors – and holds even after controlling for other factors. Second, food insecure seniors have worse health outcomes across an array of health outcomes. Namely, food insecure seniors are 74 percent more likely to be diabetic, over twice as likely to report fair or poor general health, almost 3 times more likely to suffer from depression, 20 percent more likely to report at least one ADL limitation, 19 percent more likely to have high blood pressure, 71 percent more likely to have congestive heart failure, 64 more likely to have experienced a heart attack, 89 percent more likely to report having gum disease, and 78 percent more likely to have asthma. Third, our results hold even when we restrict our attention to a low-income sample. This is further evidence that food insecurity is a predictor of worse health outcomes even after segmenting on low-income seniors.

II. DATA

The data we use comes from the National Health and Nutrition Examination Survey (NHANES), conducted by the National Center for Health Statistics, Centers for Disease Control. NHANES is a program of studies designed to assess the health and nutritional status of adults and children in the United States through interviews and focused physical examinations. The survey now examines a nationally representative sample of about 5,000 persons each year, about half of whom are adults. The interview includes demographic, socioeconomic, dietary, and health-related questions and health assessments consisting of medical and dental examinations, physiological measurements and laboratory tests. Vulnerable groups, including persons over age 60, are oversampled in the NHANES to produce more reliable statistics. We use weights constructed by NHANES that are applicable for samples pooled across years. The data in the NHANES is constructed such that two years' worth of data are combined to form one wave. So, when we present the results in the tables and figures below, the results are combined into samples spanning from 1999-2000 through 2015-2016.

For the analyses here, we use data from multiple NHANES modules. Of particular importance is, of course, the presence of the full Food Security Supplement (FSS) on the food security module. In this study, to make things comparable to the central analytical framework in our report on food insecurity (Ziliak and Gundersen, 2021), we compare seniors in *food insecure* households with seniors in *food secure* households. Consistent with the official USDA definition, a senior is in the former category if the household responds affirmatively to three or more questions from the FSS and in the latter category if the household responds affirmatively to two or fewer questions. The full set of questions is found in Appendix Table 1.

For nutrient intakes we consider variables measuring energy intake, protein, vitamin A, vitamin C, thiamin, riboflavin, vitamin B6, calcium, phosphorous, magnesium, and iron. These are all based on individual's self-reports of their food consumption for two full days.

For health outcomes, we include individuals' self-reports of the various outcomes. These are asked of all respondents over the age of 60. Some of the questions are based on whether or not a medical health professional has ever told someone they have a certain medical condition. This is the case for diabetes, high blood pressure, high cholesterol, congestive heart failure, coronary heart disease, heart attack, cancer, asthma, gum disease, and psoriasis.¹ Other reports are from the respondent's own perception of current well-being including reports of chest pain, general health (excellent, very good, good, fair, or poor)², depression³, whether or not someone can do activities of daily living (ADL)⁴, and whether someone has high blood pressure. In addition, we include a variable for whether or not someone has ever had a heart attack and a self-report of gum health (from excellent to poor).⁵ This year we include a variable for the number of days of poor physical health, the number of days of poor mental health, and whether someone has dementia. Most of these outcomes are available for each of the waves of the NHANES, but some are only available for a subset of later years. In all cases, though, at least 4 waves of data are available.⁶ Appendix Table 2 presents summary statistics for these nutrient intakes and health outcomes.

¹ Some of these outcomes could have been far in the past (e.g., a cancer diagnosis) and/or no longer impairing someone's current well-being (e.g., a respondent whose blood cholesterol is now lower). In addition, there may be some persons who currently or in the past have had some of these conditions but because they did not see a health professional, they are unaware of the health issue.

² These questions weren't asked in the 1999/2000 module.

³ In our previous work examining the association of food insecurity with depression, we used a measure of depression that was based on a question about whether or not "depression/anxiety/emotional problem" resulted in challenges in activities of daily living. We did so because the standard set of questions used to measure depression weren't asked of those over age 60 until 2007. We now measure depression using the PHQ-9 Questionnaire (<http://www.agencymeddirectors.wa.gov/files/AssessmentTools/14-PHQ-9%20overview.pdf>) which has been asked of seniors and other adults since 2007. Consistent with the recommended use of the PHQ-9, we define someone as depressed if they have a score of 10 or higher.

⁴ Examples of ADL limitations include difficulty in walking up ten steps, getting in and out of bed, and preparing meals. We define persons as having an ADL limitation if they respond affirmatively to at least one ADL.

⁵ For each question, the respondent has the choice to not respond or answer "don't know".

⁶ Number of days of poor physical health, number of days of poor mental health, and hypertension are not available 2013 and after. The variable for dementia is not available before 2002.

III. RESULTS

In this section we begin with descriptive associations between food insecurity and health outcomes for the full sample of all individuals using the updated NHANES dataset, and examine descriptive differences in nutrition and health outcomes across several demographic categories⁷. We then more formally model the relationship between food insecurity and health with multivariate regression models.

III.A. Health Outcomes across Food Security Status

In Table 1 in the top panel we display the mean values of our key nutrition outcomes broken down by food security status. All of the analyses, except for the multivariate models, use weights supplied in the NHANES to make the samples nationally representative.⁸

Intakes are lower for each nutrient for food insecure seniors in comparison to food secure seniors, and these differences can be quite large.⁹ Consider four measures of nutrient intake that are especially important for seniors—energy, protein, calcium, and iron. Out of these nutrients, food insecure seniors have intakes that are 8.5 percent (energy), 9.2 percent (protein), 9.7 percent (calcium), and 13.3 percent (iron) lower than food secure seniors.

When we consider broader measures of health outcomes (bottom panel of Table 1), a similar story emerges for most outcomes. In terms of self-reports of general health, individuals experiencing food insecurity are worse-off. For example, 39 percent of food secure individuals report excellent or very good health versus 14 percent of food insecure individuals, and 75 percent of food secure individuals report excellent, very good, or good health versus 47 percent for food insecure individuals. Rates of depression among food insecure seniors are markedly higher (26.2 percent) than among food secure seniors. Alongside these worse outcomes, food insecure seniors are 31 percent more likely to suffer from at least one ADL limitation, 71 percent more likely to report congestive heart failure, almost 78 percent more likely to report asthma, and more than 63 percent likely to have had a heart attack. Food insecure seniors also report worse gum health. The only dimension where food secure seniors are worse off than food insecure seniors is with respect to cancer where 24 percent of food secure seniors have had cancer versus 16 percent of food insecure seniors.¹⁰ For high blood pressure from an examination, coronary heart disease, hypertension, and psoriasis the differences are statistically insignificant.

⁷ Appendix Table 2 has summary statistics for our nutrition and health outcomes and Appendix Table 3 has basic demographic statistics for the full sample and by food insecurity status.

⁸ We do not weight the regression models because our models control for the socioeconomic characteristics embedded within the weights.

⁹ Unless otherwise noted, the differences discussed are statistically significant with p-values less than 0.05. For the results in Table 1, the p-values are all less than 0.01.

¹⁰ The question regarding cancer is not regarding whether or not someone currently has cancer but, rather, whether someone has ever had cancer.

III.B. Health Outcomes over Time and Food Security Status

We now consider whether the relationship between food insecurity and nutrition and health outcomes change over time. For these figures, we concentrate on select nutrients and for health outcomes which show statistically significant differences when averaged over all the years. In Figures 1 through 4 we present time series trends for four nutrient intake measures: total energy, protein, calcium, and iron. Consistent with the pooled cross-sectional averages in Table 1, food insecure seniors have lower intakes of each of these measures in every time period examined compared to food secure seniors but there are differences in patterns over time. For example, for energy, protein, and iron, the gap narrows sharply in 2011/2012. And, this gap also narrowed dramatically for iron in 2005/2006.

In Figures 5 through 13 we display results for some of the health outcomes in Table 1. The outcomes we consider are diabetes, general health, depression, ADL limitations, high blood pressure, congestive heart failure, ever having a heart attack, chest pain, and asthma. For every measure except congestive heart failure (in 2009/2010), the health outcomes of food insecure seniors are worse than food secure seniors and, in general, the gaps are large, consistent with what is seen in Table 1B. Even though food insecurity rates increased dramatically after the Great Recession, for most of the health outcomes considered the gaps between food secure and food insecure stayed roughly the same.

III.C Demographic Differences in Health Outcomes across Food Security Status

In Tables 2 through 18 we present the results for demographic groups in the NHANES for which there were at least 500 observations. (Appendix Table 3 has descriptive statistics for these demographic groups, broken down by food security status.) These tables are further broken down by nutrient intakes (top panel) and health outcomes (bottom panel). The groups were selected on the basis of the results in Ziliak and Gundersen (2021) that showed that certain subpopulations of seniors were at greater risk of food insecurity (e.g., those with lower incomes). Each table shows the nutrient intakes or health outcomes for the food secure and the food insecure, along with the difference and whether the difference is statistically different from zero.

With respect to marital status, food secure and food insecure seniors who are married or widowed have significantly different nutrient intakes for each of the 11 measures with one exception (vitamin B6 for widowed seniors) (Tables 2 and 3). In contrast, in the unmarried category (not married; not widowed) food insecure seniors only have statistically significantly different nutrient intakes for magnesium (Table 4). In general, like for the full population, food insecure seniors across marital status have worse health outcomes than food secure seniors, albeit in some cases, the differences are statistically insignificant.

Turning to income, for seniors with incomes below 200 percent of the poverty line, differences between food secure and food insecure seniors in terms of nutrient intakes are statistically insignificant with the exception of vitamin A (Table 5). For health outcomes, the differences are more muted than in Table 1B and in many cases statistically insignificant (Table 5). Comparisons by food security status for those with incomes above 200 percent of the poverty

line are similar to the full population for nutrient intakes but for health outcomes they look more like for the low-income senior population (Table 6).

Table 7 is for female seniors. The results are similar to the population as a whole for both nutrient intakes and health outcomes. A similar story holds for male seniors (Table 8).

For Black seniors, the differences in nutrient intakes are all statistically insignificant (Table 9). For health outcomes, the patterns are similar to the full population but there are more statistically insignificant results (Table 9). For Hispanic seniors, in most cases the results are statistically significantly worse for food insecure seniors (Table 10). When the sample is restricted to white seniors, the results are similar to the full population (Table 11).

Turning to education status, food insecure and food secure seniors with a high school diploma or Graduate Equivalency Degree (GED) or more have quantitatively and statistically significant differences in vitamin A, vitamin C, thiamin, riboflavin, magnesium, and iron (Table 12). For health outcomes, food insecure seniors with a high school diploma or GED are worse-off with similar patterns as found for the full population results (Table 12). For seniors who did not graduate from high school or obtain GED, the results are similar to the full population with the exception of calcium intakes and being in excellent health (Table 13).

Finally, we consider differences between food insecure and food secure seniors by age: 60-65, 66-70, 71-75, 76-80, and 81 or more (Tables 14 through 18). For younger seniors the results largely mimic those of the full population of seniors seen in Table 1. Moreover, the gaps between food insecure and food secure seniors in this age group are substantially larger for many of the outcomes. For older groups of seniors, there are fewer statistically significant differences but the direction of the differences are similar to Table 1.

III.D. The Association of Food Insecurity with Nutrition and Health Outcomes

We now turn to our analysis of the effect of food insecurity on health outcomes when we control for other known risk factors which may also influence health outcomes. As with the previous tables and figures, we estimate these models using data from the 1999-2016 NHANES.

Formally, we estimate the following model for the determinants of nutrient intakes and health outcomes (OUT) as:

$$OUT_{ij} = f_{ij}(FI_i, \mathbf{X}_i)$$

where i denotes a senior; j denotes either a nutrient intake or health condition; FI is equal to 1 if a senior is in a food insecure household, 0 otherwise; and \mathbf{X} is a vector of household demographic and economic factors and wave fixed effects. For continuous measures such as energy intakes, we estimate this using OLS regression and, for binary measures such as whether the senior is a diabetic or not, a probit model. For the probit results we report the marginal effects evaluated at the means rather than the coefficients, which do not have a ready quantitative interpretation. We do not place a causal interpretation on the relationship between food insecurity and health outcomes because of the possibility of reverse causality. We do believe that for most nutrient

outcomes the relationship runs from food insecurity to nutrients, but for some of the health outcomes, the direction of causation could run in the other direction. For example, someone suffering from ADL limitations may be less able to get to the store to purchase food in comparison with someone who is readily able to perform such daily functions as bathing, eating, and dressing.

As seen in Table 19A, even after controlling for other factors, food insecurity has a substantive and statistically significant negative association with the intakes of every nutrient with the exception of calcium. For example, controlling for other confounding factors, energy intake among food insecure seniors is 68 kcal lower, which is about 4 percent lower than the average intake among food secure seniors. Overall, the effects are about one-half the size reported in the unadjusted means of Table 1A, indicating that the other half owes to differences in income, education, race, marital status, and age between food secure and food insecure seniors. When significant, the other variables in our models have the expected association with health outcomes. For example, for energy, intakes are higher among seniors with more income¹¹, males, non-Hispanics, whites, high school graduates, and younger seniors. The differences between the bivariate results in Table 1A, where all of the differences between food insecure and food secure seniors were statistically significant, and those here demonstrate the importance of controlling for other factors when estimating the impact of food insecurity.

With respect to health outcomes, the association of food insecurity with health outcomes is also generally consistent with the results of Table 1B. As seen in the first page of Table 19B, for each of the health outcomes with the exception of the narrowest general health comparison (excellent versus very good, good, fair, or poor health), food insecurity has a negative association with positive health outcomes and a positive association with negative health outcomes. In the second page of Table 19B, like in Table 1B, depression, ADL limitations, dementia, and reported high blood pressure are all positively associated with food insecurity even after controlling for other factors. In many cases, the effects are especially large when compared with other covariates. For example, being food insecure, in terms of its association with ADL limitations is roughly equivalent to being over 14 years older. In the third page of Table 19B, congestive heart failure, coronary heart disease, having had a heart attack, and reports of chest pain are all positively associated with food insecurity. In contrast, the result in Table 1B that food insecure seniors have lower probabilities of cancer in comparison to food secure seniors disappears once we control for other factors. On the final page of Table 19B, gum disease, poor gum health, and asthma are all positively associated with food insecurity.

The associations in the tables discussed above are, in general, in the anticipated directions, and are further displayed in Figures 14 (for nutrient intakes) and 15 (for health outcomes). In those figures, the percent change in nutrient and health outcomes associated with food insecurity, controlling for other factors, is displayed.

¹¹ In the NHANES, income is only reported within bounds. (E.g., between \$5,001 and \$10,000.) NHANES then translates this information into a ratio of income to the poverty line. A small number of seniors reported incomes of less than \$20,000 or more than \$20,000 rather than the more narrow bounds. In these cases, NHANES did not assign a ratio of income to the poverty line. Because we do not want to delete these observations from our samples, we assign these households an income-to-poverty level value of the averages within the groups reporting their incomes within the more narrow bounds.

The rates of food insecurity among lower-income seniors are far higher than those with higher incomes. In our sample, 27.6 percent of seniors with incomes below the poverty line are food insecure and 11.2 percent of seniors with incomes between the poverty line and 200% of the poverty line are food insecure. In contrast, the food insecurity rate for seniors with incomes above 200% of the poverty line is 2.4 percent. We therefore now consider whether the associations of food insecurity with health outcomes are still present when we restrict the sample to those at greater risk of food insecurity.

Table 20A shows the results for the nutrient intakes covered above. The results are in the same direction as Table 19A and of similar statistical significance, albeit, the confidence levels are slightly lower in the low-income sample. In Table 20B, we consider the associations of food insecurity with health outcomes for the lower-income sample. In comparison to Table 19B, the association of food insecurity with the health outcomes are, as expected, more muted. The patterns of statistical significance are the same as the full sample in the first through third pages of Table 19B. In the fourth page of the table, the association of gum disease with food insecurity is statistically insignificant, unlike for the population of all seniors. In other words, differences in health outcomes among food secure and food-insecure low-income seniors is much less in evidence than the population of seniors overall, underscoring the evidence in Gundersen and Ziliak (2015) that income is only but one determinant of food insecurity.

IV. CONCLUSION

In these concluding remarks we emphasize four major findings from our analyses of the NHANES from 1999 through 2016. First, we find that food insecure seniors are on average worse off than food secure seniors for each nutritional outcome and most health measures we analyze. Second, the general pattern that food insecure seniors are worse-off with respect to health and nutrition outcomes than food secure seniors holds even when we restrict our samples to distinct demographic categories. To put this a different way, there are no common demographic groups which are immune to the negative impacts of food insecurity. Third, we find that the disadvantage facing food insecure seniors with respect to health outcomes persists even controlling for other known risk factors for poor health. This further reinforces the need to look at food insecurity as a policy-relevant measure, independent of other measures of well-being (e.g., income). Fourth, further buttressing the previous point, even when the sample is restricted to those with lower incomes, food insecurity still is associated with worse nutrition and health outcomes.

V. REFERENCES

- Afulani P, Herman D, Coleman-Jensen A, Harrison G. Food insecurity and health outcomes among older adults: The role of cost-related medication underuse. *Journal of Nutrition in Gerontology and Geriatrics* 2015;34:319-342.
- Bengle R, Sinnett S, Johnson T, Johnson M, Brown A, Lee J. Food insecurity is associated with cost-related medication non-adherence in community-dwelling, low-income older adults in Georgia. *Journal of Nutrition for the Elderly* 2010;29:170-191.
- Bergmans R, Zivin K, Mezuk B. Depression, food insecurity and diabetic morbidity: Evidence from the Health and Retirement Study. *Journal of Psychosomatic Research* 2019;117:22-29.
- Bhargava V, Lee J. Food insecurity and health care utilization among older adults in the United States. *Journal of Nutrition in Gerontology and Geriatrics* 2016;35(3):177-192.
- Bhargava V, Lee J. Food insecurity and health care utilization among older adults. *Journal of Applied Gerontology* 2016;35(3):177-192.
- Bhargava V, Lee JS, Jain R, Johnson MA, Brown A. Food insecurity is negatively associated with home health and out-of-pocket expenditures in older adults. *Journal of Nutrition* 2012;142:1888–95.
- Frith E, Loprinzi P. Food insecurity and cognitive function in older adults: Brief report. *Clinical Nutrition* 2018;37(5):1765-1768.
- Gundersen C, Ziliak J. Food insecurity and health outcomes. *Health Affairs* 2015;34(11):1830-1839.
- Sattler E, Lee J. Persistent food insecurity is associated with higher levels of cost-related medication non-adherence in low-income older adults. *Journal of Nutrition in Gerontology and Geriatrics* 2012;32(1):41-58.
- Sattler E, Lee J, Bhargava V. Food insecurity and medication adherence in low-income older Medicare beneficiaries with type 2 diabetes. *Journal of Nutrition in Gerontology and Geriatrics* 2014;33(4):401-417.
- Ziliak J, Gundersen C. *The State of Senior Hunger in America 2019: An Annual Report*. Report for Feeding America. 2021.
- Ziliak J, Gundersen C. *The State of Senior Hunger in America 2015: An Annual Report Supplement*. Report for Feeding America. 2017.
- Ziliak J, Gundersen C. *The Health Consequences of Senior Hunger in the United States: Evidence from the 1999-2014 NHANES*. Report submitted to Feeding America. 2017.

Ziliak J, Gundersen C. *The State of Senior Hunger in America 2011: An Annual Report. Supplement*. Special Report by the University of Kentucky Center for Poverty Research for the National Foundation to End Senior Hunger. 2013.

Ziliak J, Gundersen C. *The Health Consequences of Senior Hunger in the United States: Evidence from the 1999-2010 NHANES*. Special Report by the University of Kentucky Center for Poverty Research for the National Foundation to End Senior Hunger. 2013.

Ziliak J, Gundersen C. *Food Insecurity among Older Adults*. Report submitted to AARP Foundation. 2011.

Ziliak J, Gundersen C, Haist M. *The Causes, Consequences, and Future of Senior Hunger in America*. Special Report by the University of Kentucky Center for Poverty Research for the Meals on Wheels Association of America Foundation. 2008.

TABLES AND FIGURES

Table 1. Nutrition and Health Outcomes by Food Insecurity Status for All Seniors

	Food Secure	Food Insecure	Difference
	(1)	(2)	(3)
<i>Nutrient Intakes</i>			
Energy Intake (kcal)	1829.83	1674.34	-155.50**
Protein (gm)	71.17	64.63	-6.54**
Vitamin A (mcg)	710.82	539.87	-170.95**
Vitamin C (mg)	87.15	66.45	-20.70**
Thiamin (mg)	1.51	1.33	-0.17**
Riboflavin (mg)	2.05	1.78	-0.26**
Vitamin B6 (mg)	1.83	1.58	-0.26**
Calcium (mg)	832.52	751.38	-81.15**
Phosphorous (mg)	1203.23	1085.48	-117.75**
Magnesium (mg)	277.43	242.44	-34.99**
Iron (mg)	14.44	12.52	-1.92**
<i>Health Outcomes</i>			
Diabetic	0.18	0.30	0.13**
Self-Reports of General Health			
Excellent	0.10	0.04	-0.06**
Excellent or very good	0.39	0.14	-0.25**
Excellent, very good, or good	0.75	0.47	-0.28**
Number of days of poor physical health	4.43	7.82	3.39**
Number of days of poor mental health	2.68	5.70	3.02**
Suffers from depression	0.05	0.20	0.14**
At least one ADL limitation	0.64	0.84	0.2**
Dementia	0.11	0.25	0.14**
High blood pressure (reported)	0.57	0.68	0.11**
High blood pressure (measured)	0.13	0.15	0.02
Hypertension	0.48	0.45	-0.02
High cholesterol	0.55	0.58	0.03
Congestive heart failure	0.07	0.12	0.05**
Coronary heart disease	0.10	0.12	0.02
Heart attack	0.09	0.15	0.06**
Cancer	0.24	0.16	-0.08**
Reports of chest pain	0.29	0.40	0.12**
Gum disease	0.14	0.27	0.13**
Gum health? (1-excellent 5-poor)	2.69	3.49	0.8**
Psoriasis	0.03	0.04	0.01
Asthma	0.12	0.21	0.09**

Source: 1999-2016 NHANES. Notes: Food secure is defined as 2 or fewer affirmative responses in the Food Security Supplement; food insecure is defined as 3 or more affirmative responses. Column (3) = column (2) – column (1). * $p \leq 0.05$; ** $p \leq 0.01$.

Table 2. Nutrition Outcomes by Food Insecurity Status for Married Seniors

	Food Secure	Food Insecure	Difference
	(1)	(2)	(3)
<i>Nutrient Intakes</i>			
Energy Intake (kcal)	1905.37	1691.57	-213.80**
Protein (gm)	74.50	65.91	-8.59**
Vitamin A (mcg)	721.66	513.85	-207.81**
Vitamin C (mg)	89.81	65.22	-24.59**
Thiamin (mg)	1.56	1.37	-0.19**
Riboflavin (mg)	2.12	1.76	-0.37**
Vitamin B6 (mg)	1.90	1.58	-0.33**
Calcium (mg)	856.23	753.56	-102.67**
Phosphorous (mg)	1256.71	1101.73	-154.98**
Magnesium (mg)	289.14	250.25	-38.89**
Iron (mg)	15.00	12.65	-2.35**
<i>Health Outcomes</i>			
Diabetic	0.17	0.33	0.16**
Self-Reports of General Health			
Excellent	0.11	0.05	-0.06**
Excellent or very good	0.43	0.14	-0.28**
Excellent, very good, or good	0.79	0.49	-0.3**
Number of days of poor physical health	3.97	7.05	3.08**
Number of days of poor mental health	2.26	5.10	2.84**
Suffers from depression	0.04	0.14	0.1**
At least one ADL limitation	0.60	0.79	0.19**
Dementia	0.09	0.21	0.13**
High blood pressure (reported)	0.55	0.65	0.1**
High blood pressure (measured)	0.12	0.12	0
Hypertension	0.46	0.43	-0.03
High cholesterol	0.55	0.56	0
Congestive heart failure	0.06	0.11	0.05**
Coronary heart disease	0.11	0.12	0.01
Heart attack	0.08	0.15	0.07**
Cancer	0.24	0.13	-0.11**
Reports of chest pain	0.28	0.39	0.11**
Gum disease	0.13	0.27	0.13**
Gum health? (1-excellent 5-poor)	2.60	3.56	0.96**
Psoriasis	0.03	0.03	0
Asthma	0.11	0.17	0.06**
Gum health? (1-excellent 5-poor)	2.60	3.56	0.96**
Psoriasis	0.03	0.03	0
Asthma	0.11	0.17	0.06**

Source: 1999-2016 NHANES. Notes: Food secure is defined as 2 or fewer affirmative responses in the Food Security Supplement; food insecure is defined as 3 or more affirmative responses. Column (3) = column (2) – column (1). * $p \leq 0.05$; ** $p \leq 0.01$.

Table 3. Nutrition and Health Outcomes by Food Insecurity Status for Widowed Seniors

	Food Secure	Food Insecure	Difference
	(1)	(2)	(3)
<i>Nutrient Intakes</i>			
Energy Intake (kcal)	1629.03	1473.03	-156**
Protein (gm)	62.88	56.46	-6.42**
Vitamin A (mcg)	688.34	492.55	-195.78**
Vitamin C (mg)	82.63	62.41	-20.22**
Thiamin (mg)	1.36	1.18	-0.18**
Riboflavin (mg)	1.87	1.62	-0.25**
Vitamin B6 (mg)	1.66	1.43	-0.23
Calcium (mg)	767.45	687.97	-79.49**
Phosphorous (mg)	1068.09	969.96	-98.12**
Magnesium (mg)	243.49	217.35	-26.14**
Iron (mg)	13.22	10.90	-2.32**
<i>Health Outcomes</i>			
Diabetic	0.19	0.30	0.11**
Self-Reports of General Health			
Excellent	0.06	0.03	-0.03**
Excellent or very good	0.32	0.14	-0.18**
Excellent, very good, or good	0.69	0.43	-0.26**
Number of days of poor physical health	5.36	8.47	3.12**
Number of days of poor mental health	3.27	5.96	2.68**
Suffers from depression	0.07	0.23	0.16**
At least one ADL limitation	0.76	0.88	0.12**
Dementia	0.17	0.28	0.11**
High blood pressure (reported)	0.64	0.74	0.1**
High blood pressure (measured)	0.16	0.16	0
Hypertension	0.50	0.50	-0.01
High cholesterol	0.54	0.59	0.04
Congestive heart failure	0.11	0.13	0.03
Coronary heart disease	0.11	0.13	0.01
Heart attack	0.11	0.15	0.04
Cancer	0.25	0.21	-0.04
Reports of chest pain	0.30	0.39	0.09**
Gum disease	0.12	0.22	0.1
Gum health? (1-excellent 5-poor)	2.78	3.40	0.62**
Psoriasis	0.04	0.05	0.01
Asthma	0.12	0.22	0.1**

Source: 1999-2016 NHANES. Notes: Food secure is defined as 2 or fewer affirmative responses in the Food Security Supplement; food insecure is defined as 3 or more affirmative responses. Column (3) = column (2) – column (1). * $p \leq 0.05$; ** $p \leq 0.01$.

Table 4. Nutrition and Health Outcomes by Food Insecurity Status for Unmarried Seniors

	Food Secure	Food Insecure	Difference
	(1)	(2)	(3)
<i>Nutrient Intakes</i>			
Energy Intake (kcal)	1803.61	1804.42	0.81
Protein (gm)	69.40	69.21	-0.19
Vitamin A (mcg)	674.94	603.45	-71.49
Vitamin C (mg)	81.81	70.89	-10.92
Thiamin (mg)	1.47	1.40	-0.07
Riboflavin (mg)	1.99	1.94	-0.06
Vitamin B6 (mg)	1.78	1.68	-0.09
Calcium (mg)	825.66	797.75	-27.91
Phosphorous (mg)	1175.37	1153.21	-22.16
Magnesium (mg)	276.31	252.29	-24.02**
Iron (mg)	13.74	13.56	-0.18
<i>Health Outcomes</i>			
Diabetic	0.18	0.28	0.1**
Self-Reports of General Health			
Excellent	0.11	0.03	-0.08**
Excellent or very good	0.36	0.15	-0.21**
Excellent, very good, or good	0.72	0.49	-0.23**
Number of days of poor physical health	4.92	8.13	3.21**
Number of days of poor mental health	3.52	6.16	2.64**
Suffers from depression	0.08	0.23	0.15**
At least one ADL limitation	0.64	0.87	0.23**
Dementia	0.11	0.27	0.16**
High blood pressure (reported)	0.55	0.65	0.11**
High blood pressure (measured)	0.12	0.18	0.06
Hypertension	0.46	0.44	-0.03
High cholesterol	0.54	0.60	0.06
Congestive heart failure	0.06	0.11	0.06**
Coronary heart disease	0.08	0.12	0.05
Heart attack	0.09	0.14	0.05
Cancer	0.21	0.15	-0.06
Reports of chest pain	0.28	0.43	0.15**
Gum disease	0.18	0.30	0.12**
Gum health? (1-excellent 5-poor)	2.90	3.49	0.59**
Psoriasis	0.03	0.05	0.02
Asthma	0.13	0.25	0.11**

Source: 1999-2016 NHANES. Notes: Food secure is defined as 2 or fewer affirmative responses in the Food Security Supplement; food insecure is defined as 3 or more affirmative responses. Column (3) = column (2) – column (1). * $p \leq 0.05$; ** $p \leq 0.01$.

Table 5. Nutrition and Health Outcomes by Food Insecurity Status for Low-Income Seniors

	Food Secure	Food Insecure	Difference
	(1)	(2)	(3)
<i>Nutrient Intakes</i>			
Energy Intake (kcal)	1693.66	1660.75	-32.91
Protein (gm)	65.14	64.10	-1.04
Vitamin A (mcg)	661.21	541.85	-119.36**
Vitamin C (mg)	77.29	69.08	-8.21
Thiamin (mg)	1.40	1.33	-0.06
Riboflavin (mg)	1.89	1.79	-0.1
Vitamin B6 (mg)	1.66	1.57	-0.09
Calcium (mg)	768.03	746.81	-21.22
Phosphorous (mg)	1101.08	1073.23	-27.85
Magnesium (mg)	248.25	239.59	-8.67
Iron (mg)	13.45	12.56	-0.89
<i>Health Outcomes</i>			
Diabetic	0.22	0.31	0.09**
Self-Reports of General Health			
Excellent	0.05	0.03	-0.02
Excellent or very good	0.27	0.13	-0.13**
Excellent, very good, or good	0.63	0.44	-0.19**
Number of days of poor physical health	5.54	8.15	2.61**
Number of days of poor mental health	3.46	5.66	2.21**
Suffers from depression	0.10	0.20	0.11**
At least one ADL limitation	0.73	0.84	0.11**
Dementia	0.16	0.25	0.09**
High blood pressure (reported)	0.61	0.69	0.08**
High blood pressure (measured)	0.16	0.15	-0.01
Hypertension	0.50	0.46	-0.04
High cholesterol	0.54	0.58	0.04
Congestive heart failure	0.10	0.12	0.03
Coronary heart disease	0.11	0.13	0.02
Heart attack	0.12	0.15	0.03
Cancer	0.21	0.17	-0.04
Reports of chest pain	0.32	0.42	0.09**
Gum disease	0.16	0.24	0.08**
Gum health? (1-excellent 5-poor)	3.06	3.52	0.47**
Psoriasis	0.04	0.04	0
Asthma	0.12	0.22	0.1**

Source: 1999-2016 NHANES. Notes: Low-income refers to seniors with household incomes less than 200% of the federal poverty line. Food secure is defined as 2 or fewer affirmative responses in the Food Security Supplement; food insecure is defined as 3 or more affirmative responses. Column (3) = column (2) – column (1). * $p \leq 0.05$; ** $p \leq 0.01$.

Table 6. Nutrition and Health Outcomes by Food Insecurity Status for High-Income Seniors

	Food Secure	Food Insecure	Difference
	(1)	(2)	(3)
<i>Nutrient Intakes</i>			
Energy Intake (kcal)	1888.52	1722.17	-166.35**
Protein (gm)	73.78	66.51	-7.27**
Vitamin A (mcg)	732.20	532.91	-199.29**
Vitamin C (mg)	91.40	57.21	-34.19**
Thiamin (mg)	1.55	1.33	-0.22**
Riboflavin (mg)	2.12	1.77	-0.35**
Vitamin B6 (mg)	1.91	1.60	-0.31**
Calcium (mg)	860.31	767.45	-92.86
Phosphorous (mg)	1247.25	1128.61	-118.64
Magnesium (mg)	290.01	252.50	-37.5**
Iron (mg)	14.86	12.37	-2.49**
<i>Health Outcomes</i>			
Diabetic	0.16	0.30	0.14**
Self-Reports of General Health			
Excellent	0.12	0.05	-0.07**
Excellent or very good	0.45	0.18	-0.27**
Excellent, very good, or good	0.81	0.58	-0.23**
Number of days of poor physical health	3.95	6.52	2.58
Number of days of poor mental health	2.34	5.85	3.5**
Suffers from depression	0.04	0.17	0.14**
At least one ADL limitation	0.60	0.83	0.23**
Dementia	0.08	0.25	0.16**
High blood pressure (reported)	0.55	0.62	0.07
High blood pressure (measured)	0.12	0.18	0.06
Hypertension	0.47	0.43	-0.04
High cholesterol	0.55	0.56	0.01
Congestive heart failure	0.05	0.09	0.04
Coronary heart disease	0.10	0.10	0
Heart attack	0.08	0.13	0.06
Cancer	0.25	0.12	-0.13**
Reports of chest pain	0.27	0.35	0.08
Gum disease	0.13	0.35	0.22**
Gum health? (1-excellent 5-poor)	2.55	3.40	0.84**
Psoriasis	0.03	0.05	0.02
Asthma	0.12	0.16	0.05

Source: 1999-2016 NHANES. Notes: High-income refers to seniors with household incomes greater than 200% of the federal poverty line. Food secure is defined as 2 or fewer affirmative responses in the Food Security Supplement; food insecure is defined as 3 or more affirmative responses. Column (3) = column (2) – column (1). * $p \leq 0.05$; ** $p \leq 0.01$.

Table 7. Nutrition and Health Outcomes by Food Insecurity Status for Female Seniors

	Food Secure	Food Insecure	Difference
	(1)	(2)	(3)
<i>Nutrient Intakes</i>			
Energy Intake (kcal)	1607.24	1508.71	-98.52**
Protein (gm)	61.81	58.12	-3.7**
Vitamin A (mcg)	658.60	519.54	-139.06**
Vitamin C (mg)	82.40	60.37	-22.03**
Thiamin (mg)	1.32	1.20	-0.11**
Riboflavin (mg)	1.80	1.61	-0.2**
Vitamin B6 (mg)	1.59	1.40	-0.19**
Calcium (mg)	766.40	695.13	-71.27**
Phosphorous (mg)	1063.68	979.10	-84.59**
Magnesium (mg)	248.59	221.38	-27.21**
Iron (mg)	12.66	11.27	-1.4**
<i>Health Outcomes</i>			
Diabetic	0.16	0.32	0.16**
Self-Reports of General Health			
Excellent	0.09	0.04	-0.06**
Excellent or very good	0.39	0.13	-0.26**
Excellent, very good, or good	0.75	0.44	-0.31**
Number of days of poor physical health	4.87	8.28	3.41**
Number of days of poor mental health	3.46	6.56	3.1**
Suffers from depression	0.07	0.22	0.16**
At least one ADL limitation	0.70	0.86	0.16**
Dementia	0.12	0.27	0.15**
High blood pressure (reported)	0.59	0.70	0.11**
High blood pressure (measured)	0.14	0.17	0.03
Hypertension	0.49	0.47	-0.02
High cholesterol	0.55	0.60	0.05
Congestive heart failure	0.06	0.11	0.05**
Coronary heart disease	0.07	0.10	0.03
Heart attack	0.06	0.12	0.06**
Cancer	0.22	0.16	-0.07**
Reports of chest pain	0.29	0.41	0.12**
Gum disease	0.13	0.25	0.11**
Gum health? (1-excellent 5-poor)	2.65	3.42	0.77**
Psoriasis	0.03	0.05	0.02
Asthma	0.14	0.26	0.12**

Source: 1999-2016 NHANES. Notes: Food secure is defined as 2 or fewer affirmative responses in the Food Security Supplement; food insecure is defined as 3 or more affirmative responses. Column (3) = column (2) – column (1). * $p \leq 0.05$; ** $p \leq 0.01$.

Table 8. Nutrition and Health Outcomes by Food Insecurity Status for Male Seniors

	Food Secure	Food Insecure	Difference
	(1)	(2)	(3)
<i>Nutrient Intakes</i>			
Energy Intake (kcal)	2102.82	1916.74	-186.08**
Protein (gm)	82.65	74.16	-8.49**
Vitamin A (mcg)	774.86	569.63	-205.23**
Vitamin C (mg)	92.98	75.36	-17.62**
Thiamin (mg)	1.74	1.52	-0.21**
Riboflavin (mg)	2.35	2.04	-0.3**
Vitamin B6 (mg)	2.13	1.83	-0.29**
Calcium (mg)	913.62	833.70	-79.92
Phosphorous (mg)	1374.37	1241.18	-133.19**
Magnesium (mg)	312.81	273.28	-39.53**
Iron (mg)	16.61	14.35	-2.26**
<i>Health Outcomes</i>			
Diabetic	0.20	0.29	0.09**
Self-Reports of General Health			
Excellent	0.10	0.04	-0.07**
Excellent or very good	0.39	0.16	-0.23**
Excellent, very good, or good	0.76	0.53	-0.24**
Number of days of poor physical health	3.88	7.15	3.26**
Number of days of poor mental health	1.72	4.44	2.72**
Suffers from depression	0.04	0.15	0.11**
At least one ADL limitation	0.57	0.81	0.24**
Dementia	0.09	0.23	0.14**
High blood pressure (reported)	0.54	0.64	0.1**
High blood pressure (measured)	0.13	0.14	0.01
Hypertension	0.46	0.44	-0.03
High cholesterol	0.55	0.55	0
Congestive heart failure	0.08	0.12	0.04**
Coronary heart disease	0.15	0.16	0.01
Heart attack	0.13	0.19	0.06**
Cancer	0.26	0.16	-0.09**
Reports of chest pain	0.28	0.40	0.11**
Gum disease	0.15	0.30	0.15**
Gum health? (1-excellent 5-poor)	2.73	3.60	0.87**
Psoriasis	0.04	0.03	-0.01
Asthma	0.10	0.14	0.05**

Source: 1999-2016 NHANES. Notes: Food secure is defined as 2 or fewer affirmative responses in the Food Security Supplement; food insecure is defined as 3 or more affirmative responses. Column (3) = column (2) – column (1). * $p \leq 0.05$; ** $p \leq 0.01$.

Table 9. Nutrition and Health Outcomes by Food Insecurity Status for Black Seniors

	Food Secure	Food Insecure	Difference
	(1)	(2)	(3)
<i>Nutrient Intakes</i>			
Energy Intake (kcal)	1655.34	1640.24	-15.1
Protein (gm)	65.03	63.13	-1.91
Vitamin A (mcg)	662.64	515.18	-147.46
Vitamin C (mg)	83.47	73.64	-9.83
Thiamin (mg)	1.27	1.23	-0.04
Riboflavin (mg)	1.55	1.48	-0.07
Vitamin B6 (mg)	1.60	1.47	-0.13
Calcium (mg)	635.74	635.40	-0.34
Phosphorous (mg)	998.58	981.47	-17.12
Magnesium (mg)	230.12	222.88	-7.24
Iron (mg)	12.17	11.55	-0.62
<i>Health Outcomes</i>			
Diabetic	0.29	0.34	0.05
Self-Reports of General Health			
Excellent	0.05	0.05	0
Excellent or very good	0.21	0.13	-0.08**
Excellent, very good, or good	0.60	0.48	-0.12**
Number of days of poor physical health	4.93	6.73	1.8
Number of days of poor mental health	2.78	4.90	2.12**
Suffers from depression	0.06	0.13	0.06**
At least one ADL limitation	0.65	0.81	0.16**
Dementia	0.13	0.20	0.07**
High blood pressure (reported)	0.72	0.75	0.03
High blood pressure (measured)	0.19	0.24	0.05
Hypertension	0.55	0.48	-0.07
High cholesterol	0.52	0.55	0.03
Congestive heart failure	0.08	0.11	0.03
Coronary heart disease	0.06	0.08	0.03
Heart attack	0.08	0.12	0.05**
Cancer	0.14	0.11	-0.03
Reports of chest pain	0.29	0.38	0.09**
Gum disease	0.16	0.20	0.05
Gum health? (1-excellent 5-poor)	3.10	3.38	0.28**
Psoriasis	0.02	0.02	0.01
Asthma	0.13	0.22	0.08**

Source: 1999-2016 NHANES. Notes: Food secure is defined as 2 or fewer affirmative responses in the Food Security Supplement; food insecure is defined as 3 or more affirmative responses. Column (3) = column (2) – column (1). * $p \leq 0.05$; ** $p \leq 0.01$.

Table 10. Nutrition and Health Outcomes by Food Insecurity Status for Hispanic Seniors

	Food Secure	Food Insecure	Difference
	(1)	(2)	(3)
<i>Nutrient Intakes</i>			
Energy Intake (kcal)	1728.64	1591.76	-136.88**
Protein (gm)	69.61	63.76	-5.85**
Vitamin A (mcg)	610.91	541.30	-69.61
Vitamin C (mg)	82.85	72.36	-10.49**
Thiamin (mg)	1.36	1.27	-0.09
Riboflavin (mg)	1.78	1.59	-0.19**
Vitamin B6 (mg)	1.69	1.55	-0.13
Calcium (mg)	781.68	733.04	-48.64
Phosphorous (mg)	1148.31	1066.77	-81.54**
Magnesium (mg)	264.70	249.45	-15.24
Iron (mg)	13.12	12.25	-0.87
<i>Health Outcomes</i>			
Diabetic	0.26	0.30	0.04
Self-Reports of General Health			
Excellent	0.06	0.04	-0.03**
Excellent or very good	0.19	0.09	-0.1**
Excellent, very good, or good	0.53	0.36	-0.16**
Number of days of poor physical health	5.68	8.11	2.43**
Number of days of poor mental health	3.77	4.12	0.35
Suffers from depression	0.10	0.21	0.11**
At least one ADL limitation	0.63	0.80	0.16**
Dementia	0.15	0.28	0.12**
High blood pressure (reported)	0.54	0.62	0.07**
High blood pressure (measured)	0.14	0.14	-0.01
Hypertension	0.40	0.41	0.01
High cholesterol	0.53	0.53	0
Congestive heart failure	0.06	0.08	0.03
Coronary heart disease	0.07	0.08	0.01
Heart attack	0.07	0.09	0.02
Cancer	0.10	0.11	0
Reports of chest pain	0.25	0.37	0.12**
Gum disease	0.18	0.26	0.08**
Gum health? (1-excellent 5-poor)	3.28	3.69	0.42**
Psoriasis	0.02	0.04	0.01
Asthma	0.11	0.16	0.05

Source: 1999-2016 NHANES. Notes: Food secure is defined as 2 or fewer affirmative responses in the Food Security Supplement; food insecure is defined as 3 or more affirmative responses. Column (3) = column (2) – column (1). * $p \leq 0.05$; ** $p \leq 0.01$.

Table 11. Nutrition and Health Outcomes by Food Insecurity Status for White Seniors

	Food Secure	Food Insecure	Difference
	(1)	(2)	(3)
<i>Nutrient Intakes</i>			
Energy Intake (kcal)	1860.46	1731.44	-129.02**
Protein (gm)	71.98	65.96	-6.02**
Vitamin A (mcg)	725.19	552.12	-173.07**
Vitamin C (mg)	87.14	61.83	-25.3**
Thiamin (mg)	1.54	1.39	-0.15**
Riboflavin (mg)	2.13	2.01	-0.12
Vitamin B6 (mg)	1.87	1.64	-0.23**
Calcium (mg)	861.12	814.94	-46.18
Phosphorous (mg)	1230.58	1141.45	-89.13**
Magnesium (mg)	282.14	246.39	-35.75**
Iron (mg)	14.78	13.00	-1.78**
<i>Health Outcomes</i>			
Diabetic	0.15	0.29	0.14**
Self-Reports of General Health			
Excellent	0.11	0.03	-0.08**
Excellent or very good	0.43	0.18	-0.25**
Excellent, very good, or good	0.79	0.52	-0.27**
Number of days of poor physical health	4.30	8.35	4.05**
Number of days of poor mental health	2.62	6.79	4.17**
Suffers from depression	0.05	0.20	0.15**
At least one ADL limitation	0.64	0.87	0.23**
Dementia	0.10	0.26	0.16**
High blood pressure (reported)	0.55	0.67	0.12**
High blood pressure (measured)	0.12	0.14	0.01
Hypertension	0.48	0.48	0
High cholesterol	0.55	0.61	0.05
Congestive heart failure	0.07	0.13	0.07**
Coronary heart disease	0.11	0.15	0.05
Heart attack	0.09	0.19	0.1**
Cancer	0.26	0.21	-0.06
Reports of chest pain	0.29	0.42	0.13**
Gum disease	0.13	0.29	0.16**
Gum health? (1-excellent 5-poor)	2.58	3.44	0.86**
Psoriasis	0.04	0.05	0.02
Asthma	0.12	0.23	0.11**

Source: 1999-2016 NHANES. Notes: Food secure is defined as 2 or fewer affirmative responses in the Food Security Supplement; food insecure is defined as 3 or more affirmative responses. Column (3) = column (2) – column (1). * $p \leq 0.05$; ** $p \leq 0.01$.

Table 12. Nutrition and Health Outcomes by Food Insecurity Status for High-Education Seniors

	Food Secure	Food Insecure	Difference
	(1)	(2)	(3)
<i>Nutrient Intakes</i>			
Energy Intake (kcal)	1877.01	1795.08	-81.93
Protein (gm)	72.99	68.73	-4.26
Vitamin A (mcg)	729.59	570.47	-159.13**
Vitamin C (mg)	90.69	68.33	-22.36**
Thiamin (mg)	1.54	1.43	-0.11**
Riboflavin (mg)	2.10	1.93	-0.17**
Vitamin B6 (mg)	1.88	1.74	-0.15
Calcium (mg)	859.87	807.47	-52.4
Phosphorous (mg)	1238.57	1170.09	-68.49
Magnesium (mg)	287.67	262.72	-24.96**
Iron (mg)	14.73	13.39	-1.34**
<i>Health Outcomes</i>			
Diabetic	0.16	0.27	0.11**
Self-Reports of General Health			
Excellent	0.11	0.04	-0.07**
Excellent or very good	0.44	0.16	-0.28**
Excellent, very good, or good	0.80	0.56	-0.24**
Number of days of poor physical health	4.01	7.22	3.21**
Number of days of poor mental health	2.47	6.43	3.97**
Suffers from depression	0.05	0.16	0.12**
At least one ADL limitation	0.62	0.83	0.22**
Dementia	0.09	0.23	0.15**
High blood pressure (reported)	0.56	0.67	0.12**
High blood pressure (measured)	0.13	0.15	0.03
Hypertension	0.47	0.48	0.01
High cholesterol	0.55	0.58	0.03
Congestive heart failure	0.06	0.13	0.07**
Coronary heart disease	0.10	0.13	0.04
Heart attack	0.08	0.13	0.05**
Cancer	0.25	0.19	-0.06**
Reports of chest pain	0.28	0.41	0.13**
Gum disease	0.14	0.30	0.15**
Gum health? (1-excellent 5-poor)	2.61	3.46	0.85**
Psoriasis	0.03	0.05	0.02
Asthma	0.12	0.23	0.11**

Source: 1999-2016 NHANES. Notes: High-education refers to seniors with a high school diploma/GED or more. Food secure is defined as 2 or fewer affirmative responses in the Food Security Supplement; food insecure is defined as 3 or more affirmative responses. Column (3) = column (2) – column (1). * $p \leq 0.05$; ** $p \leq 0.01$.

Table 13. Nutrition and Health Outcomes by Food Insecurity Status for Low-Education Seniors

	Food Secure	Food Insecure	Difference
	(1)	(2)	(3)
<i>Nutrient Intakes</i>			
Energy Intake (kcal)	1654.49	1551.77	-102.71**
Protein (gm)	64.42	60.49	-3.93**
Vitamin A (mcg)	639.61	498.83	-140.79**
Vitamin C (mg)	73.89	64.26	-9.63**
Thiamin (mg)	1.39	1.24	-0.15**
Riboflavin (mg)	1.84	1.63	-0.21**
Vitamin B6 (mg)	1.64	1.41	-0.23**
Calcium (mg)	731.05	693.05	-38
Phosphorous (mg)	1071.96	998.73	-73.22**
Magnesium (mg)	239.18	221.37	-17.81**
Iron (mg)	13.32	11.62	-1.7**
<i>Health Outcomes</i>			
Diabetic	0.24	0.34	0.10
Self-Reports of General Health			
Excellent	0.05	0.03	-0.02
Excellent or very good	0.21	0.12	-0.09**
Excellent, very good, or good	0.57	0.38	-0.2**
Number of days of poor physical health	5.91	8.33	2.42**
Number of days of poor mental health	3.42	5.11	1.7**
Suffers from depression	0.09	0.23	0.14**
At least one ADL limitation	0.73	0.85	0.12**
Dementia	0.19	0.27	0.08**
High blood pressure (reported)	0.61	0.68	0.08**
High blood pressure (measured)	0.15	0.15	0.01
Hypertension	0.50	0.44	-0.06
High cholesterol	0.54	0.58	0.04
Congestive heart failure	0.10	0.10	0
Coronary heart disease	0.12	0.11	-0.01
Heart attack	0.11	0.16	0.05**
Cancer	0.19	0.12	-0.07**
Reports of chest pain	0.32	0.40	0.08**
Gum disease	0.15	0.23	0.09**
Gum health? (1-excellent 5-poor)	3.12	3.53	0.42**
Psoriasis	0.04	0.03	-0.01
Asthma	0.11	0.19	0.08**

Source: 1999-2016 NHANES. Notes: Low-education refers to seniors with less than a high school diploma or GED. Food secure is defined as 2 or fewer affirmative responses in the Food Security Supplement; food insecure is defined as 3 or more affirmative responses. Column (3) = column (2) – column (1). * $p \leq 0.05$; ** $p \leq 0.01$.

Table 14. Nutrition and Health Outcomes by Food Insecurity Status for Seniors, Ages 60-65

	Food Secure	Food Insecure	Difference
	(1)	(2)	(3)
<i>Nutrient Intakes</i>			
Energy Intake (kcal)	1986.23	1769.89	-216.35**
Protein (gm)	77.07	68.79	-8.28**
Vitamin A (mcg)	681.23	536.71	-144.51**
Vitamin C (mg)	86.68	62.61	-24.08**
Thiamin (mg)	1.56	1.39	-0.18**
Riboflavin (mg)	2.13	1.87	-0.26**
Vitamin B6 (mg)	1.87	1.69	-0.18
Calcium (mg)	881.74	752.02	-129.72**
Phosphorous (mg)	1289.90	1130.17	-159.73**
Magnesium (mg)	295.69	253.03	-42.67**
Iron (mg)	14.70	12.77	-1.93**
<i>Health Outcomes</i>			
Diabetic	0.17	0.29	0.12**
Self-Reports of General Health			
Excellent	0.12	0.02	-0.09**
Excellent or very good	0.43	0.12	-0.31**
Excellent, very good, or good	0.80	0.48	-0.31**
Number of days of poor physical health			
	4.14	8.34	4.21**
Number of days of poor mental health			
	3.01	7.07	4.06**
Suffers from depression			
	0.06	0.25	0.19**
At least one ADL limitation			
	0.54	0.80	0.27**
Dementia			
	0.06	0.20	0.14**
High blood pressure (reported)			
	0.50	0.64	0.14**
High blood pressure (measured)			
	0.13	0.14	0.02
Hypertension			
	0.43	0.47	0.04
High cholesterol			
	0.53	0.57	0.04
Congestive heart failure			
	0.03	0.11	0.08**
Coronary heart disease			
	0.06	0.13	0.07**
Heart attack			
	0.06	0.14	0.08**
Cancer			
	0.16	0.08	-0.08**
Reports of chest pain			
	0.27	0.43	0.16**
Gum disease			
	0.19	0.38	0.19**
Gum health? (1-excellent 5-poor)			
	2.70	3.72	1.02**
Psoriasis			
	0.03	0.05	0.01
Asthma			
	0.14	0.25	0.11**

Source: 1999-2016 NHANES. Notes: Food secure is defined as 2 or fewer affirmative responses in the Food Security Supplement; food insecure is defined as 3 or more affirmative responses. Column (3) = column (2) – column (1). * $p \leq 0.05$; ** $p \leq 0.01$.

Table 15. Nutrition and Health Outcomes by Food Insecurity Status for Seniors, Ages 66-70

	Food Secure	Food Insecure	Difference
	(1)	(2)	(3)
<i>Nutrient Intakes</i>			
Energy Intake (kcal)	1873.63	1689.63	-184**
Protein (gm)	74.21	65.00	-9.21**
Vitamin A (mcg)	739.31	567.55	-171.77
Vitamin C (mg)	89.29	66.16	-23.12**
Thiamin (mg)	1.53	1.34	-0.19**
Riboflavin (mg)	2.08	1.85	-0.22
Vitamin B6 (mg)	1.87	1.59	-0.28**
Calcium (mg)	823.31	783.65	-39.67
Phosphorous (mg)	1232.19	1114.97	-117.21**
Magnesium (mg)	289.26	242.29	-46.96**
Iron (mg)	14.62	13.01	-1.61
<i>Health Outcomes</i>			
Diabetic	0.18	0.34	0.16**
Self-Reports of General Health			
Excellent	0.11	0.04	-0.07**
Excellent or very good	0.42	0.13	-0.29**
Excellent, very good, or good	0.77	0.44	-0.33**
Number of days of poor physical health	4.32	7.63	3.31**
Number of days of poor mental health	2.62	4.92	2.3**
Suffers from depression	0.06	0.19	0.13**
At least one ADL limitation	0.60	0.84	0.24**
Dementia	0.07	0.25	0.18**
High blood pressure (reported)	0.57	0.65	0.08
High blood pressure (measured)	0.13	0.15	0.02
Hypertension	0.50	0.39	-0.11
High cholesterol	0.60	0.54	-0.05
Congestive heart failure	0.06	0.09	0.03
Coronary heart disease	0.10	0.10	0
Heart attack	0.08	0.12	0.03
Cancer	0.23	0.20	-0.03
Reports of chest pain	0.29	0.36	0.07
Gum disease	0.17	0.22	0.06
Gum health? (1-excellent 5-poor)	2.67	3.41	0.74**
Psoriasis	0.03	0.03	-0.01
Asthma	0.12	0.20	0.08**

Source: 1999-2016 NHANES. Notes: Food secure is defined as 2 or fewer affirmative responses in the Food Security Supplement; food insecure is defined as 3 or more affirmative responses. Column (3) = column (2) – column (1). * $p \leq 0.05$; ** $p \leq 0.01$.

Table 16. Nutrition and Health Outcomes by Food Insecurity Status for Seniors, Ages 71-75

	Food Secure	Food Insecure	Difference
	(1)	(2)	(3)
<i>Nutrient Intakes</i>			
Energy Intake (kcal)	1744.46	1577.13	-167.34
Protein (gm)	68.64	60.31	-8.33**
Vitamin A (mcg)	703.62	472.21	-231.41**
Vitamin C (mg)	85.86	71.90	-13.96
Thiamin (mg)	1.47	1.24	-0.23**
Riboflavin (mg)	2.00	1.62	-0.38**
Vitamin B6 (mg)	1.82	1.43	-0.39**
Calcium (mg)	809.01	721.05	-87.96
Phosphorous (mg)	1162.94	1012.42	-150.52**
Magnesium (mg)	268.42	222.66	-45.76**
Iron (mg)	14.25	11.76	-2.48**
<i>Health Outcomes</i>			
Diabetic	0.20	0.29	0.1**
Self-Reports of General Health			
Excellent	0.10	0.03	-0.07**
Excellent or very good	0.37	0.15	-0.22**
Excellent, very good, or good	0.75	0.44	-0.31**
Number of days of poor physical health	4.77	7.80	3.03**
Number of days of poor mental health	2.43	4.91	2.48**
Suffers from depression	0.04	0.18	0.13**
At least one ADL limitation	0.66	0.87	0.21**
Dementia	0.09	0.28	0.19**
High blood pressure (reported)	0.60	0.76	0.16**
High blood pressure (measured)	0.12	0.17	0.05
Hypertension	0.52	0.54	0.03
High cholesterol	0.58	0.67	0.09
Congestive heart failure	0.07	0.16	0.08**
Coronary heart disease	0.12	0.13	0.01
Heart attack	0.10	0.16	0.06
Cancer	0.27	0.25	-0.02
Reports of chest pain	0.30	0.42	0.12**
Gum disease	0.11	0.24	0.14
Gum health? (1-excellent 5-poor)	2.67	3.46	0.79**
Psoriasis	0.03	0.07	0.04
Asthma	0.11	0.24	0.12**

Source: 1999-2016 NHANES. Notes: Food secure is defined as 2 or fewer affirmative responses in the Food Security Supplement; food insecure is defined as 3 or more affirmative responses. Column (3) = column (2) – column (1). * $p \leq 0.05$; ** $p \leq 0.01$.

Table 17. Nutrition and Health Outcomes by Food Insecurity Status for Seniors, Ages 76-80

	Food Secure	Food Insecure	Difference
	(1)	(2)	(3)
<i>Nutrient Intakes</i>			
Energy Intake (kcal)	1666.63	1526.33	-140.3**
Protein (gm)	63.51	58.62	-4.89
Vitamin A (mcg)	727.69	575.47	-152.22**
Vitamin C (mg)	86.84	70.62	-16.22**
Thiamin (mg)	1.44	1.28	-0.16**
Riboflavin (mg)	1.96	1.66	-0.3**
Vitamin B6 (mg)	1.78	1.45	-0.33**
Calcium (mg)	796.94	738.85	-58.09
Phosphorous (mg)	1104.76	1014.60	-90.16**
Magnesium (mg)	252.56	236.46	-16.1
Iron (mg)	14.11	12.04	-2.07**
<i>Health Outcomes</i>			
Diabetic	0.17	0.30	0.14**
Self-Reports of General Health			
Excellent	0.07	0.08	0.01
Excellent or very good	0.34	0.20	-0.14**
Excellent, very good, or good	0.70	0.52	-0.18**
Number of days of poor physical health	4.63	6.95	2.31
Number of days of poor mental health	2.52	4.36	1.85
Suffers from depression	0.05	0.10	0.05
At least one ADL limitation	0.78	0.89	0.12**
Dementia	0.19	0.32	0.13**
High blood pressure (reported)	0.62	0.71	0.09**
High blood pressure (measured)	0.15	0.17	0.02
Hypertension	0.48	0.42	-0.07
High cholesterol	0.51	0.55	0.03
Congestive heart failure	0.11	0.13	0.02
Coronary heart disease	0.14	0.12	-0.02
Heart attack	0.13	0.20	0.07
Cancer	0.32	0.21	-0.11**
Reports of chest pain	0.30	0.38	0.08
Gum disease	0.08	0.08	0
Gum health? (1-excellent 5-poor)	2.70	3.08	0.39**
Psoriasis	0.04	0.02	-0.02
Asthma	0.10	0.13	0.03

Source: 1999-2016 NHANES. Notes: Food secure is defined as 2 or fewer affirmative responses in the Food Security Supplement; food insecure is defined as 3 or more affirmative responses. Column (3) = column (2) – column (1). * $p \leq 0.05$; ** $p \leq 0.01$.

Table 18. Nutrition and Health Outcomes by Food Insecurity Status for Seniors, Ages 81+

	Food Secure	Food Insecure	Difference
	(1)	(2)	(3)
<i>Nutrient Intakes</i>			
Energy Intake (kcal)	1654.18	1481.17	-173.01**
Protein (gm)	62.30	58.30	-4
Vitamin A (mcg)	748.13	556.49	-191.64**
Vitamin C (mg)	89.54	84.28	-5.26
Thiamin (mg)	1.43	1.21	-0.22**
Riboflavin (mg)	1.93	1.57	-0.36**
Vitamin B6 (mg)	1.79	1.43	-0.36**
Calcium (mg)	801.77	702.49	-99.28
Phosphorous (mg)	1097.18	989.17	-108.01
Magnesium (mg)	251.42	232.51	-18.91
Iron (mg)	13.99	10.90	-3.1**
<i>Health Outcomes</i>			
Diabetic	0.16	0.32	0.16**
Self-Reports of General Health			
Excellent	0.08	0.10	0.02
Excellent or very good	0.34	0.24	-0.09
Excellent, very good, or good	0.69	0.54	-0.15**
Number of days of poor physical health	4.32	7.98	3.67
Number of days of poor mental health	2.74	6.39	3.64
Suffers from depression	0.05	0.08	0.03
At least one ADL limitation	0.81	0.89	0.08
Dementia	0.20	0.35	0.14**
High blood pressure (reported)	0.65	0.71	0.06
High blood pressure (measured)	0.13	0.13	0.01
Hypertension	0.36	0.25	-0.12
High cholesterol	0.50	0.52	0.03
Congestive heart failure	0.12	0.11	-0.01
Coronary heart disease	0.14	0.12	-0.03
Heart attack	0.13	0.18	0.05
Cancer	0.32	0.15	-0.17**
Reports of chest pain	0.29	0.37	0.08
Gum disease	0.07	0.09	0.01
Gum health? (1-excellent 5-poor)	2.71	3.06	0.35
Psoriasis	0.03	0.02	-0.01
Asthma	0.10	0.11	0.01

Source: 1999-2016 NHANES. Notes: Food secure is defined as 2 or fewer affirmative responses in the Food Security Supplement; food insecure is defined as 3 or more affirmative responses. Column (3) = column (2) – column (1). * $p \leq 0.05$; ** $p \leq 0.01$

Table 19A: Effect of Food Insecurity on Nutrient Intakes, All Seniors

	Energy	Protein	Vitamin A	Vitamin C	Thiamin	Riboflavin
	(1)	(2)	(3)	(4)	(5)	(6)
Food insecure	-68.059** (20.767)	-3.587** (0.928)	-82.262** (27.473)	-5.354* (2.531)	-0.069** (0.022)	-0.089** (0.030)
Not married or widowed	49.498** (16.629)	1.011 (0.743)	52.002* (21.999)	2.550 (2.026)	0.021 (0.017)	0.084** (0.024)
Widowed	43.191* (17.053)	1.129 (0.762)	28.125 (22.561)	-0.370 (2.078)	0.030 (0.018)	0.074** (0.024)
Income/Poverty line	30.946** (4.663)	1.515** (0.208)	25.755** (6.169)	4.355** (0.568)	0.028** (0.005)	0.042** (0.007)
Female	-446.247** (12.940)	-18.154** (0.578)	-79.816** (17.120)	-7.207** (1.577)	-0.353** (0.014)	-0.456** (0.019)
Black	-151.856** (17.370)	-4.546** (0.776)	-23.242 (22.980)	3.704 (2.117)	-0.229** (0.018)	-0.532** (0.025)
Hispanic	-71.283** (17.561)	0.471 (0.784)	-50.375* (23.233)	9.662** (2.140)	-0.112** (0.018)	-0.240** (0.025)
Asian American, Pacific Islander, Native American, and people who identify as multi-racial	-213.172** (29.917)	-2.924* (1.336)	5.676 (39.579)	17.248** (3.646)	-0.065* (0.031)	-0.438** (0.043)
High school graduate	125.304** (14.870)	4.174** (0.664)	83.420** (19.672)	13.982** (1.812)	0.083** (0.016)	0.145** (0.021)
Age	-15.821** (1.003)	-0.640** (0.045)	3.092* (1.327)	0.383** (0.122)	-0.006** (0.001)	-0.009** (0.001)
Constant	2,922.412** (79.145)	115.775** (3.535)	779.949** (104.705)	57.264** (9.644)	1.965** (0.083)	2.544** (0.113)

Source: 1999-2016 NHANES. Notes: Number of observations is 13,173. Standard errors are in parentheses. * significant at 5% level; ** significant at 1% level.

Table 19A (continued): Effect of Food Insecurity on Nutrient Intakes, All Seniors

	VitaminB6	Calcium	Phosphorous	Magnesium	Iron
	(7)	(8)	(9)	(10)	(11)
Food insecure	-0.116** (0.034)	-25.343 (13.964)	-49.721** (14.973)	-9.044* (3.659)	-0.623** (0.229)
Not married or widowed	0.065* (0.027)	36.129** (11.182)	23.228 (11.989)	8.857** (2.930)	0.051 (0.183)
Widowed	0.053 (0.028)	21.528 (11.467)	15.820 (12.296)	1.707 (3.005)	0.227 (0.188)
Income/Poverty line	0.061** (0.008)	19.858** (3.136)	25.772** (3.362)	9.220** (0.822)	0.339** (0.051)
Female	-0.449** (0.021)	-114.755** (8.702)	-267.811** (9.330)	-52.505** (2.280)	-3.254** (0.143)
Black	-0.207** (0.028)	-200.200** (11.680)	-194.746** (12.524)	-39.220** (3.061)	-2.131** (0.192)
Hispanic	-0.064* (0.028)	-22.896 (11.809)	-10.927 (12.662)	5.221 (3.095)	-0.773** (0.194)
Asian American, Pacific Islander, Native American, and people who identify as multi-racial	-0.063 (0.048)	-167.535** (20.118)	-125.783** (21.571)	10.965* (5.272)	-0.843* (0.330)
High school graduate	0.156** (0.024)	60.126** (9.999)	78.458** (10.721)	26.017** (2.620)	0.893** (0.164)
Age	-0.002 (0.002)	-2.546** (0.674)	-8.108** (0.723)	-1.452** (0.177)	-0.025* (0.011)
Constant	1.911** (0.128)	876.783** (53.220)	1,721.801** (57.065)	353.868** (13.947)	16.886** (0.873)

Source: 1999-2016 NHANES. Notes: Number of observations is 13,173. Standard errors are in parentheses. * significant at 5% level; ** significant at 1% level.

Table 19B: Effect of Food Insecurity on Health Outcomes, All Seniors

	Diabetic	Excellent	Excellent or very good	Excellent, very good, or good	Number of days of poor physical health	Number of days of poor mental health
	(1)	(2)	(3)	(4)	(5)	(6)
Food insecure	0.031** (0.011)	-0.009 (0.008)	-0.082** (0.013)	-0.098** (0.015)	2.209** (0.355)	1.944** (0.270)
Not married or widowed	-0.036** (0.009)	0.005 (0.006)	-0.002 (0.011)	-0.026* (0.012)	0.400 (0.269)	0.582** (0.205)
Widowed	0.003 (0.009)	-0.012* (0.005)	-0.024* (0.011)	-0.034** (0.012)	0.585* (0.269)	0.559** (0.205)
Income/Poverty line	-0.019** (0.003)	0.015** (0.001)	0.043** (0.003)	0.050** (0.003)	-0.410** (0.075)	-0.271** (0.057)
Female	-0.024** (0.007)	-0.008 (0.004)	-0.001 (0.008)	-0.001 (0.009)	0.798** (0.209)	1.564** (0.159)
Black	0.116** (0.011)	-0.027** (0.005)	-0.115** (0.009)	-0.106** (0.012)	-0.373 (0.278)	-0.605** (0.211)
Hispanic	0.083** (0.010)	-0.017** (0.005)	-0.136** (0.010)	-0.155** (0.013)	0.489 (0.286)	-0.432* (0.217)
Asian American, Pacific Islander, Native American, and people who identify as multi-racial	0.062** (0.017)	-0.029** (0.007)	-0.108** (0.014)	-0.105** (0.020)	-0.249 (0.523)	-1.058** (0.398)
High school graduate	-0.035** (0.008)	0.020** (0.005)	0.108** (0.009)	0.143** (0.010)	-0.878** (0.235)	-0.352* (0.179)
Age	-0.001* (0.001)	-0.000 (0.000)	-0.001 (0.001)	-0.003** (0.001)	-0.029 (0.016)	-0.079** (0.012)
Constant					7.673** (1.262)	8.748** (0.959)
N	14,873	13,407	13,407	13,407	8,960	8,960

Source: 1999-2016 NHANES. Notes: Standard errors are in parentheses. * significant at 5% level; ** significant at 1% level.

Table 19B (continued): Effect of Food Insecurity on Health Outcomes, All Seniors

	Suffers from depression	At least one ADL limitation	Dementia	High blood pressure (reported)	High blood pressure (exam)	Hypertension
	(7)	(8)	(9)	(10)	(11)	
Food insecure	0.060** (0.010)	0.144** (0.011)	0.079** (0.012)	0.057** (0.014)	-0.002 (0.011)	0.029 (0.023)
Not married or widowed	0.031** (0.008)	0.023* (0.010)	0.029** (0.009)	-0.026* (0.011)	0.020* (0.009)	-0.002 (0.018)
Widowed	0.021* (0.009)	0.034** (0.011)	0.024** (0.009)	0.013 (0.011)	0.046** (0.009)	-0.009 (0.018)
Income/Poverty line	-0.018** (0.002)	-0.033** (0.003)	-0.019** (0.002)	-0.012** (0.003)	-0.009** (0.002)	0.014** (0.005)
Female	0.022** (0.006)	0.094** (0.008)	0.004 (0.007)	0.059** (0.009)	0.004 (0.007)	0.009 (0.014)
Black	-0.025** (0.006)	-0.041** (0.011)	-0.003 (0.009)	0.159** (0.011)	0.065** (0.010)	0.065** (0.018)
Hispanic	-0.002 (0.007)	-0.054** (0.012)	0.019* (0.009)	-0.016 (0.012)	0.017 (0.010)	-0.047* (0.019)
Asian American, Pacific Islander, Native American, and people who identify as multi-racial	-0.030** (0.008)	-0.081** (0.019)	0.035* (0.015)	-0.022 (0.019)	0.082** (0.018)	0.022 (0.031)
High school graduate	-0.023** (0.007)	-0.038** (0.009)	-0.052** (0.008)	0.001 (0.010)	-0.001 (0.008)	0.055** (0.015)
Age	-0.002** (0.000)	0.011** (0.001)	0.006** (0.001)	0.005** (0.001)	0.002** (0.001)	0.001 (0.001)
N	7,601	14,873	11,801	14,826	14,873	8,504

Source: 1999-2016 NHANES. Notes: Standard errors are in parentheses. * significant at 5% level; ** significant at 1% level.

Table 19B (continued): Effect of Food Insecurity on Health Outcomes, All Seniors

	High cholesterol	Congestive heart failure	Coronary heart disease	Heart attack	Cancer	Reports of chest pain
	(12)	(13)	(14)	(15)	(16)	(17)
Food insecure	0.010 (0.015)	0.031** (0.008)	0.026** (0.009)	0.044** (0.009)	0.002 (0.012)	0.119** (0.014)
Not married or widowed	-0.019 (0.012)	-0.002 (0.006)	-0.013* (0.006)	0.014* (0.007)	-0.003 (0.009)	0.017 (0.010)
Widowed	-0.018 (0.012)	0.022** (0.006)	0.012 (0.007)	0.023** (0.007)	-0.018* (0.008)	0.005 (0.010)
Income/Poverty line	-0.002 (0.003)	-0.013** (0.002)	-0.005** (0.002)	-0.012** (0.002)	0.012** (0.002)	-0.017** (0.003)
Female	0.033** (0.009)	-0.028** (0.004)	-0.073** (0.005)	-0.078** (0.005)	-0.028** (0.007)	0.006 (0.008)
Black	-0.028* (0.012)	-0.004 (0.006)	-0.052** (0.005)	-0.032** (0.006)	-0.080** (0.008)	-0.027** (0.010)
Hispanic	-0.012 (0.013)	-0.030** (0.005)	-0.044** (0.006)	-0.045** (0.005)	-0.123** (0.007)	-0.077** (0.010)
Asian American, Pacific Islander, Native American, and people who identify as multi-racial	-0.043* (0.019)	-0.023** (0.008)	-0.024** (0.009)	-0.038** (0.008)	-0.116** (0.009)	-0.054** (0.016)
High school graduate	0.008 (0.010)	-0.008 (0.005)	-0.002 (0.006)	-0.004 (0.006)	0.027** (0.008)	-0.001 (0.009)
Age	-0.003** (0.001)	0.003** (0.000)	0.003** (0.000)	0.003** (0.000)	0.008** (0.001)	-0.001 (0.001)
N	13,442	14,767	14,721	14,826	14,855	14,846

Source: 1999-2016 NHANES. Notes: Standard errors are in parentheses. * significant at 5% level; ** significant at 1% level.

Table 19B (continued): Effect of Food Insecurity on Health Outcomes, All Seniors

	Gum disease	Gum health? (1- excellent 5-poor)	Psoriasis	Asthma
	(12)	(13)	(14)	(15)
Food insecure	0.037** (0.014)	0.245** (0.042)	0.004 (0.008)	0.056** (0.010)
Not married or widowed	0.030* (0.012)	0.074* (0.035)	0.005 (0.007)	0.012 (0.007)
Widowed	0.030* (0.014)	0.037 (0.039)	0.005 (0.007)	0.003 (0.007)
Income/Poverty line	-0.010** (0.003)	-0.142** (0.010)	-0.001 (0.002)	-0.004* (0.002)
Female	-0.022* (0.009)	-0.123** (0.028)	-0.005 (0.005)	0.040** (0.005)
Black	-0.003 (0.012)	0.253** (0.038)	-0.022** (0.005)	0.004 (0.007)
Hispanic	0.023 (0.013)	0.346** (0.039)	-0.010 (0.006)	-0.032** (0.007)
Asian American, Pacific Islander, Native American, and people who identify as multi-racial	0.044* (0.018)	0.191** (0.051)	-0.006 (0.008)	-0.010 (0.011)
High school graduate	0.000 (0.011)	-0.204** (0.034)	0.003 (0.006)	0.005 (0.006)
Age	-0.008** (0.001)	-0.014** (0.002)	-0.000 (0.000)	-0.002** (0.000)
Constant		4.366** (0.172)		
N	6,424	6,503	5,110	14,856

Source: 1999-2016 NHANES. Notes: Standard errors are in parentheses. * significant at 5% level; ** significant at 1% level.

Table 20A: Effect of Food Insecurity on Nutrient Intakes, Low-Income Seniors

	Energy	Protein	Vitamin A	Vitamin C	Thiamin	Riboflavin
	(1)	(2)	(3)	(4)	(5)	(6)
Food insecure	-57.570*	-3.336**	-90.963**	-6.022*	-0.064**	-0.068*
	(23.709)	(1.044)	(30.328)	(2.826)	(0.023)	(0.032)
Not married or widowed	76.385**	1.531	67.817*	4.027	0.009	0.123**
	(23.263)	(1.024)	(29.758)	(2.773)	(0.023)	(0.032)
Widowed	50.221*	1.029	33.919	1.486	0.039	0.093**
	(24.120)	(1.062)	(30.854)	(2.875)	(0.023)	(0.033)
Income/Poverty line	75.998**	1.711	-7.206	3.569	0.057**	0.091**
	(21.065)	(0.927)	(26.946)	(2.511)	(0.021)	(0.029)
Female	-423.577**	-16.828**	-60.605*	-7.706**	-0.308**	-0.396**
	(19.245)	(0.847)	(24.618)	(2.294)	(0.019)	(0.026)
Black	-133.016**	-3.748**	-29.711	6.720*	-0.191**	-0.518**
	(25.394)	(1.118)	(32.484)	(3.027)	(0.025)	(0.035)
Hispanic	-56.579*	1.734	-38.807	12.250**	-0.086**	-0.233**
	(24.304)	(1.070)	(31.090)	(2.897)	(0.024)	(0.033)
Asian American, Pacific Islander, Native American, and people who identify as multi-racial	-180.152**	-0.589	84.845	24.602**	-0.009	-0.389**
	(45.981)	(2.024)	(58.818)	(5.481)	(0.045)	(0.063)
High school graduate	131.032**	4.715**	84.109**	12.511**	0.097**	0.160**
	(19.683)	(0.866)	(25.178)	(2.346)	(0.019)	(0.027)
Age	-13.349**	-0.540**	3.823*	0.332	-0.005**	-0.009**
	(1.493)	(0.066)	(1.910)	(0.178)	(0.001)	(0.002)
Constant	2,660.635**	106.586**	715.959**	56.882**	1.824**	2.420**
	(117.634)	(5.178)	(150.475)	(14.021)	(0.115)	(0.161)

Source: 1999-2016 NHANES. Notes: Number of observations is 6,410. Standard errors are in parentheses. * significant at 5% level; ** significant at 1% level.

Table 20A (continued): Effect of Food Insecurity on Nutrient Intakes, Low-Income Seniors

	VitaminB6	Calcium	Phosphorous	Magnesium	Iron
	(7)	(8)	(9)	(10)	(11)
Food insecure	-0.126** (0.035)	-22.674 (15.529)	-47.445** (16.837)	-10.705** (3.990)	-0.509* (0.246)
Not married or widowed	0.071* (0.035)	57.101** (15.238)	47.851** (16.521)	9.017* (3.915)	0.031 (0.241)
Widowed	0.068 (0.036)	25.200 (15.799)	22.774 (17.129)	0.994 (4.060)	0.262 (0.250)
Income/Poverty line	0.078* (0.031)	38.298** (13.798)	41.658** (14.960)	10.752** (3.545)	0.757** (0.218)
Female	-0.387** (0.029)	-99.907** (12.606)	-248.545** (13.667)	-47.310** (3.239)	-2.835** (0.199)
Black	-0.193** (0.038)	-181.366** (16.633)	-176.335** (18.034)	-31.588** (4.274)	-1.634** (0.263)
Hispanic	-0.044 (0.036)	13.896 (15.920)	22.240 (17.260)	12.479** (4.091)	-0.550* (0.252)
Asian American, Pacific Islander, Native American, and people who identify as multi-racial	0.001 (0.068)	-158.734** (30.118)	-107.175** (32.654)	14.258 (7.739)	-0.319 (0.477)
High school graduate	0.138** (0.029)	77.433** (12.892)	89.067** (13.978)	26.242** (3.313)	0.913** (0.204)
Age	-0.004* (0.002)	-0.599 (0.978)	-6.751** (1.060)	-1.234** (0.251)	-0.022 (0.015)
Constant	1.988** (0.175)	688.198** (77.051)	1,575.814** (83.538)	331.325** (19.799)	15.506** (1.219)

Source: 1999-2016 NHANES. Notes: Number of observations is 6,410. Standard errors are in parentheses. * significant at 5% level; ** significant at 1% level.

Table 20B: Effect of Food Insecurity on Health Outcomes, Low-Income Seniors

	Diabetic	Excellent	Excellent or very good	Excellent, very good, or good	Number of days of poor physical health	Number of days of poor mental health
	(1)	(2)	(3)	(4)	(5)	(6)
Food insecure	0.040** (0.014)	-0.004 (0.006)	-0.055** (0.012)	-0.091** (0.016)	1.862** (0.423)	1.730** (0.328)
Not married or widowed	-0.041** (0.013)	0.003 (0.006)	0.016 (0.013)	-0.001 (0.016)	0.282 (0.404)	0.533 (0.314)
Widowed	-0.010 (0.013)	-0.016** (0.006)	-0.008 (0.013)	0.000 (0.017)	0.571 (0.408)	0.303 (0.316)
Income/Poverty line	-0.000 (0.012)	0.009 (0.006)	0.037** (0.011)	0.092** (0.015)	-0.971** (0.366)	-0.513 (0.284)
Female	0.005 (0.011)	-0.003 (0.005)	-0.016 (0.010)	-0.022 (0.013)	1.038** (0.332)	1.793** (0.257)
Black	0.097** (0.016)	-0.006 (0.006)	-0.058** (0.012)	-0.066** (0.017)	-1.280** (0.429)	-1.240** (0.333)
Hispanic	0.075** (0.014)	-0.008 (0.006)	-0.102** (0.011)	-0.140** (0.017)	0.031 (0.417)	-0.879** (0.323)
Asian American, Pacific Islander, Native American, and people who identify as multi-racial	0.060* (0.026)	-0.016 (0.009)	-0.066** (0.017)	-0.050 (0.028)	-0.447 (0.812)	-1.190 (0.630)
High school graduate	-0.030** (0.011)	0.009 (0.005)	0.068** (0.010)	0.125** (0.013)	-0.790* (0.330)	-0.308 (0.256)
Age	-0.002* (0.001)	0.001 (0.000)	0.002* (0.001)	-0.001 (0.001)	-0.098** (0.025)	-0.125** (0.020)
Constant					14.499** (2.008)	11.751** (1.549)
N	7,417	6,613	6,613	6,613	4,272	4,271

Source: 1999-2016 NHANES. Notes: Standard errors are in parentheses. * significant at 5% level; ** significant at 1% level.

Table 20B (continued): Effect of Food Insecurity on Health Outcomes, Low-Income Seniors

	Suffers from depression	At least one ADL limitation	Dementia	High blood pressure (reported)	High blood pressure (exam)	Hypertension
	(7)	(8)	(9)	(10)	(11)	
Food insecure	0.073** (0.014)	0.114** (0.012)	0.070** (0.014)	0.060** (0.015)	-0.010 (0.013)	0.046 (0.025)
Not married or widowed	0.044** (0.014)	0.026* (0.013)	0.036** (0.014)	0.008 (0.015)	0.015 (0.013)	-0.002 (0.025)
Widowed	0.029 (0.015)	0.031* (0.013)	0.013 (0.014)	0.031* (0.015)	0.044** (0.013)	-0.023 (0.025)
Income/Poverty line	-0.044** (0.011)	-0.056** (0.012)	-0.038** (0.012)	0.000 (0.013)	-0.029** (0.011)	0.056* (0.022)
Female	0.047** (0.010)	0.079** (0.011)	-0.008 (0.011)	0.084** (0.012)	0.007 (0.010)	0.056** (0.020)
Black	-0.052** (0.011)	-0.053** (0.015)	-0.010 (0.014)	0.150** (0.015)	0.051** (0.014)	0.031 (0.026)
Hispanic	-0.008 (0.013)	-0.069** (0.014)	0.019 (0.014)	-0.026 (0.015)	-0.005 (0.013)	-0.043 (0.026)
Asian American, Pacific Islander, Native American, and people who identify as multi-racial	-0.061** (0.014)	-0.076** (0.026)	0.016 (0.023)	0.020 (0.027)	0.061* (0.025)	-0.051 (0.044)
High school graduate	-0.018 (0.011)	-0.034** (0.011)	-0.045** (0.011)	-0.003 (0.012)	0.007 (0.010)	0.066** (0.020)
Age	-0.004** (0.001)	0.008** (0.001)	0.006** (0.001)	0.004** (0.001)	0.002* (0.001)	-0.001 (0.002)
N	3,679	7,417	5,846	7,387	7,417	4,227

Source: 1999-2016 NHANES. Notes: Standard errors are in parentheses. * significant at 5% level; ** significant at 1% level.

Table 20B (continued): Effect of Food Insecurity on Health Outcomes, Low-Income Seniors

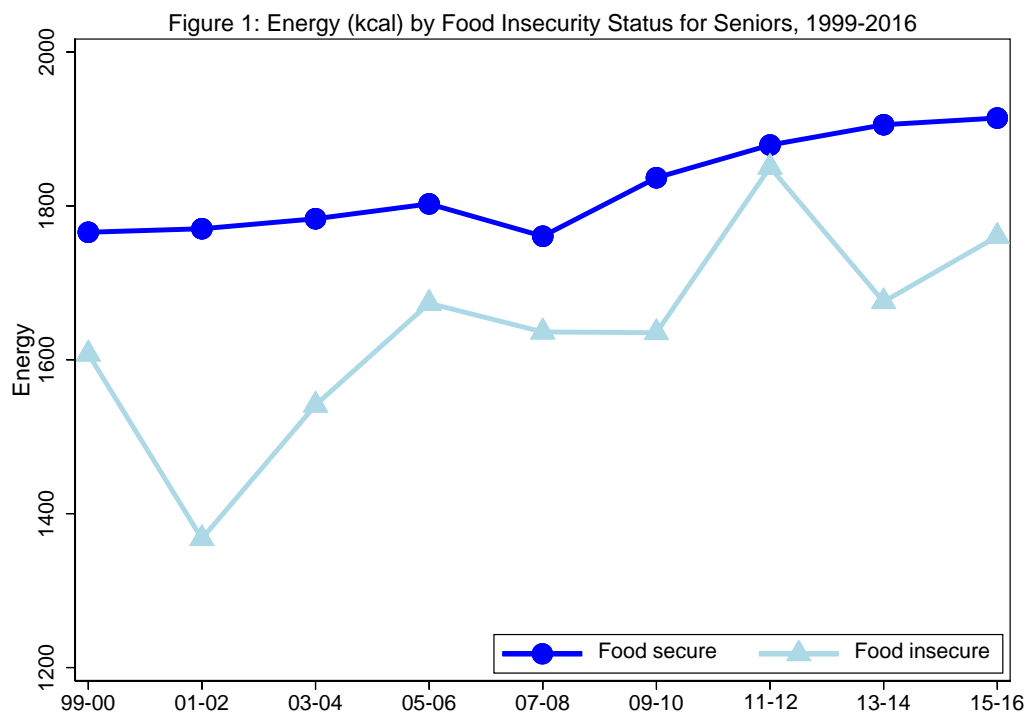
	High cholesterol	Congestive heart failure	Coronary heart disease	Heart attack	Cancer	Reports of chest pain
	(12)	(13)	(14)	(15)	(16)	(17)
Food insecure	0.020 (0.017)	0.031** (0.010)	0.022* (0.010)	0.045** (0.011)	0.003 (0.012)	0.117** (0.015)
Not married or widowed	-0.001 (0.016)	-0.008 (0.009)	-0.018* (0.009)	0.012 (0.010)	-0.009 (0.011)	0.027 (0.014)
Widowed	0.009 (0.017)	0.012 (0.009)	0.005 (0.009)	0.024* (0.010)	-0.018 (0.011)	0.014 (0.015)
Income/Poverty line	0.030* (0.015)	-0.017* (0.008)	-0.020* (0.008)	-0.007 (0.009)	0.013 (0.010)	-0.017 (0.013)
Female	0.049** (0.013)	-0.023** (0.007)	-0.055** (0.008)	-0.084** (0.008)	-0.009 (0.009)	0.012 (0.012)
Black	-0.024 (0.018)	-0.018* (0.009)	-0.060** (0.008)	-0.041** (0.009)	-0.073** (0.010)	-0.056** (0.015)
Hispanic	-0.002 (0.017)	-0.046** (0.008)	-0.058** (0.008)	-0.066** (0.008)	-0.110** (0.009)	-0.105** (0.014)
Asian American, Pacific Islander, Native American, and people who identify as multi-racial	0.003 (0.029)	-0.045** (0.011)	-0.039** (0.012)	-0.059** (0.012)	-0.112** (0.011)	-0.063** (0.024)
High school graduate	-0.007 (0.013)	-0.001 (0.007)	-0.003 (0.008)	-0.006 (0.008)	0.025** (0.009)	-0.002 (0.012)
Age	-0.004** (0.001)	0.003** (0.001)	0.002** (0.001)	0.003** (0.001)	0.006** (0.001)	-0.003** (0.001)
N	6,443	7,340	7,315	7,386	7,407	7,397

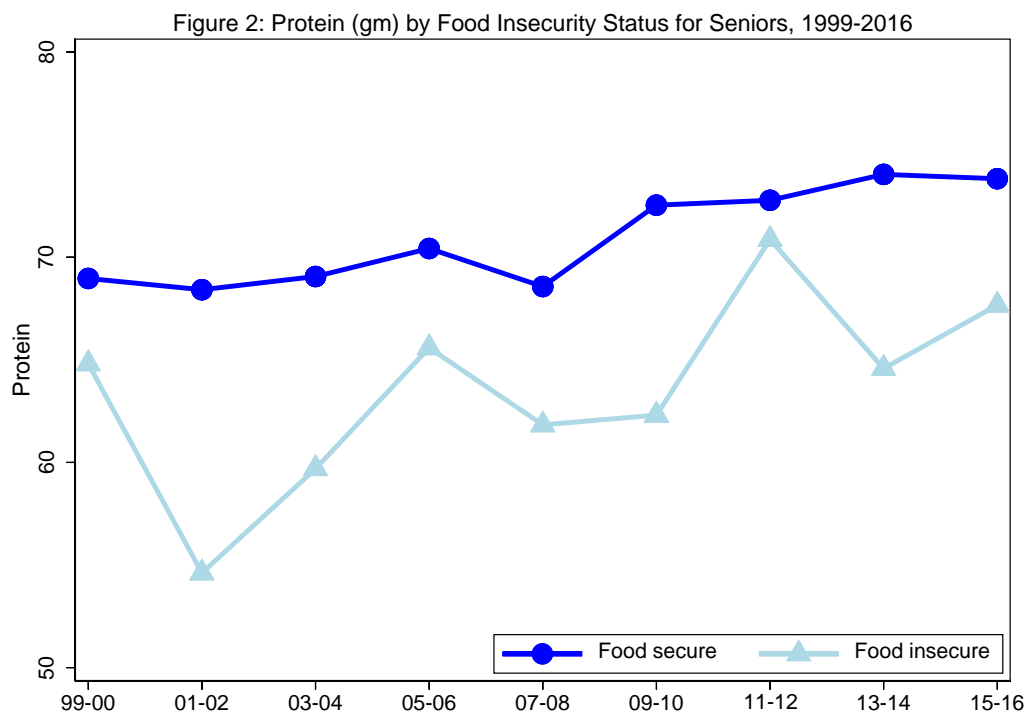
Source: 1999-2016 NHANES. Notes: Standard errors are in parentheses. * significant at 5% level; ** significant at 1% level.

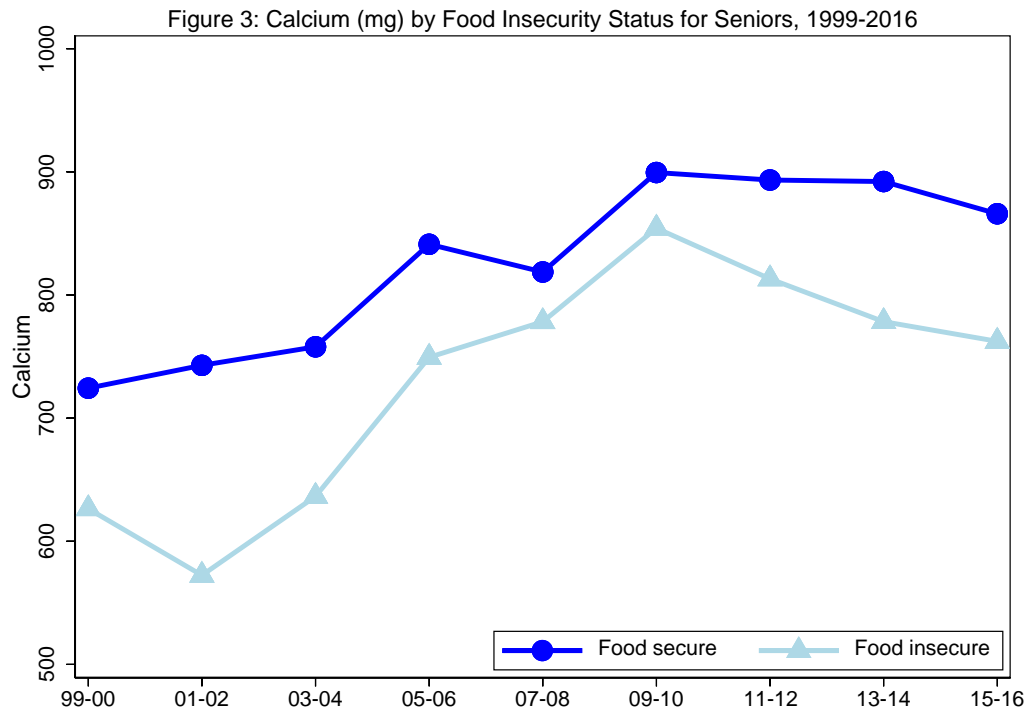
Table 20B (continued): Effect of Food Insecurity on Health Outcomes, Low-Income Seniors

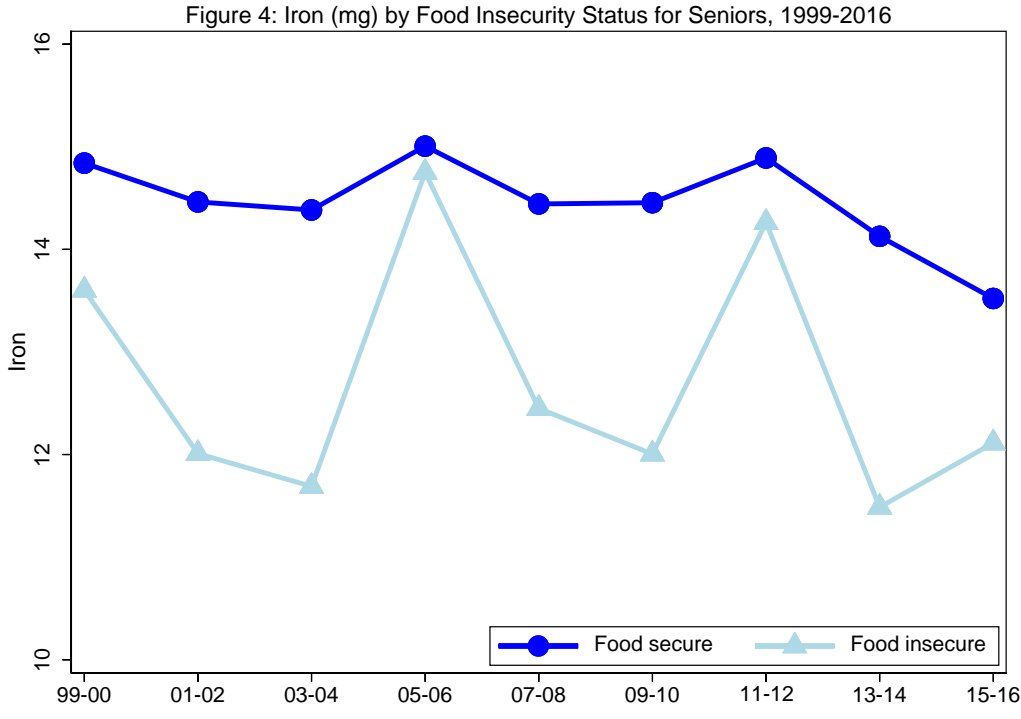
	Gum disease	Gum health? (1- excellent 5-poor)	Psoriasis	Asthma
	(12)	(13)	(14)	(15)
Food insecure	0.020 (0.016)	0.224** (0.049)	0.001 (0.009)	0.054** (0.011)
Not married or widowed	0.038* (0.017)	0.059 (0.050)	0.009 (0.010)	0.020* (0.010)
Widowed	0.028 (0.020)	0.006 (0.055)	-0.008 (0.009)	0.005 (0.010)
Income/Poverty line	-0.002 (0.015)	-0.150** (0.046)	0.006 (0.009)	-0.004 (0.009)
Female	-0.026 (0.014)	-0.095* (0.042)	-0.001 (0.008)	0.045** (0.008)
Black	-0.028 (0.018)	0.092 (0.057)	-0.017* (0.008)	0.006 (0.011)
Hispanic	0.035 (0.019)	0.239** (0.056)	-0.016 (0.008)	-0.038** (0.009)
Asian American, Pacific Islander, Native American, and people who identify as multi-racial	0.060* (0.029)	0.026 (0.077)	-0.010 (0.011)	-0.009 (0.017)
High school graduate	0.008 (0.015)	-0.174** (0.044)	0.005 (0.008)	0.003 (0.008)
Age	-0.010** (0.001)	-0.021** (0.003)	0.000 (0.001)	-0.002** (0.001)
Constant		4.954** (0.258)		
N	3,125	3,192	2,454	7,408

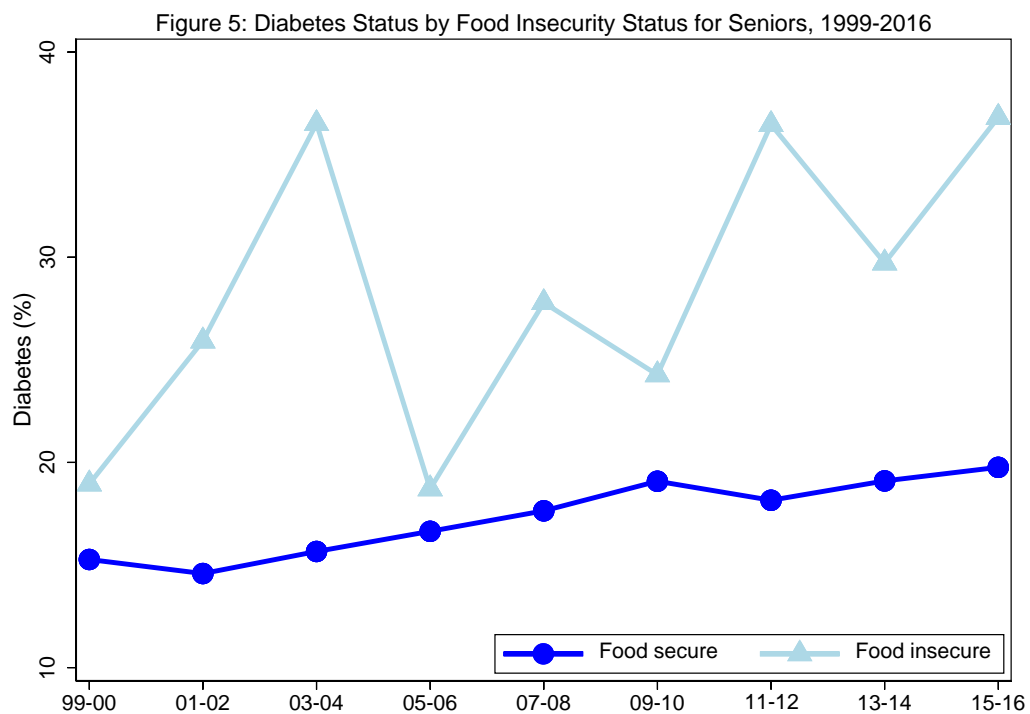
Source: 1999-2016 NHANES. Notes: Standard errors are in parentheses. * significant at 5% level; ** significant at 1% level.

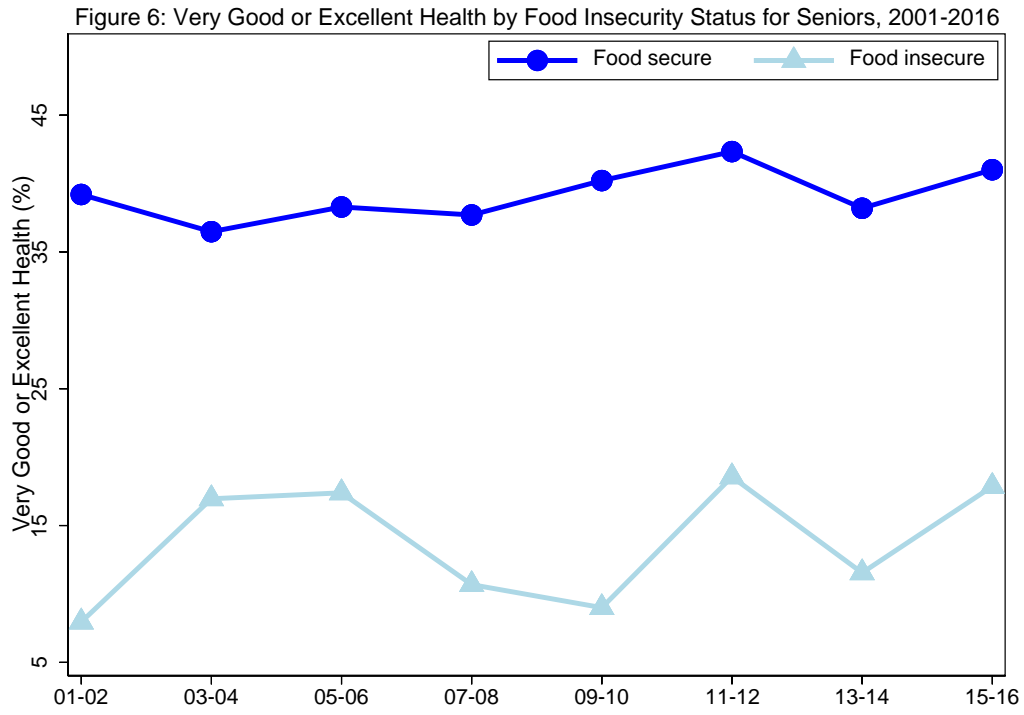


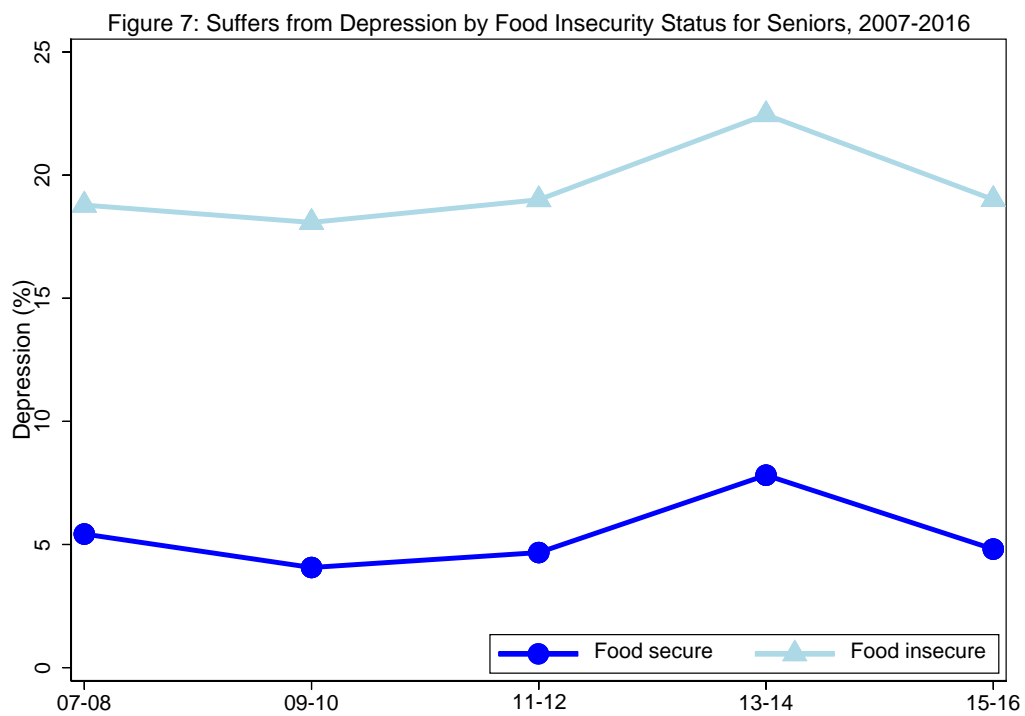












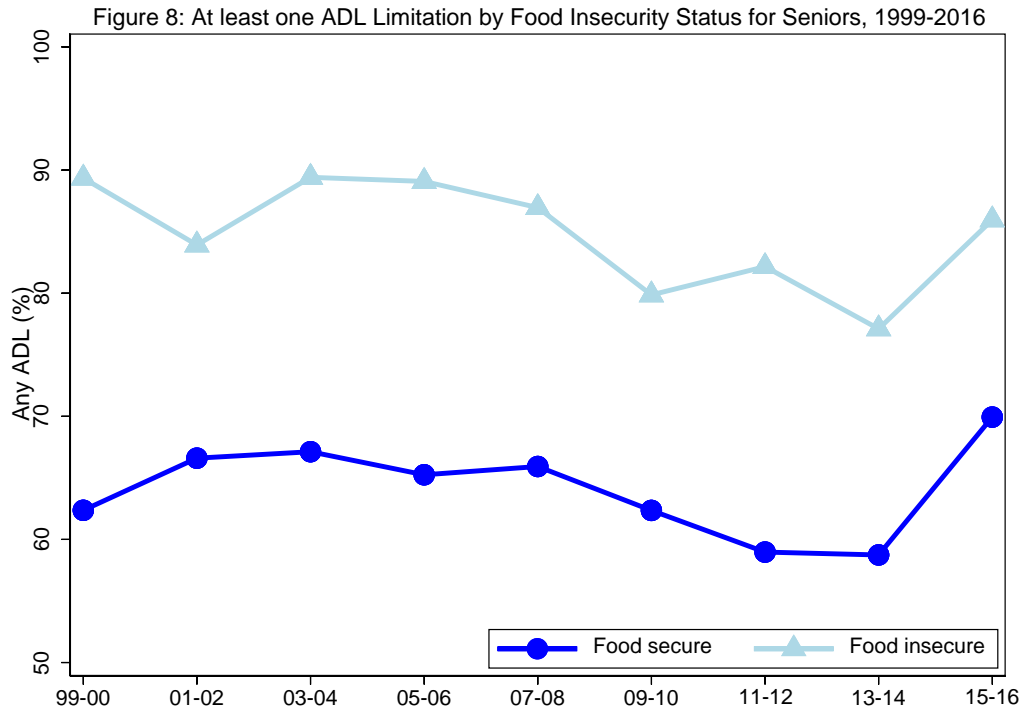
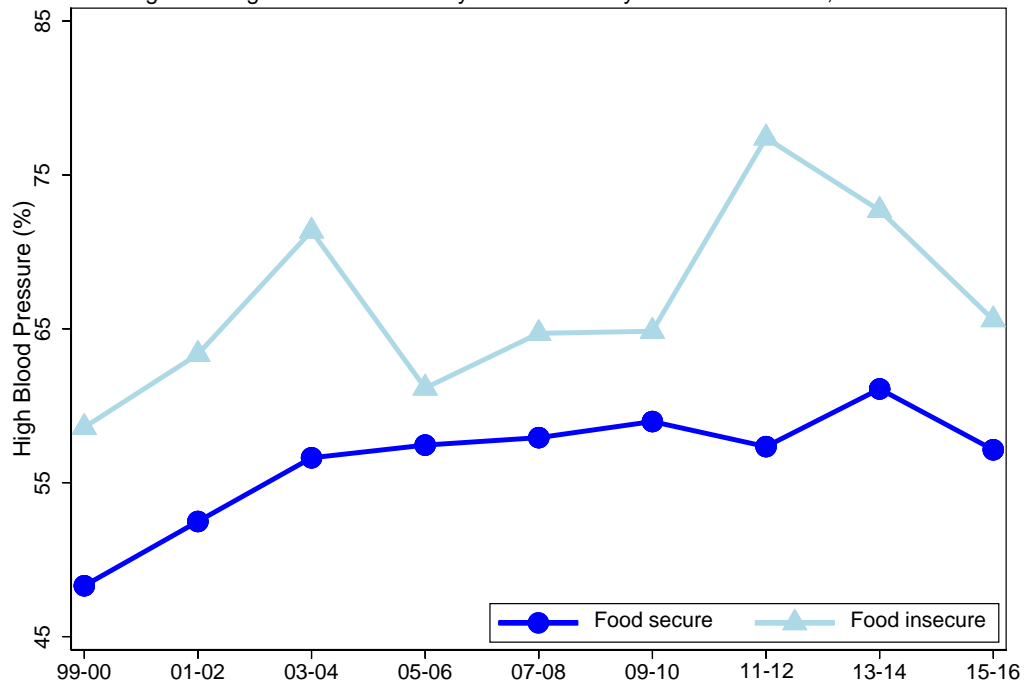
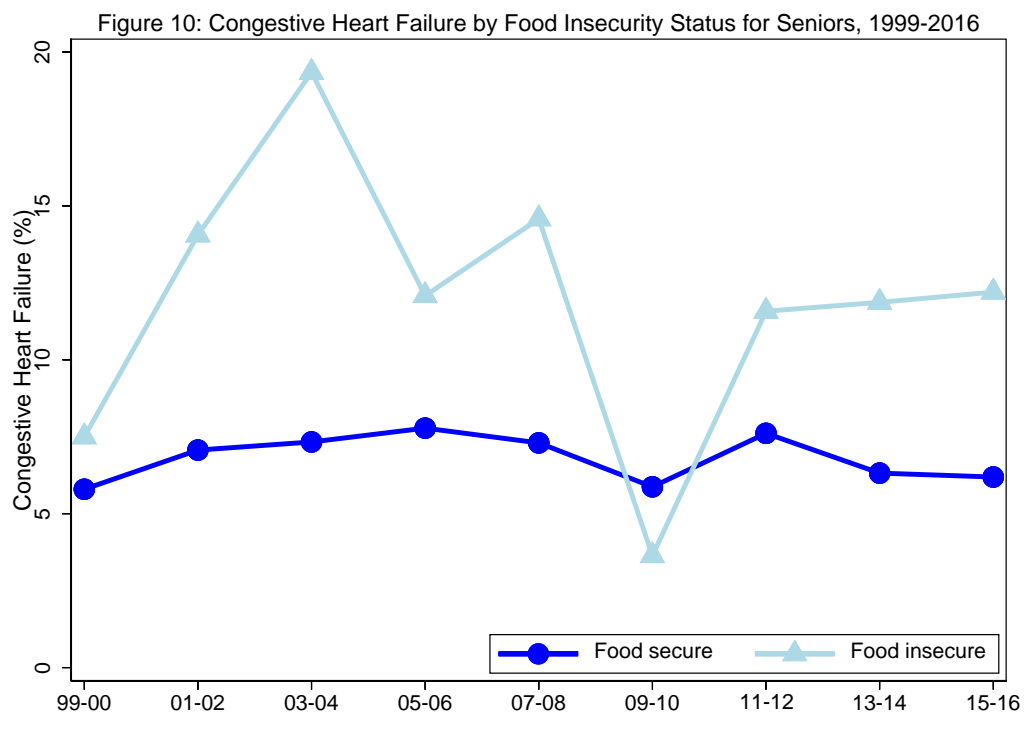
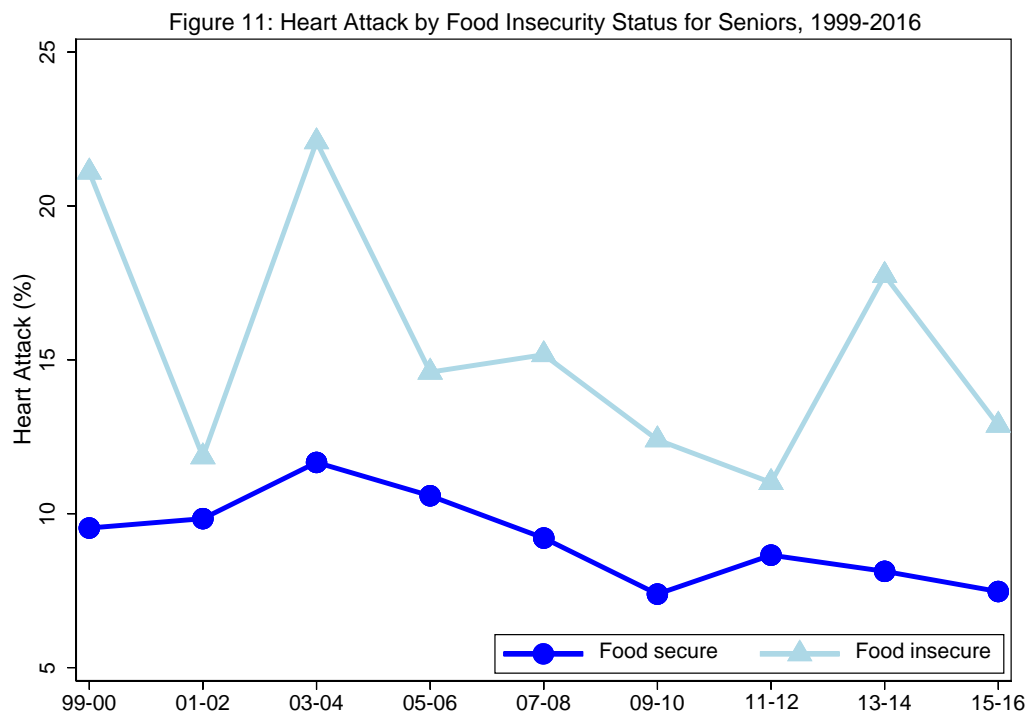


Figure 9: High Blood Pressure by Food Insecurity Status for Seniors, 1999-2016







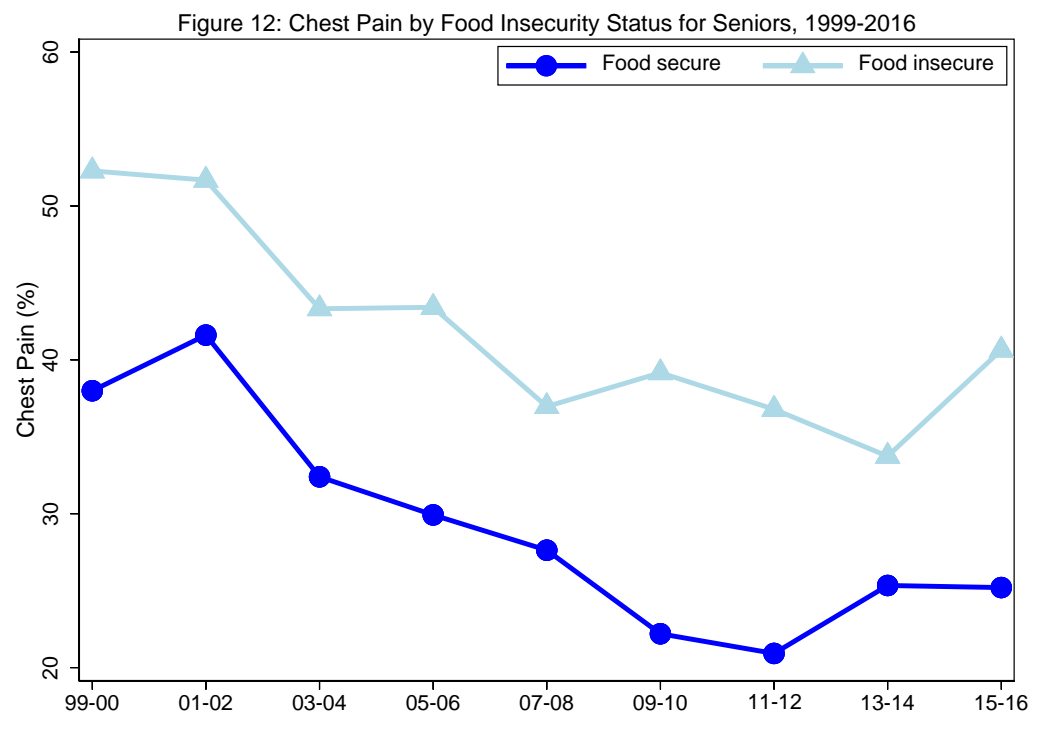
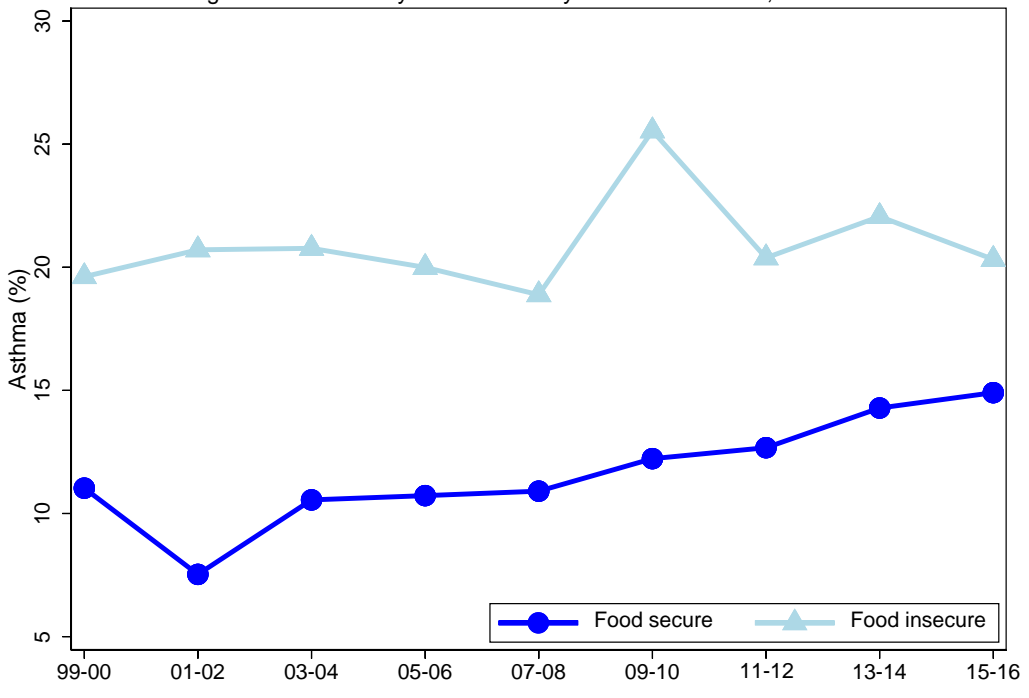


Figure 13: Asthma by Food Insecurity Status for Seniors, 1999-2016



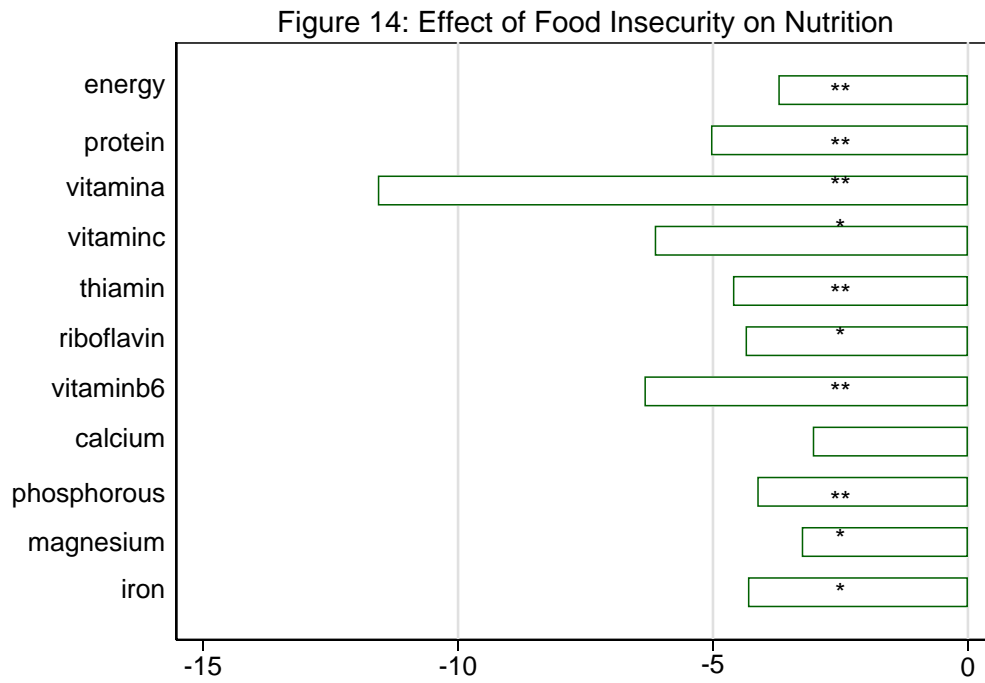
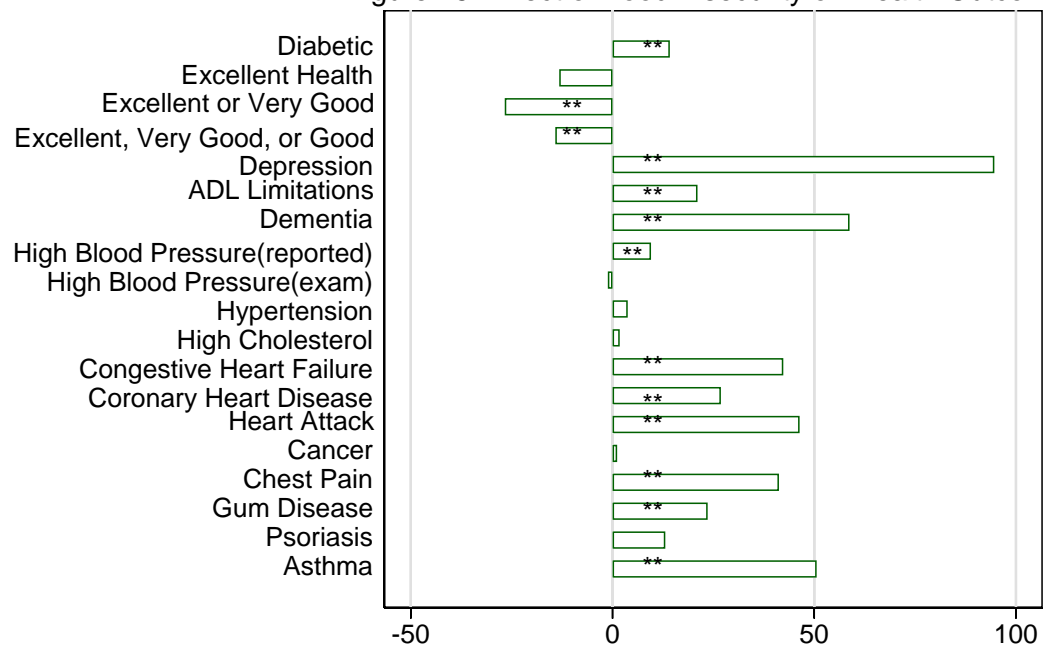


Figure 15: Effect of Food Insecurity on Health Outcomes



Appendix Table 1: Questions on the Food Security Supplement

Food Insecurity Question	Asked of Households with Children	Asked of Households without Children
1. “We worried whether our food would run out before we got money to buy more.” Was that often, sometimes , or never true for you in the last 12 months?	x	x
2. “The food that we bought just didn’t last and we didn’t have money to get more.” Was that often, sometimes , or never true for you in the last 12 months?	x	x
3. “We couldn’t afford to eat balanced meals.” Was that often, sometimes , or never true for you in the last 12 months?	x	x
4. “We relied on only a few kinds of low-cost food to feed our children because we were running out of money to buy food.” Was that often, sometimes , or never true for you in the last 12 months?	x	
5. In the last 12 months, did you or other adults in the household ever cut the size of your meals or skip meals because there wasn’t enough money for food? (Yes/No)	x	x
6. “We couldn’t feed our children a balanced meal, because we couldn’t afford that.” Was that often, sometimes , or never true for you in the last 12 months?	x	
7. In the last 12 months, did you ever eat less than you felt you should because there wasn’t enough money for food? (Yes/No)	x	x
8. (If yes to Question 5) How often did this happen— almost every month, some months but not every month , or in only 1 or 2 months?	x	x
9. “The children were not eating enough because we just couldn’t afford enough food.” Was that often, sometimes , or never true for you in the last 12 months?	x	
10. In the last 12 months, were you ever hungry, but didn’t eat, because you couldn’t afford enough food? (Yes/No)	x	x
11. In the last 12 months, did you lose weight because you didn’t have enough money for food? (Yes/No)	x	x
12. In the last 12 months, did you ever cut the size of any of the children’s meals because there wasn’t enough money for food? (Yes/No)	x	
13. In the last 12 months did you or other adults in your household ever not eat for a whole day because there wasn’t enough money for food? (Yes/No)	x	x
14. In the last 12 months, were the children ever hungry but you just couldn’t afford more food? (Yes/No)	x	
15. (If yes to Question 13) How often did this happen— almost every month, some months but not every month , or in only 1 or 2 months?	x	x
16. In the last 12 months, did any of the children ever skip a meal because there wasn’t enough money for food? (Yes/No)	x	
17. (If yes to Question 16) How often did this happen— almost every month, some months but not every month , or in only 1 or 2 months?	x	
18. In the last 12 months did any of the children ever not eat for a whole day because there wasn’t enough money for food? (Yes/No)	x	

Notes: Responses in bold indicate an “affirmative” response.

Appendix Table 2. Nutrition and Health Outcomes for All Seniors

<i>Nutrient Intakes</i>	
Energy Intake (kcal)	1818.88
Protein (gm)	70.73
Vitamin A (mcg)	698.07
Vitamin C (mg)	85.79
Thiamin (mg)	1.49
Riboflavin (mg)	2.03
Vitamin B6 (mg)	1.81
Calcium (mg)	826.19
Phosphorous (mg)	1194.52
Magnesium (mg)	274.78
Iron (mg)	14.30
<i>Health Outcomes</i>	
Diabetic	0.18
Self-Reports of General Health	
Excellent	0.10
Excellent or very good	0.39
Excellent, very good, or good	0.75
Number of days of poor physical health	4.43
Number of days of poor mental health	2.68
Suffers from depression	0.05
At least one ADL limitation	0.64
Dementia	0.11
High blood pressure (reported)	0.57
High blood pressure (measured)	0.13
Hypertension	0.48
High cholesterol	0.55
Congestive heart failure	0.07
Coronary heart disease	0.10
Heart attack	0.09
Cancer	0.24
Reports of chest pain	0.29
Gum disease	0.14
Gum health? (1-excellent 5-poor)	2.69
Psoriasis	0.03
Asthma	0.12

Source: 1999-2016 NHANES.

Appendix Table 3: Selected Characteristics of Seniors Age 60 and Older

	All	Food Secure	Food Insecure
Food insecure	0.07	0.00	1.00
Not married or widowed	0.18	0.17	0.34
Widowed	0.21	0.21	0.27
Income/Poverty line	2.90	3.02	1.34
Female	0.56	0.55	0.60
Black	0.09	0.08	0.19
Hispanic	0.07	0.06	0.24
Asian American, Pacific Islander, Native American, and people who identify as multi-racial	0.05	0.05	0.07
High school graduate	0.76	0.78	0.51
Age	70.11	70.23	68.58

Source: 1999-2016 NHANES.

ABOUT THE AUTHORS

James P. Ziliak, Ph.D., holds the Carol Martin Gatton Endowed Chair in Microeconomics in the Department of Economics and is Founding Director of the Center for Poverty Research at the University of Kentucky. He received his BA/BS degrees in economics and sociology from Purdue University, and his Ph.D. in Economics from Indiana University. He served as assistant and associate professor of economics at the University of Oregon, and has held visiting positions at the Brookings Institution, University College London, University of Michigan, and University of Wisconsin. His research expertise is in the areas of labor economics, poverty, food insecurity, and tax and transfer policy. Recent projects include the causes and consequences of hunger among older Americans; trends in earnings and income volatility in the U.S.; trends in the antipoverty effectiveness of the social safety net; the origins of persistent poverty in America; and regional wage differentials across the earnings distribution. He is editor of *Welfare Reform and its Long Term Consequences for America's Poor* published by Cambridge University Press (2009) and *Appalachian Legacy: Economic Opportunity after the War on Poverty* published by Brookings Institution Press (2012), and co-editor of *SNAP Matters: How Food Stamps Affect Health and Well Being* at Stanford University Press (2015).

Craig Gundersen, Ph.D., is the Snee Family Endowed Chair at the Baylor Collaborative on Hunger and Poverty (BCHP) and a Professor in the Department of Economics at Baylor University. He is also on the Technical Advisory Group for Feeding America, the lead researcher on Feeding America's *Map the Meal Gap* project, the Managing Editor for *Applied Economic Perspectives and Policy*, a Round Table Fellow of the Farm Foundation, and a Faculty Affiliate of the Wilson Sheehan Lab for Economic Opportunities (LEO) at the University of Notre Dame. His research concentrates on the causes and consequences of food insecurity and on the evaluation of food assistance programs, with an emphasis on SNAP.

Contact information:

Dr. James P. Ziliak
Center for Poverty Research, University of Kentucky
550 South Limestone St
Gatton Building, Suite 234
Lexington, KY 40506-0034
Phone: (859) 257-6902
Email: jziliak@uky.edu

Dr. Craig Gundersen
Baylor University Baylor Collaborative on Hunger and Poverty
One Bear Place #97320 Waco, TX 76798
Craig_Gundersen@baylor.edu