Healthcare and Hunger: Impacts of the Affordable Care Act on Food Insecurity in America

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Abstract

I examine the effect of the Patient Protection and Affordable Care Act of 2010 (ACA) on food hardship in US households, utilizing food security information from the Food Security Supplement of the Current Population Survey. Because states adopted the Medicaid expansions provided under the ACA at different times beginning in 2014, the cross-state, over time variation allows me to separate the impact of the ACA on food hardship using triple difference specifications. The richness of questions in the Food Security Supplement allows me to examine the effect of the ACA across different measures of food hardship, and also examine differential response for households participating in the Supplemental Nutrition Assistance Program (SNAP). Examining the mechanisms through which the ACA could affect food insecurity, I find the ACA not only increased average weekly food expenditure, but also the probability a household participates in SNAP. I employ a two-stage, control function approach to address reverse causality between SNAP and food insecurity. I find that the ACA reduced the probability that a household participating in SNAP falls into the two lowest food security categories by 6.5 percentage points and reduced the probability of being food insecure by 14.2 percentage points. Across specifications, I find strong evidence for increasing returns to program participation, and evidence of a differential impact of the ACA across the distribution of food hardship.

JEL Classification H31, I38

Keywords: Affordable Care Act, Food Insecurity, Multiple Program Participation

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I. Introduction

The Patient Protection and Affordable Care Act (ACA) of 2010 enacted broad reform for healthcare in the United States. The number of Americans lacking health insurance has been a public health issue for policy makers, with 17.5% of non-elderly individuals uninsured in 2009. The ACA implemented large expansions in Medicaid that provided subsidized health insurance coverage for individuals less than 133% of the federal poverty line. However, 19 states chose not to expand Medicaid, leaving residents who did not qualify for Medicaid under previous rules ineligible for increased benefits provided by the ACA.

Alongside the lack of health insurance, food insecurity has emerged as a persistent public health concern facing the nation. From 2008 through 2016, between 12% and 15% of households were food insecure. While food insecurity has been declining in recent years, in 2016 12.3% percent of US households were still defined as food insecure by the U.S. Department of Agriculture, implying 15.6 million households did not have adequate access to the quantity nor quality of food necessary for a healthy lifestyle. Moreover, 6.1 million households experienced very low food security, a severe category of food insecurity that often results in families not eating for entire days (Coleman-Jensen et al., 2017).

The health consequences of food insecurity can be dire. Food insecurity has detrimental effects on adult health, and is associated with poor nutritional outcomes, both obesity and low body mass index, less healthy diets, poor mental health outcomes, and various other serious conditions (Cook et al., 2013; Heflin and Ziliak, 2008; Bhattacharya et al., 2004). Children living in food insecure households have also been shown to be negatively affected by food insecurity, being more likely to have poor health (Gundersen et al., 2011; Meyerhoefer and Yang, 2011; Almond et al., 2011; Gundersen and Kreider, 2009; Cook et al., 2004), have poor BMI (Gundersen and Kreider, 2009), experience behavioral issues (Howard, 2011), and experience a host of specific health problems (Chi et al., 2014; Gundersen and Ziliak, 2014). Gundersen and Ziliak (2015) show that these poor outcomes are evident across studies,

countries, data sets, and time periods.

Policy makers have many traditional methods of combating food insecurity such as the Supplemental Nutrition Assistance Program (SNAP), one of the largest public assistance programs in the US (5th by expenditure, 3rd by recipients), the Special Supplemental Nutrition Program for Women, Infants, and Children (WIC), and school breakfast and lunch programs. As noted by Moffitt (2015), nearly 80% of SNAP recipients also receive Medicaid benefits, however, we know little about how healthcare policy, acting alone or in concert with other food programs, may affect food insecurity. Despite the proliferation of literature on both food insecurity and the ACA, few studies, if any, have yet examined potential links between public healthcare and food insecurity. Public healthcare provides in-kind benefits to at-risk individuals, and while these benefits do not directly address food insecurity, they may free up household income to be redirected toward alleviating food hardship.

I fill this gap in the literature using data from the Current Population Survey (CPS) Food Security Supplement for years 2001-2016 to present the first evidence on the effect of the ACA on food insecurity in America. I contribute to the literature examining the effect of non-food programs on food insecurity, and I extend these studies by analyzing the interaction between the traditional food support system (SNAP) and Medicaid. For my purposes, I limit the impact of the ACA to families with incomes less than 185% of the federal poverty line, capturing not only the population most served by Medicaid expansion, but also households who are likely to receive food benefits. I utilize variation across time in the roll-out of Medicaid expansion through the ACA, as well as cross-state variation in Medicaid expansion, to identify the effect of the ACA. This allows me to employ a quasi-experimental design, examining the impact of the ACA across many food insecurity thresholds and varying definitions of food hardship. As many studies have shown (Gregory et al., 2015; Gundersen et al., 2011), reverse causality between SNAP and food insecurity results in the endogeneity of SNAP benefits. Thus, I use a two stage control function approach to address the endogeneity of SNAP and its interaction with Medicaid expansions. I find that the ACA had the largest

impact for households already participating in SNAP, reducing the probability that these households fall into the two lowest categories of food security by 6.5 percentage points. I also find the ACA reduced the probability households participating in SNAP are food insecure by 14.2 percentage points. I find the ACA increased average household weekly food expenditure, as well as the probability the household participates in SNAP, providing two avenues through which the ACA could influence food hardship.

These results suggest that while the safety net does affect food insecurity, it does not do so uniformly across the distribution of food hardship. I show that the largest mitigating factor for those experiencing very low, low, or marginal food security is SNAP. However, spillovers from the ACA increase gains in food security by roughly 50% at all thresholds, with larger total gains at the low end of the food security spectrum. I show large, increasing returns to program participation, of particular importance for policy makers and researchers studying safety net programs. By ignoring the positive spillovers from the ACA and SNAP, we risk drastically understating the efficacy of both programs in addressing food insecurity.

II. Background and Motivation

Official food insecurity statistics are reported by the United States Department of Agriculture (USDA) and come from the Food Security Supplement (FSS) in the December Current Population Survey (CPS). Coleman-Jensen et al. (2017) categorize food security as all individuals in a household having enough food for an active, healthy lifestyle. Households are placed into categories of food hardship based on their responses to 18 questions in the FSS, with affirmative responses indicating increased food hardship for the family. The module includes three questions about food conditions of the entire household, seven questions about food security conditions of adults in the household, and eight questions about food conditions of children if they are present.

I use the nomenclature of the USDA and consider four categories of food security—fully food secure, marginally food secure, low food secure, and very low food secure. Households

are fully food secure if they report no food insecure conditions, marginally food secure if they report one or two food insecure conditions, low food secure if they report three to five food insecure conditions with no children (three to seven with children), and very low food secure if they report six or more food insecure conditions (8 or more with children). For some of my analyses, I instead focus on the nonmutually exclusive categories of marginally food insecure, food insecure, and very low food secure. Households are marginally food insecure if they report at least one food insecure condition, food insecure if they report at least three food insecure conditions, and are very low food secure if they report six or more food insecure conditions (eight or more if children are present in the household). Note that all households that are very low food secure will also be food insecure and marginally food insecure, and all households that are food insecure will also be marginally food insecure.

The questions that characterize food hardship are summarized in table 1. Examples of questions include "We worried whether our food would run out before we got money to buy more." (the least severe); "In the last 12 months, did you lose weight because there wasn't enough money for food?"; or the most severe, "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?" These questions are designed to assess a spectrum of food hardship ranging from stress about the adequacy of food, to monetary concerns associated with food costs, to the lack of meals for members of the family. Each of these questions is also qualified by the stipulation that the food insecure condition be a result of lack of funds, rather than some other reason for the reported hardship. The questions are designed to assess the impact of household financial conditions on the general adequacy of food.

Figure 1 shows response rates to these questions over time. What is immediately apparent is that response rates to questions indicating food hardship for adults are much higher than those indicating food hardship among children. The first panel of figure 1 demonstrates that many households worried about their ability to maintain adequate food in the household (questions 1-3). From 2008 onward, between 16-20 percent of households worried they would

run out of money for food, while roughly 15% of households ran out of money for food or could not afford to eat balanced meals. A smaller portion of households had to reduce their food intake due to lack of sufficient funds for food (questions 4-10).

The second panel of figure 1 shows that less than 1% of households with children were forced to reduce food intake for children (questions 14-18). However, children were not completely insulated from food hardship, with around 4-6% of households with children forced to reduce the quality of meals for children, and 3-4% of households with children unable to feed the children balanced meals. Taken together, these questions show that many households experience many different kinds of food hardship.

The reforms of the ACA were not designed to directly address food hardship, rather, they focused on decreasing the population of uninsured individuals through the expansion of Medicaid to those below 133% of the federal poverty line (FPL), decreasing the cost of healthcare through additional subsidies, and improving the continuity and quality of care received through new regulations. Health insurance exchanges were established in order to provide a statewide marketplace where consumers could compare competing health plans. Individual mandates required that all individuals obtain a minimum standard of health insurance, and employer mandates required employers with more than 50 employees offer insurance coverage that meets minimum requirements. New regulations were put into place that addressed the price and types of services insurance plans covered, as well as changing how insurance companies delivered and charged for care.

States that expanded Medicaid coverage received additional subsidies from the federal government for doing so, and also had more control over the operation of the state-run health exchanges. Prior to the ACA, the income limit for Medicaid eligibility was 100% FPL. The ACA mandated that those less than 133% FPL[1] be eligible for Medicaid, expanding the population of potential beneficiaries. However, the Supreme Court ruled in National

[1]The law also proposes a 5% income disregard, making the effective income eligibility limit 138% FPL. The Centers for Medicare and Medicaid Services classify the limit as 133% FPL, which I will follow in this paper.

Federation of Independent Business v. Sebelius in 2012 that mandated Medicaid expansions were unconstitutional, and allowed states to opt out of the expansions. Twenty four states and the District of Columbia enacted Medicaid expansion on January 1, 2014. Subsequently, 7 states expanded Medicaid in later years.[2] Figure 2 shows the cross-state and over time variation in Medicaid expansion. Many states on the East and West Coast, as well as Midwestern states, chose to expand Medicaid, while many Southern states did not. However, some Southern states like Kentucky, West Virginia, Arkansas, and Louisiana did choose to expand Medicaid, while some coastal states, like Maine, chose not to, showing the expansion decision was not exclusively regional. These reforms all attempt to reduce the burden of healthcare costs by moderating the price of healthcare and increasing healthcare coverage.

Evidence suggests that the ACA has increased coverage, and benefited individuals who were targeted by the ACA. Black and Cohen (2015) find that not only has the number of uninsured decreased after the implementation of the ACA, but also states that expanded Medicaid saw larger decreases in the uninsured population. Courtemanche et al. (2017) also find that the ACA increased coverage, and note that coverage increased through both public and private markets. Some evidence suggests that the expansion of Medicaid may have crowded out private insurance (Wagner, 2015). Still, the broad impact seems to be that the ACA increased coverage across the population, not only amongst low-income individuals, with overall improvements in health and access (Antwi et al., 2015; Sommers et al., 2012). Hu et al. (2016) have shown the ACA contributed to the financial security of individuals in Medicaid expansion states, decreasing levels of debt and enabling individuals to meet other financial obligations. With evidence suggesting small (if any) negative impacts on employment (Garrett and Kaestner, 2014), and overall decreases in the amount of resources individuals need to devote to healthcare, the ACA could have a potentially large impact on food insecurity by changing the consumer's budget set.

[2]Michigan (4/1/2014), New Hampshire (8/15/2014), Pennsylvania (1/1/2015), Indiana (2/1/2015), Alaska (9/1/2015), Montana (1/1/2016), and Louisiana (7/1/2016). The election of Matt Bevin as governor of Kentucky has prompted the state to discuss dismantling the Medicaid expansion in place.

Figure 3 shows average food insecurity across states in 2012-2013 and 2014-2015, immediately before and after the ACA Medicaid expansions. In 2013, no states had expanded Medicaid, while by 2015, all but two states that ultimately expanded Medicaid had done so. After expanding Medicaid, four states worsened with regard to food insecurity (Alaska, Indiana, New Jersey, and New Mexico), while many others improved. Many states that did not expand Medicaid saw improvements in food insecurity; however, states like Alabama, Nebraska, Maine, and South Carolina saw increases in food insecurity, while others such as Louisiana (which did not expand Medicaid until 2016), Mississippi, and Georgia, saw no change in food insecurity, leaving many residents without access to sufficient food. While the maps are far from definitive regarding the relationship between public healthcare and food insecurity, they do provide some context for further analysis of how healthcare subsidies may affect food insecurity.

Figures 5-7 present a simple budget constraint analysis to provide intuition about the effect of Medicaid subsidies on food consumption, and how participation in SNAP may affect these outcomes. I assume convex preferences that can be well represented by a generic utility curve. Figure 5 shows how consumption of both food and all other goods (which includes medical care) responds to Medicaid benefits. In the absence of subsidized medical care, a representative consumer would consume some mix of both food and other goods, here represented by (F_0, G_0). The introduction of public health insurance guarantees some base level of medical care, creating a kink in the budget set represented by point D. This causes an outward shift in the budget set, resulting in an increase in consumption of both food and other goods. Figure 6 shows the analogous shift in the budget set from the introduction of SNAP benefits. Once again, we see that the SNAP subsidy increases consumption of both food and other goods.

Figure 7 depicts an individual receiving both Medicaid and SNAP subsidies. In the depicted scenario, consumption of both food and other goods increase from (F_0, G_0) to (F_3, G_3). These three figures show how the introduction of Medicaid benefits may increase

consumption of food, thereby reducing food insecurity. However, I also show that the increase in consumption may not be the same for all Medicaid beneficiaries. If an individual does not receive SNAP benefits, they consume the bundle (F_1, G_1) after the expansion of benefits. Individuals participating in SNAP consume $(F_3, G3)$, which is not necessarily, or likely, equal to (F_1, G_1).

In each of these scenarios, it may be possible that the subsidies do not increase the consumption of either other goods or food. For example, Medicaid or SNAP subsidies may simply result in an increase in other goods consumed, with no change in food consumption. If subsidies do not increase food consumption, this suggests that the individual does not desire additional food, and that the individual in unlikely to be food insecure. This is unlikely to be the case for SNAP recipients; Hoynes et al. (2015) show that, in the case of SNAP, most consumers are inframarginal, consuming more than the cash value of benefits, indicating consumption at any point $F_j < F_0$ (including point E) unlikely after receiving the SNAP subsidy. Moreover, Beatty and Tuttle (2014) show that increases in SNAP benefits from the American Recovery and Reinvestment Act of 2009 resulted in more spending than even typical theory suggests. Medicaid subsidies have been shown to increase the consumption of medical care (Wherry and Miller, 2016), however, the link between Medicaid and food consumption is not as clear, thus, I will explore whether the ACA has increased the consumption of food. Finally, it may be the case that the addition of subsidies changes preferences for food or other goods, resulting in a change in the marginal rate of substitution and the shape of the indifference curves, which could also result in no increase in food consumption.

The goal of this paper is to disentangle the effect of ACA Medicaid expansion alone and the effect of ACA Medicaid expansion for individuals also participating in SNAP. This paper fits into the small literature examining the issues associated with the interaction of non-food programs and food insecurity, alongside Borjas (2004) who examines the impact of welfare reform on food insecurity, and Schmidt et al. (2015), who simulate eligibility for many programs, including Medicaid, to determine the effect of cash benefits on food

insecurity. Identifying this interaction is difficult. There is a large literature on the effect of nutrition programs on food insecurity; however, reverse causality between SNAP and food insecurity can often severely bias estimates. Overall, after controlling for the endogeneity associated with reverse causality, results suggest that SNAP reduces food insecurity and improves the health outcomes of recipients (Hoynes et al., 2016; Gregory et al., 2015; Hoynes and Schanzenbach, 2015; Gundersen and Ziliak, 2014; Yen, 2010). To understand how the ACA interacts with traditional food programs, I control for the the endogeneity of SNAP. Similar to Borjas (2004), I employ a two stage control function strategy that accounts for the endogeneity of all interactions of the ACA and SNAP.

III. Model

Ordered Probit

Most studies that examine food hardship consider only the most widely reported category, food insecurity. However, it is not immediately apparent that the ACA should have similar effects across the distribution of food insecure households. Moreover, figure 3 suggests differential food insecurity rates across states that expanded Medicaid, with some states showing much larger decreases in food insecurity than others. Thus, I begin by analyzing how the ACA affected the probability a household falls within the mutually exclusive categories of marginally food secure, low food secure, and very low food secure. By establishing an ordering, I'm able to see how the ACA might move families along the distribution of food insecurity.

These categories represent increased levels of food hardship, with very low food security being more severe than low food security, both of which are more severe than being marginally food secure. I employ an ordered probit model that uses these categories as thresholds. My primary specification is

$$\begin{aligned}\text{Food Rank}^{*}_{ijt} = \beta_1 \text{ACA}_{jt} + \beta_2 \text{SNAP}_{ijt} + \beta_3 (\text{ACA} \times \text{SNAP})_{ijt} \\ + X'_{ijt}\beta_4 + \delta_t + \delta_j + \eta_{ijt}\end{aligned} \tag{1}$$

where, $\text{Food Rank}^{*}_{ijt}$ is a latent variable representing where a household falls on the food security spectrum. As $\text{Food Rank}^{*}_{ijt}$ crosses some unknown thresholds α_l, food hardship increases such that for $\text{Food Rank}^{*}_{ijt} < \alpha_0$ the household is fully food secure, $\alpha_0 < \text{Food Rank}^{*}_{ijt} \leq \alpha_1$ the household is marginally food secure, and so on. I let $\text{Food Rank}^{*}_{ijt} \in \{0, 1, 2, 3\}$, and define $\text{Food Rank}^{*}_{ijt}$ below.

$$\text{Food Rank}^{*}_{ijt} = \begin{cases} 0 & \text{if Fully Food Secure} \\ 1 & \text{if Marginally Food Secure} \\ 2 & \text{if Low Food Secure} \\ 3 & \text{if Very Low Food Secure} \end{cases} \tag{2}$$

Thus, $\text{Food Rank}^{*}_{ijt}$ describes household i's food security status in state j at time t, δ_j, δ_t are state and year fixed effects, and X_{ijt} is a vector of state and household demographic characteristics shown to impact food insecurity, including gender, household size, number of children, marital status, age, age squared, disability status, race, education, urban/rural status, number of Medicaid beneficiaries in the state, governor party affiliation, the natural log of the 50/10 income ratio, the 25th percentile of income, and the unemployment rate (Ziliak, 2015; Gundersen and Ribar, 2011; Bartfeld and Dunifon, 2006; Bhattacharya et al., 2004).

Since implementation of the ACA took place at different times across different states, I estimate a continuous measure of the proportion of the year a state had Medicaid reform implemented (ACA_{jt}). This variable holds at zero for states such as South Carolina which never implement Medicaid reform, is a 1 for 2014 onward for states such as Kentucky who implement Medicaid reform at the beginning of 2014, and is some positive fraction for the remaining states. To more accurately capture the treatment population, I limit the impact

of the ACA to only those less than 185% of the federal poverty line (FPL). While the ACA extends coverage to those less than 133% of the FPL, special SNAP eligibility requirements for the elderly and disabled, along with provisions for broad based categorical eligibility, make this threshold less clear.[3] This results in an intention to treat estimate, with identification coming from cross-state and over time variation of Medicaid expansion, framed as a triple difference specification.

$SNAP_{ijt}$ is a dichotomous measure of SNAP participation, equal to one if the household participates in SNAP and zero otherwise. Reverse causality between SNAP and food insecurity is a significant issue. Bitler (2015) notes that SNAP use is correlated with observable characteristics regarding health, but also unobserved characteristics such as innate health, health habits, and general self-care that researchers may not observe in the data. Prima facie evidence often seems to suggest that SNAP actually *increases* food insecurity, a result of significantly biased estimates. It is highly unlikely that there is some underlying propensity for food insecurity amongst SNAP recipients, rather, it is more likely that those with strong needs seek food assistance. There have been a variety of approaches to control for this reverse causality (Gregory et al., 2015; Schmeiser, 2012; Gundersen et al., 2011; Meyerhoefer and Yang, 2011; Yen, 2010; Borjas, 2004). Any method employing matching estimators relies crucially on matching on only observed characteristics, which does not address unobserved health conditions. Moreover, the health stock evolves dynamically. This presents challenges in panel settings when trying to account for unobserved selection via a fixed effects approach, which will be insufficient for addressing time variant unobserved heterogeneity.

To address the endogeneity of SNAP as a result of this reverse causality, I use measures of SNAP access and state level measures of benefit generosity to exogenously identify SNAP participation, employing a control function approach. I use measures of broad based categorical eligibility, fingerprinting requirements, the presence of online applications (and the ability to sign these applications online), the presence of vehicle exclusions, non-citizen eligi-

[3]The binned income data of the December CPS also makes identifying the 133% FPL threshold difficult. 185% of the FPL corresponds to the variable hrpoor in the CPS data, and is a more precise threshold.

bility requirements, the family specific SNAP benefit, and the log of the prevailing minimum wage as exogenous identifying variation. Ziliak (2015) discusses many of these state level SNAP eligibility and policy parameters, and how they influence SNAP take-up, while Gregory et al. (2015) and Borjas (2004) use many of these variables (specifically the eligibility of non-citizens) as key identifying parameters. Letting Z_{jt} be the set of exogenous variables, the requirements for the validity of this control function strategy are that $\mathbb{E}[Z_{jt}\eta_{ijt}] = 0$ and $\mathbb{E}[Z_{jt}\text{SNAP}_{ijt}] \neq 0$, or that the policy instruments are both orthogonal to individual level health investment decisions and correlated with participation in SNAP. Since these policy variables are set at the state level, it is unlikely that they are determined by individual level health based decisions, lending credence to the exogeneity of the policy variables.

I include the interaction of the ACA and SNAP to examine whether the impact of the marginal benefit dollar will differentially affect SNAP beneficiaries vs non-participants. In this model, $(\text{ACA} \times \text{SNAP})_{ijt}$ will be endogenous through the endogeneity of SNAP. I instrument for this interaction with the product of the exogenous variables and the measure of the ACA. Thus, my first stage regressions take the form

$$\text{SNAP}_{ijt} = \gamma_1 \text{ACA}_{jt} + Z'_{jt}\Theta_1 + \text{ACA}_{jt}Z'_{jt}\Gamma_1 + X'_{ijt}\Omega_1 + \delta_{1t} + \delta_{1j} + a_{ijt} \tag{3}$$

$$\text{ACA}_{jt} \times \text{SNAP}_{ijt} = \gamma_2 \text{ACA}_{jt} + Z'_{jt}\Theta_2 + \text{ACA}_{jt}Z'_{jt}\Gamma_2 + X'_{ijt}\Omega_2 + \delta_{2t} + \delta_{2j} + e_{ijt} \tag{4}$$

where all variables are defined as above. As noted by Heckman and Robb Jr (1985); Wooldridge (2002), and Blundell and Powell (2004), to consistently estimate β_1, β_2, and β_3 in the second stage, the control function methodology also requires the independence of Z_{jt} and the first stage error terms, or $Z_{jt} \perp a_{ijt}$ and $Z_{jt} \perp e_{ijt}$. While the conditions for the consistency of the control function approach are less well established for my model, they are likely to follow through. I then save the residuals, $\widehat{a_{ijt}}, \widehat{e_{ijt}}$, and include them in my second stage specification. Thus, the final functional form of the ordered probit model is

$$\begin{aligned}\text{Food Rank}^{*}_{ijt} &= \beta_1 \text{ACA}_{jt} + \beta_2 \text{SNAP}_{ijt} + \beta_3 (\text{ACA} \times \text{SNAP})_{ijt} \\ &+ X'_{ijt}\beta_4 + \widehat{a_{ijt}} + \widehat{e_{ijt}} + \delta_t + \delta_j + \eta_{ijt} \\ &= \widetilde{X}\psi + \eta_{ijt}\end{aligned} \tag{5}$$

where the model is simplified to $\widetilde{X}\psi + \eta_{ijt}$ for notational convenience. The functional form of the ordered probit model implies that the probability a household falls into food security category l is defined by

$$\begin{aligned}Pr[\text{Food Rank}_{ijt} = l] &= Pr[\alpha_{l-1} < \text{Food Rank}^{*}_{ijt} \leq \alpha_l] \\ &= \Phi(\alpha_l - \widetilde{X}\psi) - \Phi(\alpha_{l-1} - \widetilde{X}\psi)\end{aligned}$$

where $\Phi()$ is the standard normal cumulative distribution function. The regression parameters are obtained by maximizing the likelihood for the ordered probit, which involves maximizing the product of the probabilities associated with each discrete outcome. The marginal effects for each associated outcome are defined by

$$\frac{\partial Pr[\text{Food Rank}_{ijt} = l]}{\partial \widetilde{X}} = [\phi(\alpha_{l-1} - \widetilde{X}\psi) - \phi(\alpha_l - \widetilde{X}\psi)]\psi \tag{6}$$

where $\phi() = \Phi'()$.

There may be additional concern about the endogeneity of Medicaid expansion through the ACA in equation (5), however, this concern should be of second order importance. First, by controlling for governor party affiliation as well as state and year fixed effects, the endogeneity must enter through time varying, state specific means that remain un-captured by the changing political climate as controlled for by gubernatorial party. Next, the large literature on food insecurity establishes the large biases associated with the endogeneity of SNAP, requiring that addressing this endogeneity be of primary importance for any estimates of policy on food insecurity. Since I already instrument $\text{ACA}_{jt} \times \text{SNAP}_{ijt}$ with $\text{ACA}_{jt} \times$

Z_{jt}, β_3 is biased only if $\mathbb{E}[(\text{ACA}_{jt} \times Z_{jt})\eta_{ijt}] \neq 0$, or the interaction of state level SNAP eligibility parameters and Medicaid expansion must be correlated with both some unobserved propensity for healthcare expansion and food insecurity. Food insecurity was not the primary concern of the ACA; the topic is not even mentioned in the text of the bill. For β_1 to be biased, Medicaid expansion must be correlated with some unobserved heterogeneity that is also correlated with food insecurity. By the arguments above, food insecurity was not only not a driving force in Medicaid expansion, but any political characteristics that might affect both expansion and food insecurity would be captured through controls for governor party affiliation as well as the control function approach taken with food policy. Finally, the intention-to-treat framework mitigates endogeneity through Medicaid take-up since all individuals in Medicaid expansion states are given the same "treatment" value, regardless of actual participation. Thus, bias in β_1 and β_3 resulting from the endogeneity of Medicaid expansion is likely to be small.

Linear Probability Difference-in-Difference-in-Differences

While the ordered probit model is useful in determining how a household moves from one mutually exclusive food security category to another, a large portion of the literature examines the non-mutually exclusive categories of marginally food insecure, food insecure, and very low food secure. Thus, I also employ linear probability triple difference (difference-in-difference-in-differences) models, which have the benefit of relaxing the functional form assumptions of the ordered probit framework. Similar to the models above, I establish

$$\begin{aligned} \text{food insecure}_{ijt} = \tau_1 \text{ACA}_{jt} + \tau_2 \text{SNAP}_{ijt} + \tau_3 (\text{ACA}_{jt} \times \text{SNAP}_{ijt}) \\ + X'_{ijt}\beta + \mu_t + \mu_j + \nu_{ijt} \end{aligned} \tag{7}$$

where $\text{food insecure}_{ijt} \in \{\text{food marginally food insecure, food insecure, very low food secure}\}$ is an indicator measure of household i's food insecurity status in state j at time t, μ_t is a state fixed effect, μ_j is a time fixed effect, and all other variables are defined as above.

The same caveats about the reverse causality between SNAP and food insecurity hold in this model. Thus, I employ an analogous IV approach as above, instrumenting for both SNAP_{ijt} and $\text{ACA}_{jt} \times \text{SNAP}_{ijt}$. Triple difference specifications also allow me to examine the effect of the ACA across the distribution of food insecurity, and allow me to directly interpret the effect of the ACA on falling in to a given food insecurity category. However, they do not take into account the inherent ordering of food insecurity outcomes. For example, suppose the marginal effect of the ACA on marginal food insecurity in a triple difference model is $\kappa > 0$. This tells us that individuals living in states that enacted Medicaid reform are κ percentage points more likely to be marginally food insecure.

This result could have two possible interpretations. The first is that the ACA actually *increased* food hardship, resulting in more families describing at least one food insecure condition. The other possibility is that the ACA increased the probability a household is marginally food insecure by reducing more severe food deprivation conditions, but not completely alleviating food hardship all together. Thus, care must be employed when interpreting the coefficients in the linear probability models.

Mechanisms

I will consider two separate mechanisms through which the ACA could influence food hardship. The first, as discussed previously, is increased food expenditure. If the ACA allows households to reallocate food away from medical expenditure, toward food expenditure, then households may be able to reduce their degree of food hardship. To estimate this mechanism, I will employ the same instrumental variable strategy as before, with

$$\begin{aligned} \text{Food Expend.}_{ijt} = \psi_1 \text{ACA}_{jt} + \psi_2 \text{SNAP}_{ijt} + \psi_3 (\text{ACA} \times \text{SNAP})_{ijt} \\ + X'_{ijt}\psi_4 + \rho_{1t} + \rho_{1j} + \zeta_{ijt} \end{aligned} \tag{8}$$

where $\text{Food Expend.}_{ijt}$ is weekly food expenditure, in dollars, for household i in state j at time t, ρ_{1t} and ρ_{1j} are the year and state fixed effects, and all other variables are defined

as before. Here, the one exception will be the addition of the bin of household income in X_{ijt}. Since I am estimating a model of expenditure in (8), failing to control for income could greatly bias results. This model allows me to directly estimate the change in expenditure due to both Medicaid expansion in the ACA as well as the receipt of SNAP benefits.

The second mechanism I will consider is the influence of the ACA on SNAP take-up. Moffitt (2015) notes a large degree of multiple program participation in SNAP and Medicaid. Furthermore, Keane and Moffitt (1998) show that there are many costs associated with participating in safety-net programs. The expansions of Medicaid through the ACA may induce households to pay some of these costs, such as stigma and information costs, thereby making participation in SNAP less costly. The receipt of SNAP benefits, in turn, could reduce food hardship. Thus, I will estimate

$$\text{SNAP}_{ijt} = \iota_1 \text{ACA}_{jt} + X'_{ijt}\iota_2 + \rho_{2t} + \rho_{2j} + \vartheta_{ijt} \tag{9}$$

through both a probit and linear probability models, where all variables are defined as before. Since SNAP_{ijt} enters on the left hand side of the equation, I do not have to employ an instrumental variables strategy, and equation (9) takes the form of a simple difference in differences model where ACA_{jt} is identified through cross state, over time variation in Medicaid expansion.

Alternative Measures of Food Hardship

All previously described measures of food insecurity estimate the probability a household falls into a certain category of food insecurity, but fail to take into account the variability of food deprivation within a given category, and fail to fully utilize the richness of the 18 question food security supplement. Dutta and Gundersen (2007) propose new measures that more strongly weight households that experience severe food deprivation. I consider two measures the authors propose—the food insecurity gap and the square of the food insecurity gap, which are based on similar measures utilized in the income poverty literature. These

measures are also utilized in Gundersen (2008).

To compute the food insecurity gap, affirmative answers to the 18 question food security supplement are converted into a single indicator by the Rasch scoring method, which measures the probability a household answers in the affirmative depending on the degree of food insecurity experienced by the household and the extent of food insecurity captured by the question. Using this Rasch score, one can create an index that measures how far a food insecure household is from the food security threshold relative to the maximum distance from the food security threshold (i.e. answering in the affirmative to all 18 questions in the food security supplement.) Letting d_{ijt} be the normalized distance from the food security threshold, the normalized food insecurity gap is measured as:

$$d_{ijt} = \begin{cases} \frac{s_{ijt}-e}{z-e} & \text{if } s_i > e \\ 0 & \text{if } s_i \leq e \end{cases} \tag{10}$$

where s_{ijt} is the Rasch scoring indicator, which depends not only on the number of questions an individual answers affirmatively, but also on family structure. The maxima of the Rasch scores are represented by z, and are 13.03 for a household with children, and 11.05 for a household without children. e is the minimum value for a household to be food insecure, and is 3.10 for a household with children, and 2.56 for a household without children. Thus, all food secure households obtain a value of zero, and all food insecure households obtain a value between zero and one based on the severity of their food insecurity. The food insecurity gap squared is simply d_{ijt}^2.

Since the food insecurity gap measure is directly dependent on the number of children, including IVs that are dependent on the number of children (EITC rates and the family specific SNAP benefit), along with the number of children directly, violates exclusion restrictions. Thus, when modeling the food insecurity gap, I do not include the number of children in the household as an independent variable. The regression framework takes the form

$$d_{ijt} = \pi_1 \text{ACA}_{jt} + \pi_2 \text{SNAP}_{ijt} + \pi_3 (\text{ACA} \times \text{SNAP})_{ijt} + X'_{ijt}\pi_4 + \omega_{1t} + \omega_{1j} + \varepsilon_{ijt} \tag{11}$$

where ω_{1t}, ω_{1j} are year and state fixed effects, ε_{ijt} is the error term, and all other variables are defined as above. I also address the endogeneity of SNAP in the same manner as before.

The final measure of food deprivation that I consider is the additional amount of money a household would need to spend each week to purchase enough food to meet household needs, which I term the income gap. This measure directly monetizes the severity of food deprivation, providing a continuous scale of income to needs. However, this is also a subjective measure, requiring both accurate assessment and reporting of the money needed to meet food needs. I model the income gap as

$$I_{ijt} = \lambda_1 \text{ACA}_{jt} + \lambda_2 \text{SNAP}_{ijt} + \lambda_3 (\text{ACA} \times \text{SNAP})_{ijt} + X'_{ijt}\lambda_4 + \omega_{2t} + \omega_{2j} + \xi_{ijt} \tag{12}$$

where ξ_{ijt} is the error term, and the definition of variables and the description of the endogeneity of SNAP are defined as before.

IV. Data

Individual characteristics, along with food security information, come from the 2001-2016 waves of the Current Population Survey Food Security Supplement, also known as the December CPS. The December CPS asks all 18 questions in the food security module, which determines the household's food security status, with households placed into varying categories of food hardship depending on the number of affirmative responses to the questionnaire. These categories are defined above, and represent a spectrum of food hardship, with marginal food security being the least severe, and having very low food security being the most severe.

Figure 8 depicts rates of food security statistics over time, including marginal food se-

curity, low food security, and very low food security. In 2007, coinciding with the Great Recession, we see a large uptick in all categories of food hardship. All categories of food hardship remain persistently high until approximately 2013, with around 8.5% of households experiencing marginal food security, 8.5% of households experiencing low food security, and 5% of households experiencing very low food security. These rates begin to trend downward after 2013, coinciding with the implementation of the ACA. Figure 12 in the appendix details the commonly reported, nonmutually exclusive categories of food insecurity over time, showing similar patterns as figure 8.

Figure 9 shows rates of food security by Medicaid expansion status. One of the requirements for a difference in differences methodology is the parallel trend assumption for both treatment and comparison groups. Figure 9 shows generally uniform trends for both Medicaid expansion and non-expansion states, validating the assumption of parallel trends. While it seems that food hardship is generally higher in non-expansion states, there does seem to be some divergence, especially in low and very low food security, between the groups in later years.

The December CPS reports the household's Rasch score, which I use to construct the food insecurity gap (and squared gap) as defined in equation (11). The mean of the food insecurity gap (squared food insecurity gap) is 0.13 (0.98) for the population as a whole. Figure 10 depicts the mean of the food insecurity gap for different subsets of households. We see that poorer households have larger gaps, and that households receiving SNAP benefits and households headed by single mothers have larger gaps than average. Interestingly, households in Medicaid expansion states have slightly lower gaps than the national average.

The December CPS also asks questions about average weekly food expenditure, and about how much more income a household would need to spend each week to purchase enough food to meet household needs, which I term the income gap. Prior to 2011, average weekly food expenditure was top-coded at $1,000, while from 2011 onward, the top values range from $400-530. To account for such a large discrepancy, I use only the years from 2011 onward

for average weekly expenditure. While this limits the scope of the analysis, the time frame accounts for a sizable "pre" period prior to ACA Medicaid expansions, as well as the years post expansion. The income gap changes top-coding more frequently than average weekly food expenditure, however, I top-code the entire series at $200 for consistency. In each year, the dollar amounts range from $1 to the top value. The mean of the income gap is $3.99 per week for the population as a whole. Figure 11 breaks out the income gap by sub-category. Here, we see SNAP recipients have large income gaps, around $17 per week, with poorer households and single mothers also experiencing larger income gaps.

Table 2 presents weighted summary statistics from the December CPS by Medicaid expansion status as well as SNAP receipt. Medicaid expansion states are similar to states that did not expand Medicaid with regard to poverty, age, education, and household composition. Individuals in Medicaid expansion states are more likely to be black, live in a metro area, and experience higher unemployment rates. They also have higher 50/10 income ratios and the 25th percentile of earnings is higher, suggesting that middle-income inequality is greater in Medicaid expansion states. Individuals receiving SNAP are more likely to be black or Hispanic, female, and unmarried. SNAP recipients are also younger, have more children, and have lower levels of education on average.

To address endogeneity in equation (7), I identify SNAP participation with measures of SNAP access and generosity from the USDA Economic Research Service SNAP policy database, along with other state level measures of benefit generosity. The SNAP policy database documents state policy options for SNAP, and provides these data at a monthly level. While the majority of the data are up to date, the most recent version of the SNAP policy database contains missing data for some variables for 2013-2016. I assume missing values take on the value in the previous year, and if the policy was in effect for a portion of the year, that fraction is represented in the policy variable. Means for these instruments are presented in table 3. Data from the University of Kentucky Center for Poverty Research are used for state level economic data, and data on SNAP benefits. SNAP benefits are calculated

at the national level and adjusted for family size and income, resulting in family size specific SNAP benefits. I use weighted estimates from the Current Population Survey Annual Social and Economic Supplement (CPS ASEC) to construct the 50/10 income ratio and the 25th percentile of income for each state and year.

V. Results

I begin by presenting the ordered probit results examining the mutually exclusive categories of food security, using a two stage control function approach to control for the endogeneity of SNAP. I then present linear probability specifications for the nonmutually exclusive food insecurity categories while instrumenting for the endogeneity of SNAP. Next, I present evidence for the mechanisms through which the ACA might influence food hardship, including both expenditure and SNAP take-up. Finally, I present other measures of food hardship to assess the robustness of the impact of the ACA on food insecurity. All models control for state and year fixed effects, individual characteristics, and all standard errors are clustered at the state level.

Main Results

Table 4 presents first stage results from the two stage ordered probit model. Not all of the exogenous, state level policy variables are statistically significant individually, but the policy variables are strongly jointly significant, with large F statistics and p-values for F statistics of 0. Moreover, these policy variables have been shown to be predictive in other contexts, as noted in Ziliak (2015).[4] This suggests the policy variables have predictive power for SNAP receipt.

Table 5 presents the ordered probit results from estimating equation (5), employing a

[4]While these state level policy variables have been used extensively in other contexts, I am also able to examine them one by one for the validity of their inclusion in the instrument set. For example, the p-values for the C-statistic for the natural log of the minimum wage are above 0.05 for all triple difference models except those marginal food insecurity, suggesting it's inclusion in the set of exogenous policy variables is valid.

control function approach. I present coefficients, as well as marginal effects (at means) for the three mutually exclusive categories of households experiencing food hardship. Using an ordered probit framework allows me to examine how both SNAP and the ACA move households from more severe food insecurity categories to less severe categories. The primary benefit from this framework is that there is no ambiguity in the transition from threshold to threshold, with each cut point representing transition from less severe food insecurity to more severe food insecurity. While not presented in the table, the coefficients on the first stage residuals are strongly significant, with p-values <0.001, confirming the validity of the control function approach.

Column (1) from table 5 presents the coefficients from the model. Here, we see that SNAP reduced food hardship in U.S. households, however, the own effect of the ACA is positive, small in magnitude, and statistically insignificant, suggesting relatively little impact from the ACA alone. If individuals live in ACA expansion states, but do not meet the criteria for subsidies, they will be required to pay some form of premium. This could result in the positive, but small and insignificant own-effects in the first row. While magnitudes are not directly interpretable from coefficients, we are able to see that not only did SNAP reduce the probability a household experienced food hardship, but also that this reduction in probability increased for families living in Medicaid expansion states. This suggests some positive spillover from the ACA, with households participating in both programs experiencing more gains than households treated by SNAP or the ACA alone.

Columns (2)-(4) show the marginal effects at each threshold of food security. These marginal effects have the same implications as above. SNAP reduced the probability a household was very low food secure by 15 percentage points, the probability a household was low food secure by 16 percentage points, and the probability a household was marginally food secure by 6.4 percentage points (all statistically significant at the 1% level). These results also suggest that the impact of SNAP is strongest for those households experiencing more severe food insecurity, but further suggest that SNAP alleviates all levels of food hardship,

moving households towards full food security. However, households in each of these food secure categories saw additional gains from the ACA. The marginal effects of the interaction between the ACA and SNAP suggest that households participating in SNAP and in Medicaid expansion states saw an additional reduction of 6.4 percentage points in the probability of being very low food secure, an additional 6.8 percentage point reduction in the probability of being low food secure, and an additional reduction in the probability of being marginally food secure of 2.7 percentage points. All marginal effects for SNAP and the interaction of the ACA and SNAP are statistically significant at the 1% level, and while the marginal effects at the low food secure and very low food secure levels are not statistically different from one another, both are statistically different from the marginal effect at the marginally food secure level.

These results suggest large, increasing returns to program participation. Schmidt et al. (2015) found that $1,000 in additional non-food benefits reduced the incidence of food insecurity by roughly 0.9 percentage points. While low food security and food insecurity measure slightly different types of food hardship, a 6.5 percentage point reduction in the probability of being low food secure is roughly equivalent to $6,500 in additional non-food benefits. The average spending per enrollee in Medicaid was $5,736[5] in 2014, suggesting that the Medicaid expansions more than doubled the value of the benefit for SNAP recipients.

Table A1 in the appendix shows results from a standard ordered probit for reference. The ordered probit results that do not control for reverse causality with SNAP show large, negative values for the impact of the ACA, but also large positive values for the impact of SNAP on food hardship. The two stage control function approach presented in table 5 removes the bias stemming from economic circumstances and participation in SNAP.

Table 6 presents the results of estimating equation (7) at different, nonmutually exclusive food insecurity thresholds. For reference, I present results from OLS regressions that estimate the impact of the ACA where the endogeneity of SNAP is not accounted for in table A2 in

[5]http://www.kff.org/medicaid/state-indicator/medicaid-spending-per-enrollee/?currentTimeframe=0&sortModel=%7B%
%22sort%22:%22asc%22%7D

the appendix, once again demonstrating the reverse causality associated with SNAP.

Column (1) shows the impact of the ACA on the commonly reported summary category of food insecurity. Here, we see no statistical relationship between Medicaid expansion alone and food insecurity. However, for households who also participate in SNAP, the ACA further reduced the probability they are food insecure by 14.2 percentage points. In my sample, 53% of households participating in SNAP are food insecure. This 14.2 percentage point reduction translates into a 26.8% decrease in the probability a household is food insecure. Thus, program interaction matters, with increasing returns to program participation for reductions in food insecurity.

Column (2) examines the effect of the ACA on marginal food insecurity. Here, we still see the impact of multiple program participation as well as increasing returns to program participation, with SNAP households seeing a reduction in the probability of being marginally food insecure of 28 percentage points on a basis of 74%, or a 38% reduction in the probability of being marginally food insecure.

This is strongly contrasted with results in column (3), where we see no impact of the ACA on the probability of experiencing very low food security, regardless of SNAP participation. However, we see the own effect from SNAP reduces the probability a household experiences very low food security by 74 percentage points. The large coefficient suggests that SNAP strongly reduces the probability individuals experience extreme food hardship, although individuals who leave this category may still be food insecure. This suggests that at the low end of the food security distribution, SNAP does most of the work in alleviating food hardship, with little effect from healthcare programs. These results suggest that the ACA and SNAP assist those at different ends of the food insecurity spectrum, and also present the first IV estimates of SNAP on very low food security of which I am aware.

I also report first stage statistics to assess the performance of the instruments. The Kleibergen under-identification statistics reject the null hypothesis that the SNAP access measures and state policy variables are only weakly correlated with SNAP participation.

Since I have more instruments than endogenous regressors, I also report the Hansen J statistic as a test of overidentifying restrictions. Here, the large p-values result in failing to reject the null hypothesis that the instruments are uncorrelated with the error term at any standard threshold, giving greater confidence in the validity of the instrument set.

While the results in column (1) coincide with the notions of program interaction, some of the results from columns (2) and (3), specifically the coefficients on SNAP, are surprising in sign and magnitude. Taken at face value, the coefficient on SNAP in column (2) suggests participating in SNAP *increases* the probability an individual is marginally food insecure by 33.2 percentage points, even when instrumenting for SNAP participation. In column (3), the large, negative coefficient on SNAP suggests a surprisingly large decrease in very low food insecurity. However, the findings in table 5 provide the needed context. Here, it seems that SNAP reduces food hardship at all levels, but does not completely alleviate it, suggesting SNAP increases the probability of being higher on the food security distribution (more food secure), and decreases the probability of being lower on the food insecurity distribution (less food secure).

The key finding of this paper is that the ACA reduces the probability a household experiences food insecurity, but that these reductions are not uniform across the distribution of food insecurity, nor are they uniform across the SNAP benefit population. Tables 5 and 6 together show the interplay of Medicaid expansion through the ACA and SNAP. The ACA complemented the traditional food support system, further reducing food insecurity for those already receiving SNAP benefits. Furthermore, I show that SNAP moves people up the food security distribution at all levels.

Evidence on Mechanisms

Previously, I discussed the intuition behind how the ACA might influence food hardship. In this section, I provide evidence detailing two mechanisms through which the ACA might increase household access to food. In the background section, I presented budget constraint

analysis that graphically depicts the income effect of receiving both Medicaid and SNAP subsidies, with the general idea being that receiving subsidized public health care allows households to reallocate resources away from medical expenditure and towards food expenditure. Thus, I directly estimate the effect of the ACA on food expenditure.

When estimating food expenditure models, I limit the analysis to the years 2011-2016. The reason for this is twofold. First, as discussed previously, the wide discrepancy in the top-coding of food expenditure in the CPS makes comparison with earlier years difficult. Second, this provides a tighter window around Medicaid expansion to analyze expenditure. When estimating food expenditure, I also further control for the income bin provided by the CPS. While I do not have exact data on household income, attempting to estimate expenditure without controlling for income in some fashion could bias estimates. Column (1) of table 7 shows instrumental variables results examining how both SNAP and the ACA influence average real average weekly food expenditure using the same instrument set described above.

Here, we see that participation in SNAP increases weekly food expenditure by $164.32, which I consider to be an upper bound on the effect of SNAP on food expenditure. From 2011-2016, the nominal value of the maximum weekly benefit for a family of four is approximately $160, which is roughly equivalent to the estimate presented above. The average family size for SNAP recipients in my sample is 3, with an average maximum weekly benefit of $105.34. Average weekly food expenditure is $115.93. Thus, the estimated return to SNAP participation is large compared with sample baselines. However, the instrumental variables strategy results in a local average treatment effect, meaning the effect may be larger than otherwise estimated. Beatty and Tuttle (2014) find that the actual food share of the budget changes in response to changes in SNAP benefits, resulting in greater increases in food expenditure than otherwise predicted, consistent with the results presented here.

Column (1) also shows that households in Medicaid expansion states see larger increases than other households. I find that average weekly food expenditure is $21.63 lower in ACA states on average, however, for households that reside in expansion states and participate in

SNAP, food expenditure is $38.24 higher. This is once again consistent with requiring premiums for those who do not meet Medicaid income cutoffs. These individuals may reduce food expenditure to cover premiums (which will be required for all due to the individual mandate). For those who also receive SNAP benefits, any income lost due to income will be mitigated through food subsidies. The increase in food expenditure for SNAP recipients in Medicaid expansion states is direct evidence for the mechanism described previously—households residing in Medicaid expansion states see an additional return to program participation, once again detailing the complementarities between Medicaid and SNAP. Thus, it seems that subsidized public healthcare does act as an income shock for SNAP households, increasing their access to food.

Another potential avenue for the ACA to influence food hardship comes through the reduction in information and/or stigma costs associated with participating in the safety net. Columns (2) and (3) of table 7 examine whether the Medicaid expansions through the ACA brought new households into the safety net. For these households, participation in SNAP (if they were not already participating) may become easier. Perhaps by participating in public healthcare, these households have learned something about navigating the safety net, making it subsequently easier to apply for, and obtain, SNAP benefits. These households might also pay some fixed portion of the stigma costs, as noted by Keane and Moffitt (1998), making it less costly for them to participate in SNAP. Columns (2) and (3) show that the ACA increased SNAP take-up, regardless of using a linear probability or probit model to estimate the impact on take-up. Together with the evidence from spending, I show two means by which the ACA might cause the results presented above.

Additional Measures of Food Hardship

I now turn to other measures of food hardship. Table 8 presents IV results estimating the impact of the ACA on the food insecurity gap, the square of the food insecurity gap, and the income gap as defined in equations (11) and (12). OLS results are available in table A3 in the

appendix. Here, I attempt to more fully utilize the entirety of the food security supplement in the December CPS. Regardless of whether we consider only the food insecurity gap (d_{ijt}) in column (1), or the square of the gap (d_{ijt}^2) in column (2), the results are the same. I find that the own effect of the ACA is positive, suggesting that households in Medicaid expansion states are more likely to be farther from the food security threshold. However, for households participating in SNAP, the ACA reduces the distance to the food security threshold by 9.2-10.1 percentage points. I also show that SNAP participation greatly reduces the distance to the food security threshold by approximately 33-42 percentage points in both columns (1) and (2). While less conclusive than the results from tables 5 and 6, these results still suggest there are increasing returns to program participation, with the ACA and SNAP acting in concert to reduce food hardship.

The income gap provides the benefit of directly monetizing the amount of food hardship experienced by the household, at the expense of potential increases in measurement error. The question as posed by the CPS asks individuals to opine on the amount of money that they would require to meet food needs. The hypothetical nature of the question inherently poses uncertainty in the measure. However, in column (3) I (imprecisely) estimate that the ACA reduces the amount of money a household needs to meet food needs by approximately $5 per week. I once again show increasing returns to program participation, with the magnitude of the effect larger for households participating in SNAP. The coefficient on SNAP is positive. Taken at face value, this suggests SNAP increases the amount of money a household needs to meet food requirements; however, the coefficients on the ACA suggest beneficial effects of Medicaid expansion.

These additional measures are less commonly reported in both the food insecurity literature and policy debates. However, they still suggest that the Medicaid expansions from the ACA and SNAP work together to reduce food insecurity, and are more effective as a pair than either alone. While precise identification of these parameters is difficult, they compliment earlier, more ubiquitous measures of food insecurity.

V. Conclusion

The focus of the Affordable Care Act was to overhaul the American healthcare system through mandated coverage, subsidized private coverage, reforms in Medicare taxes and spending, and significant expansions in the Medicaid program to low income populations. Gruber (2011) provides an overview of the aims and predicted consequences of the ACA, documenting many of the challenges associated with assessing the impact of the law. However, he does not consider the impact that expanded Medicaid coverage might have on food insecurity, one of the largest public health concerns facing the nation.

Participating in multiple safety net programs is one way households may increase total resources available to alleviate food hardship. This paper examines the effect of the Affordable Care Act, one of the largest increases in Medicaid coverage, on food insecurity. While the primary goal of Medicaid expansion through the ACA was to increase healthcare coverage across America, I find strong evidence that the ACA also reduced food hardship across the spectrum of food security, but that these gains were concentrated among those who also participated in SNAP. I find the ACA reduced the probability a household participating in SNAP falls into the two lowest food security categories by about 6.5 percentage points, and reduced the probability these households were classified as food insecure by 14.2 percentage points.

One consistent implication of the results implies that the ACA had a differential impact depending on whether the household received SNAP benefits. Despite the reverse causality between SNAP and food security, demonstrated in this work and elsewhere, I show that households that both reside in Medicaid expansion states and receive SNAP benefits experience larger gains in food security than households benefiting from either program alone. Households in Medicaid expansion states see a 45% greater reduction in the probability of being very low food secure or low food secure than households participating in SNAP alone. Households that participate in SNAP and live in Medicaid expansion states see a decrease

in the probability of being food insecure, nearly doubling the impact from SNAP alone. Even under alternative measures of food hardship, I consistently find evidence for increasing returns to food security from program participation; living in a Medicaid expansion state and participating in SNAP have larger benefits for food security than either program alone.

Increasing returns to program participation shows that by analyzing these programs separately, we risk mischaracterizing the benefits of the safety net. Rarely do families participate in only one safety net program. By receiving multiple types of benefits, households may be able to redirect resources in ways that compound gains in resources from a single program. As this study shows, by including multiple benefit types in our analyses, we may be able to get a more complete picture of where policy actually bites. This is especially relevant for researchers studying the impact of the safety net on poverty related issues. By limiting the scope of analysis for safety net issues, researchers narrow the spectrum of results that might otherwise be present. Ultimately, this paper shows that public health insurance has benefits beyond healthcare coverage. While access to quality medical care is crucial for the health of all families, so too is access to food. As many studies have shown, food insecurity can have large, detrimental effects on health. I show that public healthcare can make large strides in alleviating health risks posed by food insecurity.

References

Almond, D., Hoynes, H.W., Schanzenbach, D.W., 2011. Inside the War on Poverty: The Impact of Food Stamps on Birth Outcomes. The Review of Economics and Statistics 93, 387–403.

Antwi, Y.A., Moriya, A.S., Simon, K.I., 2015. Access to Health Insurance and the Use of Inpatient Medical Care: Evidence from the Affordable Care Act Young Adult Mandate. Journal of Health Economics 39, 171–187.

Bartfeld, J., Dunifon, R., 2006. State-Level Predictors of Food Insecurity Among Households With Children. Journal of Policy Analysis and Management 25, 921–942.

Beatty, T.K., Tuttle, C.J., 2014. Expenditure Response to Increases in In-Kind Transfers: Evidence from the Supplemental Nutrition Assistance Program. American Journal of Agricultural Economics 97, 390–404.

Bhattacharya, J., Currie, J., Haider, S., 2004. Poverty, Food Insecurity, and Nutritional Outcomes in Children and Adults. Journal of Health Economics 23, 839–862.

Bitler, M.P., 2015. The Health and Nutrition Effects of SNAP: Selection into the Program and a Review of the Literature on Its Effects, in: Bartfeld, J., Gundersen, C., Smeeding, T., Ziliak, J.P. (Eds.), SNAP Matters: How Food Stamps Affect Health and Well-Being. Stanford University Press.

Black, L.I., Cohen, R.A., 2015. Insurance Status by State Medicaid Expansion Status: Early Release of Estimates from the National Health Interview Survey, 2013–September 2014. National Center for Health Statistics .

Blundell, R.W., Powell, J.L., 2004. Endogeneity in Semiparametric Binary Response Models. The Review of Economic Studies 71, 655–679.

Borjas, G.J., 2004. Food Insecurity and Public Assistance. Journal of Public Economics 88, 1421–1443.

Chi, D.L., Masterson, E.E., Carle, A.C., Mancl, L.A., Coldwell, S.E., 2014. Socioeconomic Status, Food Security, and Dental Caries in US Children: Mediation Analyses of Data from the National Health and Nutrition Examination Survey, 2007–2008. Journal Information 104.

Coleman-Jensen, A., Rabbitt, M.P., Gregory, C., Singh, A., 2017. Household Food Security in the United States in 2016. U.S. Department of Agriculture, Economic Research Service .

Cook, J.T., Black, M., Chilton, M., Cutts, D., de Cuba, S.E., Heeren, T.C., Rose-Jacobs, R., Sandel, M., Casey, P.H., Coleman, S., et al., 2013. Are Food Insecurity's Health Impacts Underestimated in the US population? Marginal Food Security Also Predicts Adverse Health Outcomes in Young US Children and Mothers. Advances in Nutrition: An International Review Journal 4, 51–61.

Cook, J.T., Frank, D.A., Berkowitz, C., Black, M.M., Casey, P.H., Cutts, D.B., Meyers, A.F., Zaldivar, N., Skalicky, A., Levenson, S., et al., 2004. Food Insecurity is Associated With Adverse Health Outcomes Among Human Infants and Toddlers. The Journal of Nutrition 134, 1432–1438.

Courtemanche, C., Marton, J., Ukert, B., Yelowitz, A., Zapata, D., 2017. Impacts of the Affordable Care Act on Health Insurance Coverage in Medicaid Expansion and Non-Expansion States. Journal of Policy Analysis and Management 36, 178–210.

Dutta, I., Gundersen, C., 2007. Measures of Food Insecurity at the Household Level, in: Food Security Indicators, Measurement, and the Impact of Trade Openness: Series: WIDER Studies in Development Economics. Oxford University Press.

Garrett, B., Kaestner, R., 2014. The Best Evidence Suggests the Effects of the ACA on Employment Will Be Small Timely Analysis of Immediate Health Policy Issues. Technical Report. Urban Institute.

Gregory, C., Rabbitt, M.P., Ribar, D.C., 2015. The Supplemental Nutrition Assistance Program and Food Insecurity, in: Bartfeld, J., Gundersen, C., Smeeding, T., Ziliak, J.P. (Eds.), SNAP Matters: How Food Stamps Affect Health and Well-Being. Stanford University Press.

Gruber, J., 2011. The Impacts of the Affordable Care Act: How Reasonable Are the Projections? Technical Report. National Bureau of Economic Research.

Gundersen, C., 2008. Measuring the Extent, Depth, and Severity of Food Insecurity: an Application to American Indians in the USA. Journal of Population Economics 21, 191–215.

Gundersen, C., Kreider, B., 2009. Bounding the Effects of Food Insecurity on Children's Health Outcomes. Journal of Health Economics 28, 971–983.

Gundersen, C., Kreider, B., Pepper, J., 2011. The Economics of Food Insecurity in the United States. Applied Economic Perspectives and Policy .

Gundersen, C., Ribar, D., 2011. Food Insecurity and Insufficiency at Low Levels of Food Expenditures. Review of Income and Wealth 57, 704–726.

Gundersen, C., Ziliak, J.P., 2014. Childhood Food Insecurity in the US: Trends, Causes, and Policy Options. The Future of Children 24, 1–19.

Gundersen, C., Ziliak, J.P., 2015. Food Insecurity and Health Outcomes. Health Affairs .

Heckman, J.J., Robb Jr, R., 1985. Alternative Methods For Evaluating the Impact of Interventions: An Overview. Journal of Econometrics 30, 239–267.

Heflin, C.M., Ziliak, J.P., 2008. Food Insufficiency, Food Stamp Participation, and Mental Health. Social Science Quarterly 89, 706–727.

Howard, L.L., 2011. Does Food Insecurity at Home Affect Non-Cognitive Performance at School? A Longitudinal Analysis of Elementary Student Classroom Behavior. Economics of Education Review 30, 157–176.

Hoynes, H., Schanzenbach, D.W., 2015. U.S. Food and Nutrition Programs. NBER Working Papers 21057. National Bureau of Economic Research, Inc.

Hoynes, H., Schanzenbach, D.W., Almond, D., 2016. Long-Run Impacts of Childhood Access to the Safety Net. The American Economic Review 106, 903–934.

Hoynes, H.W., McGranahan, L., Schanzenbach, D.W., 2015. SNAP and Food Consumption, in: Bartfeld, J., Gundersen, C., Smeeding, T., Ziliak, J.P. (Eds.), SNAP Matters: How Food Stamps Affect Health and Well-Being. Stanford University Press.

Hu, L., Kaestner, R., Mazumder, B., Miller, S., Wong, A., 2016. The Effect of the Patient Protection and Affordable Care Act Medicaid Expansions on Financial Well-Being. National Bureau of Economic Research Working Paper .

Keane, M., Moffitt, R., 1998. A Structural Model of Multiple Welfare Program Participation and Labor Supply. International Economic Review , 553–589.

Meyerhoefer, C.D., Yang, M., 2011. The Relationship Between Food Assistance and Health: A Review of the Literature and Empirical Strategies for Identifying Program Effects. Applied Economic Perspectives and Policy .

Moffitt, R., 2015. Multiple Program Participation and the SNAP Program, in: Bartfeld, J., Gundersen, C., Smeeding, T., Ziliak, J.P. (Eds.), SNAP Matters: How Food Stamps Affect Health and Well-Being. Stanford University Press.

Schmeiser, M.D., 2012. The Impact of Long-Term Participation in the Supplemental Nutrition Assistance Program on Child Obesity. Health Economics 21, 386–404.

Schmidt, L., Shore-Sheppard, L., Watson, T., 2015. The Effect of Safety Net Programs on Food Insecurity. Journal of Human Resources .

Sommers, B.D., Baicker, K., Epstein, A.M., 2012. Mortality and Access to Care Among Adults After State Medicaid Expansions. New England Journal of Medicine 367, 1025–1034.

Wagner, K.L., 2015. Medicaid Expansions for the Working Age Disabled: Revisiting the Crowd-Out of Private Health Insurance. Journal of Health Economics 40, 69–82.

Wherry, L.R., Miller, S., 2016. Early Coverage, Access, Utilization, and Health Effects Associated With the Affordable Care Act Medicaid Expansions: A Quasi-experimental Study. Annals of Internal Medicine 164, 795–803.

Wooldridge, J.M., 2002. Econometric Analysis of Cross Section and Panel Data. MIT press.

Yen, S.T., 2010. The Effects of SNAP and WIC Programs on Nutrient Intakes of Children. Food Policy 35, 576–583.

Ziliak, J.P., 2015. Why Are So Many Americans on Food Stamps? The Role of the Economy, Policy, and Demographics, in: Bartfeld, J., Gundersen, C., Smeeding, T., Ziliak, J.P. (Eds.), SNAP Matters: How Food Stamps Affect Health and Well-Being. Stanford University Press.

Tables and Figures

Figure 1: Response Rates to FI Questions

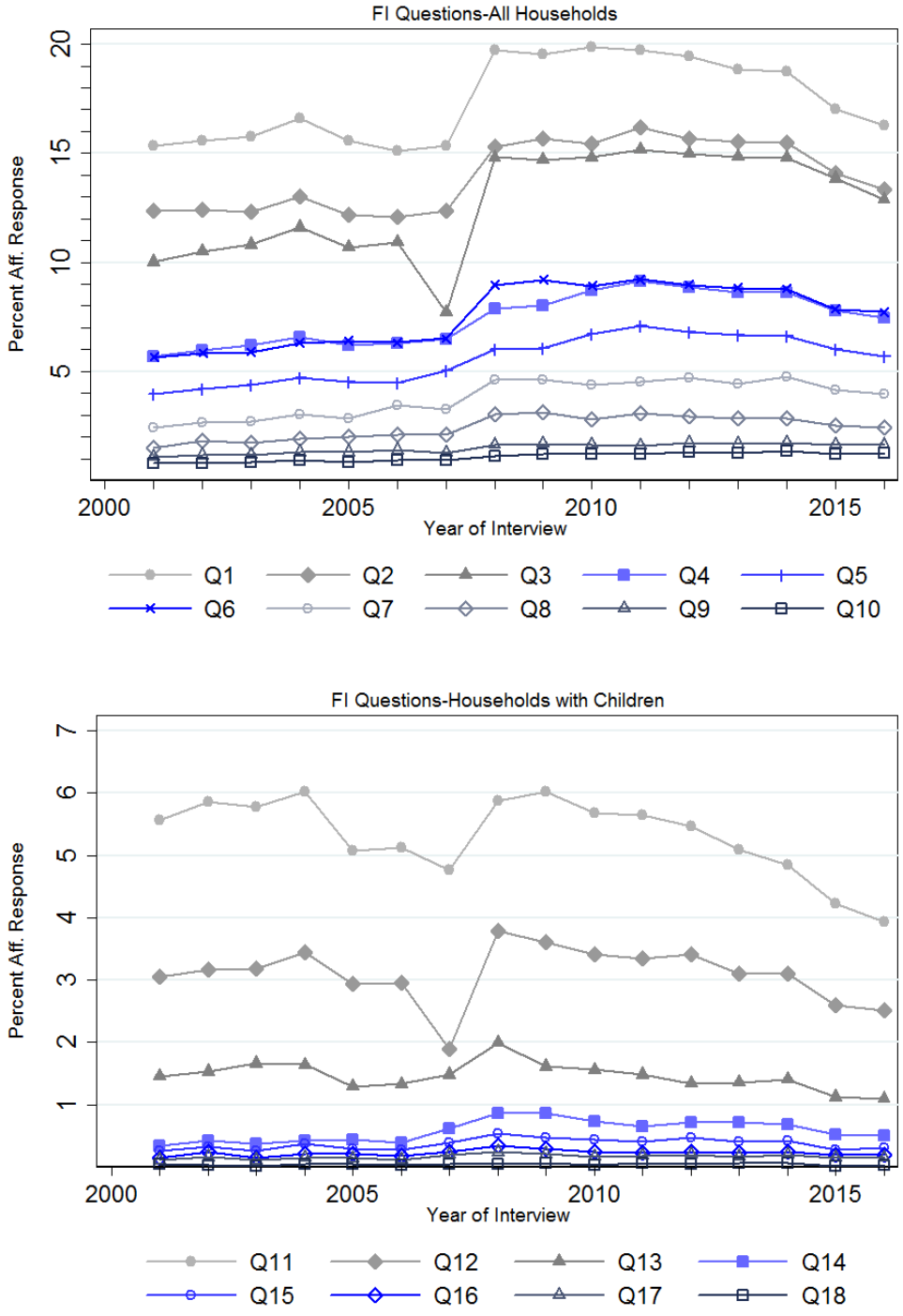


Figure 2: State Medicaid Expansion

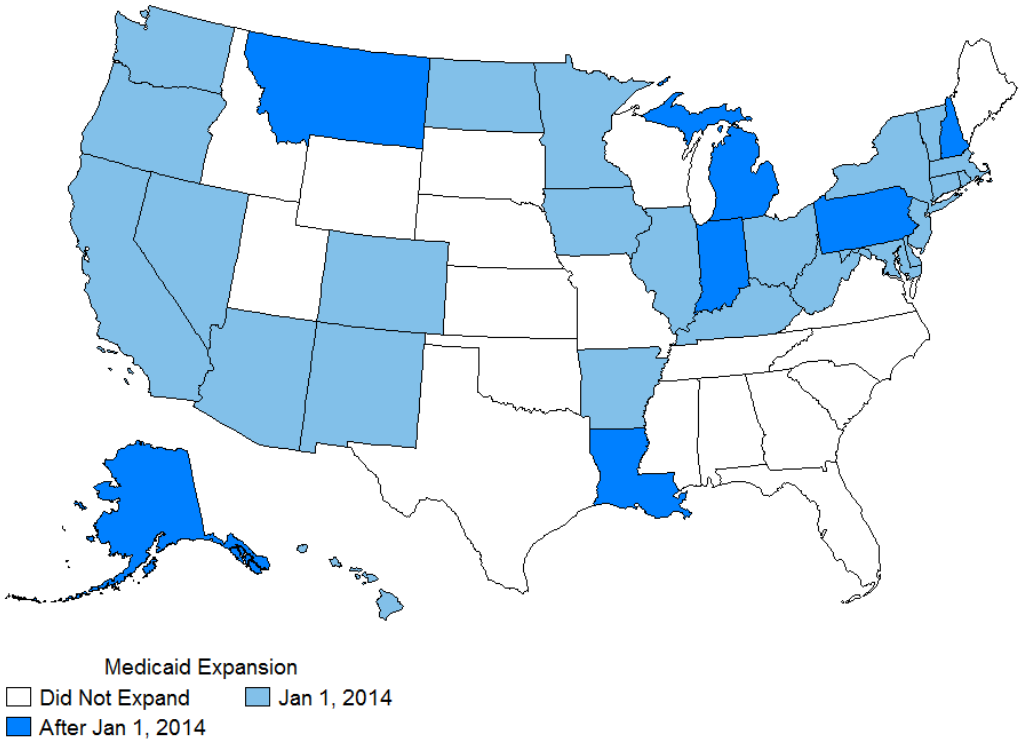


Figure 3: Food Insecurity Rates: 2013

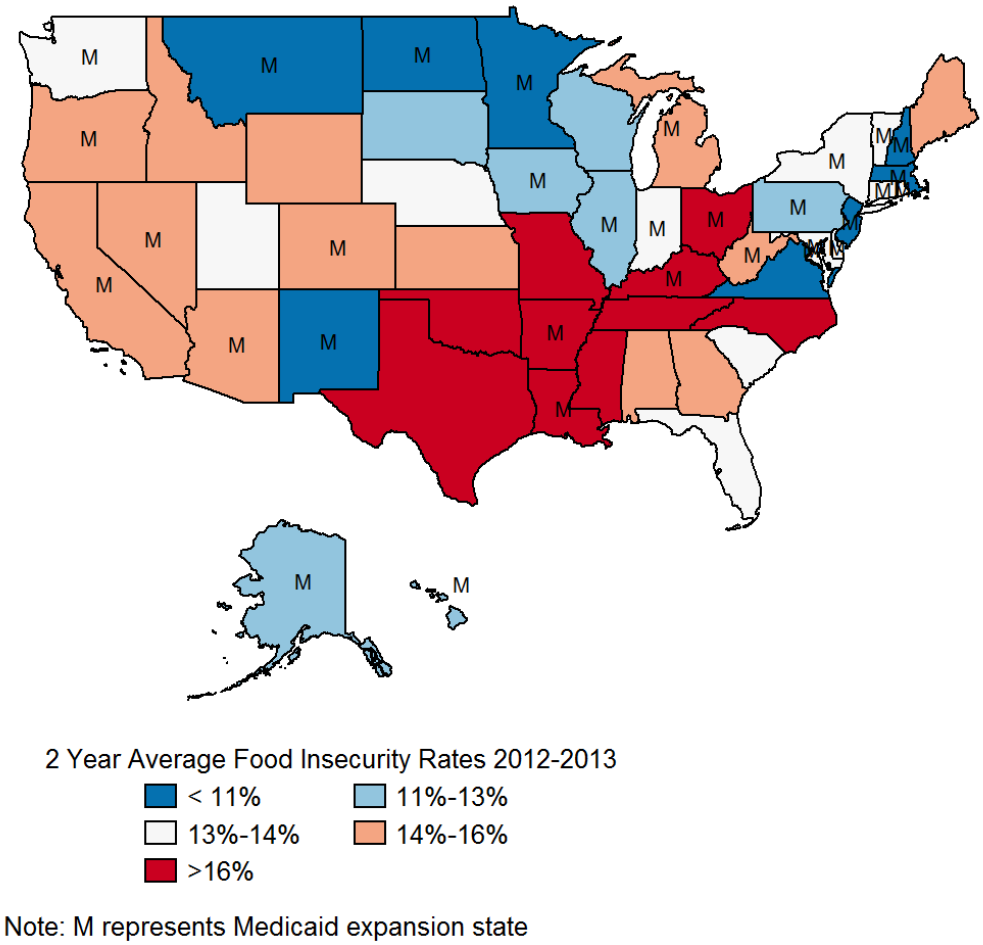
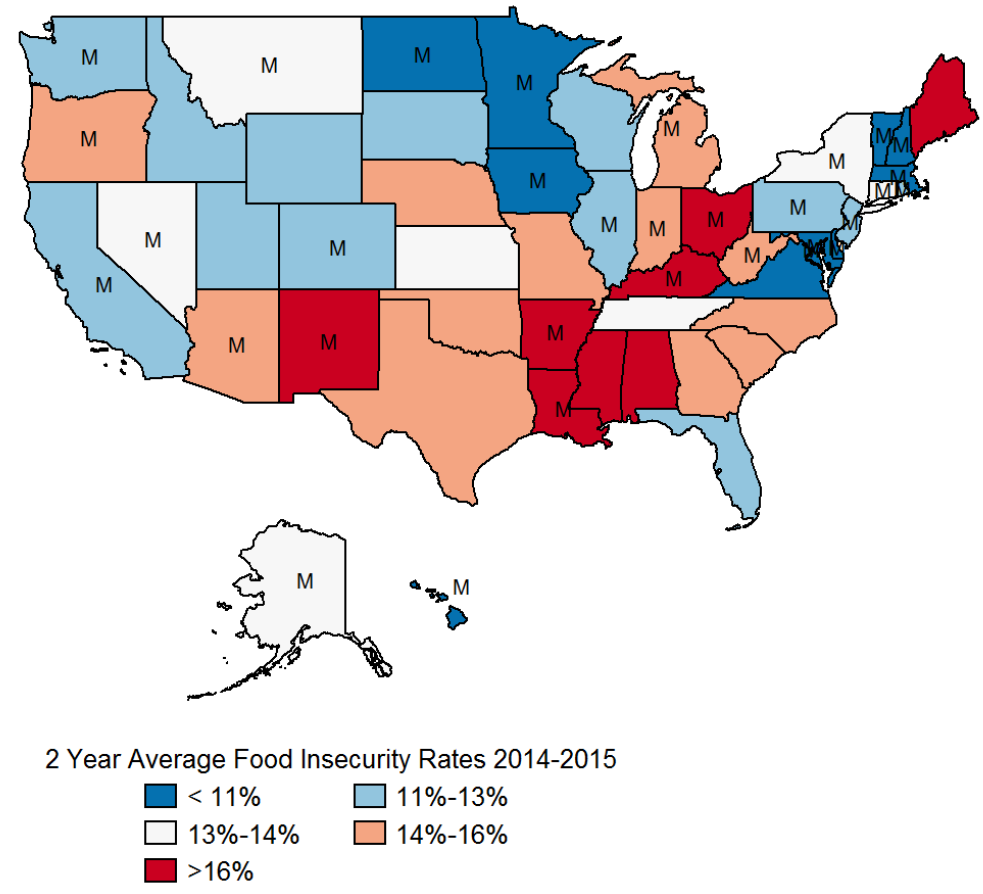


Figure 4: Food Insecurity Rates: 2015



Note: M represents Medicaid expansion state

Figure 5: Medicaid Subsidy

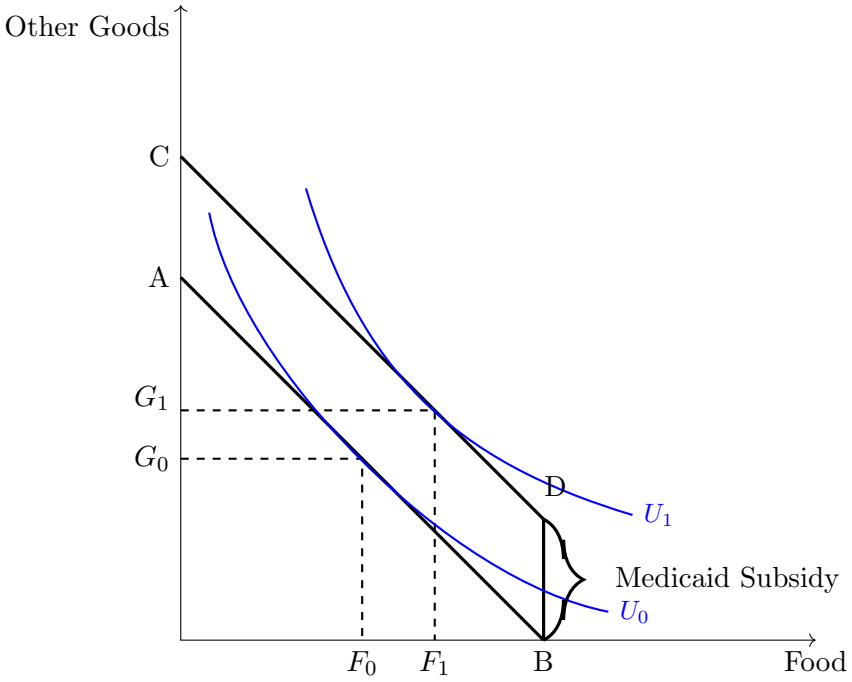


Figure 6: SNAP Subsidy

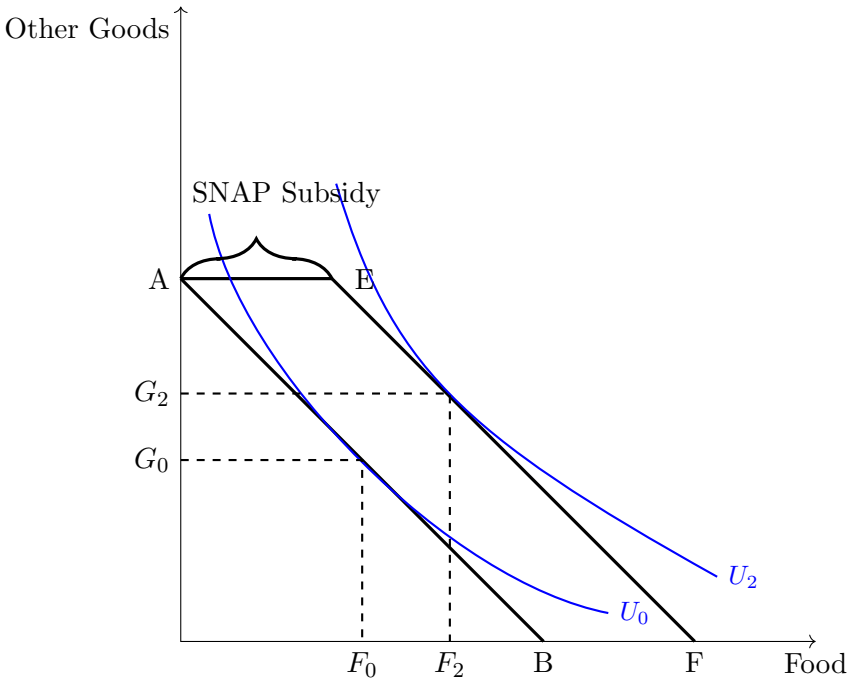


Figure 7: SNAP & Medicaid Subsidies

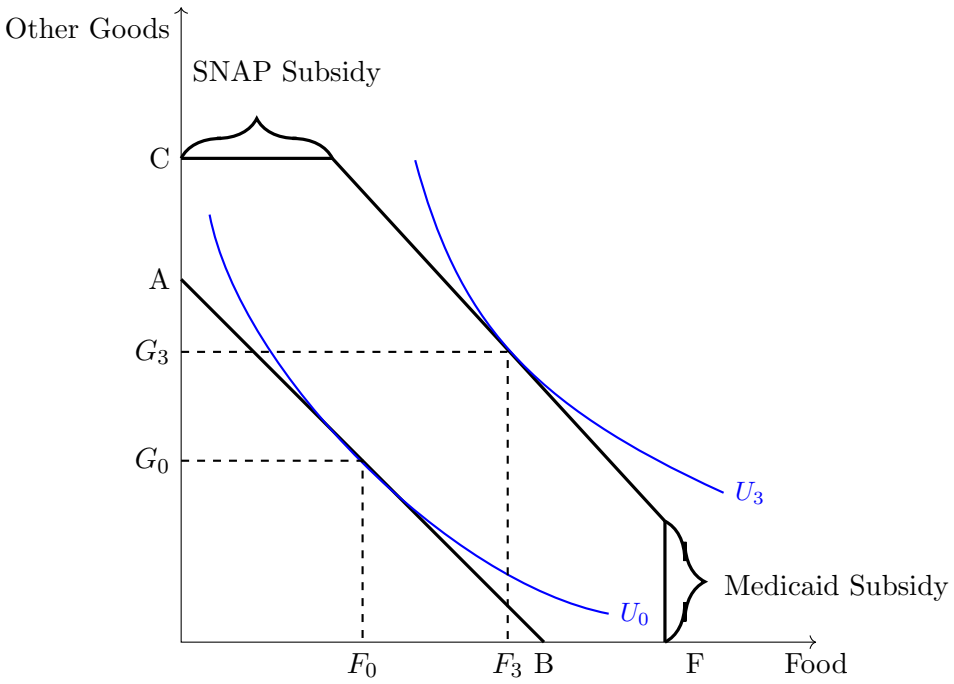


Figure 8: Household Food Security

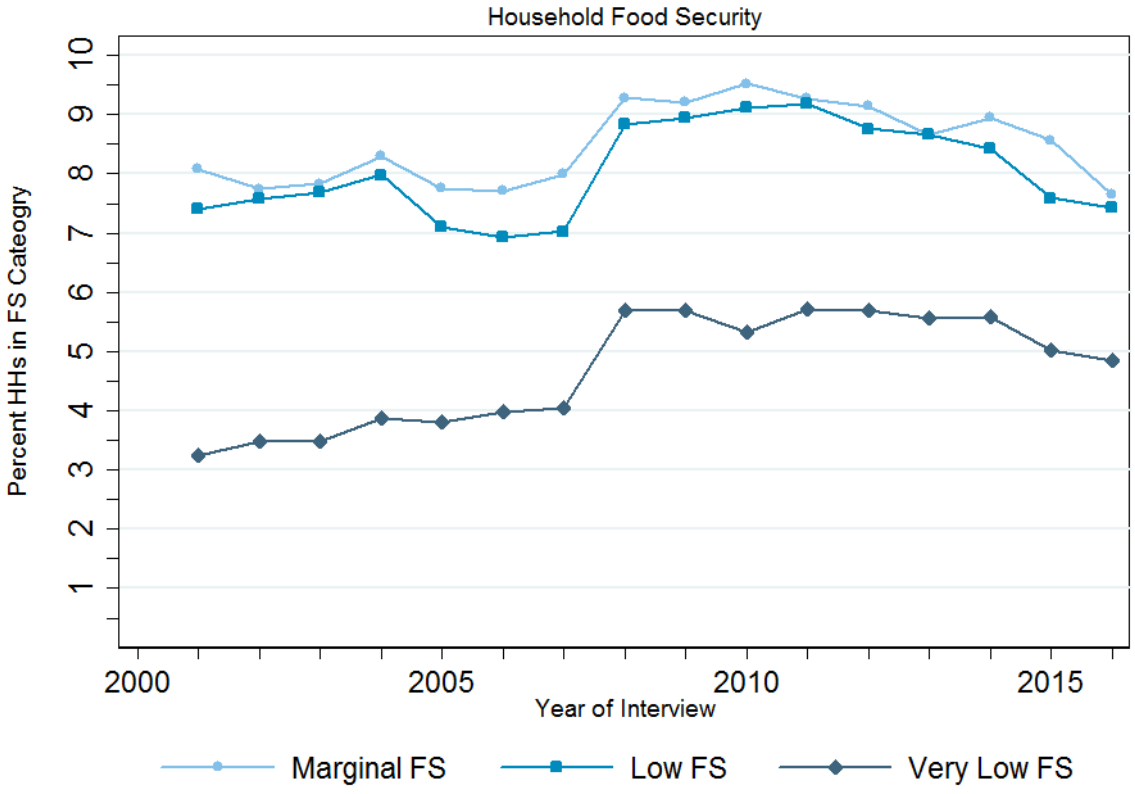


Figure 9: Household Food Security by Medicaid Expansion

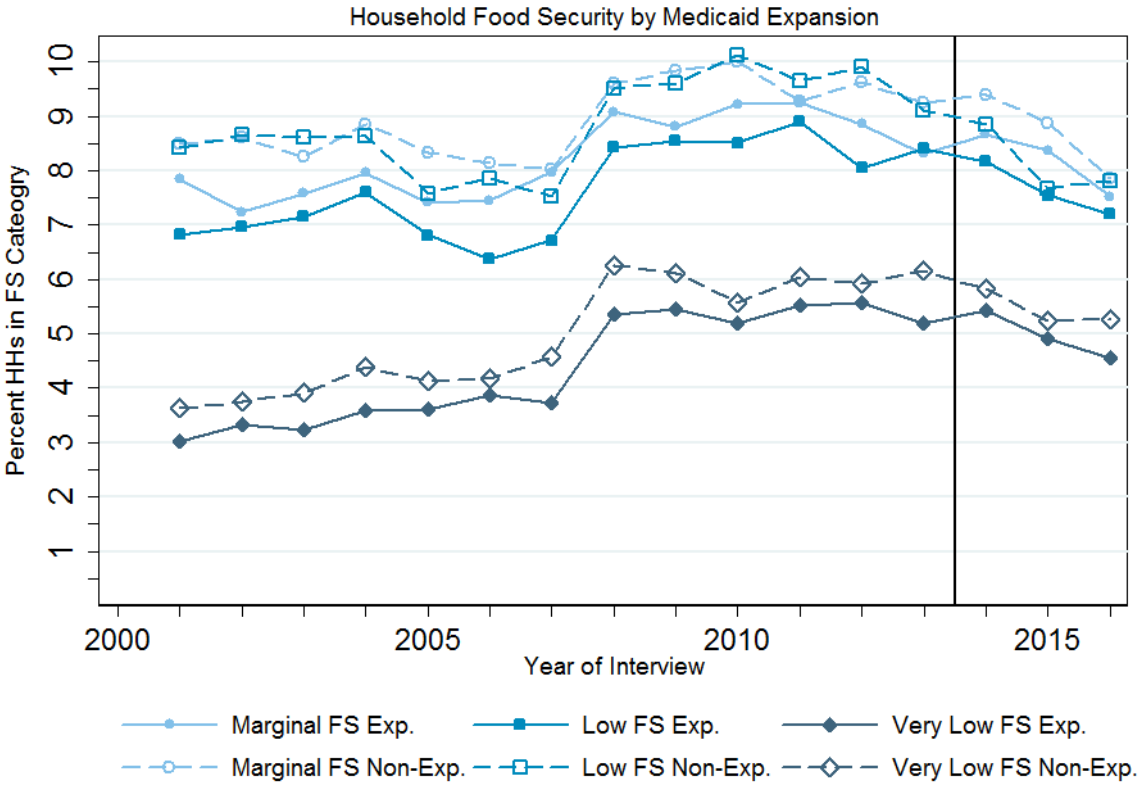


Figure 10: Mean of FI Gap

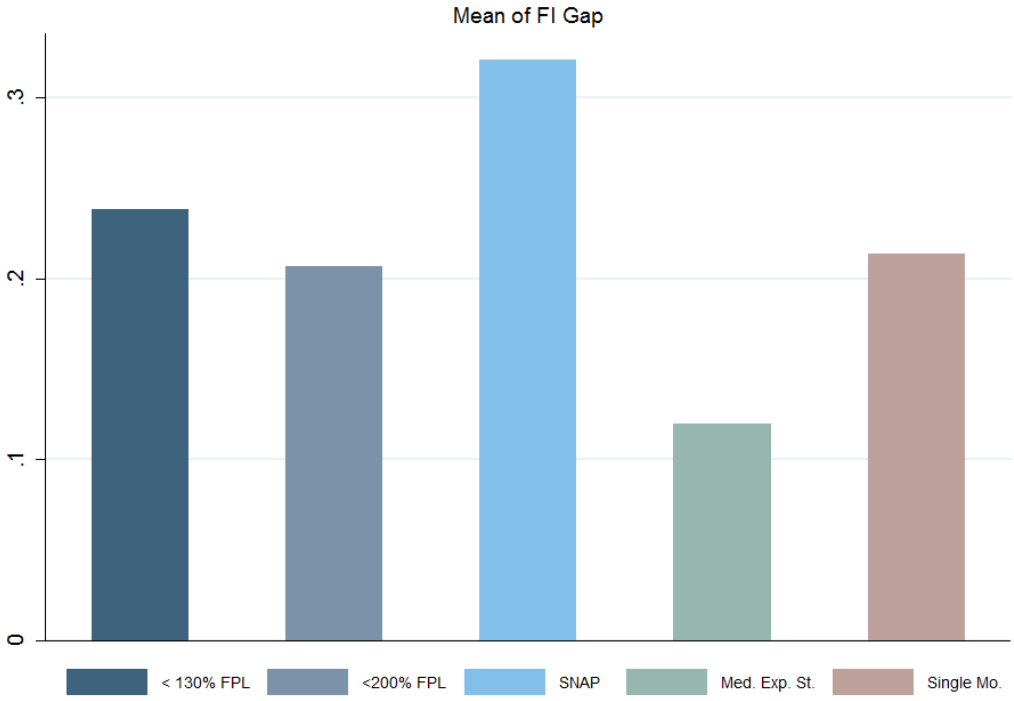


Figure 11: Mean of Income Gap

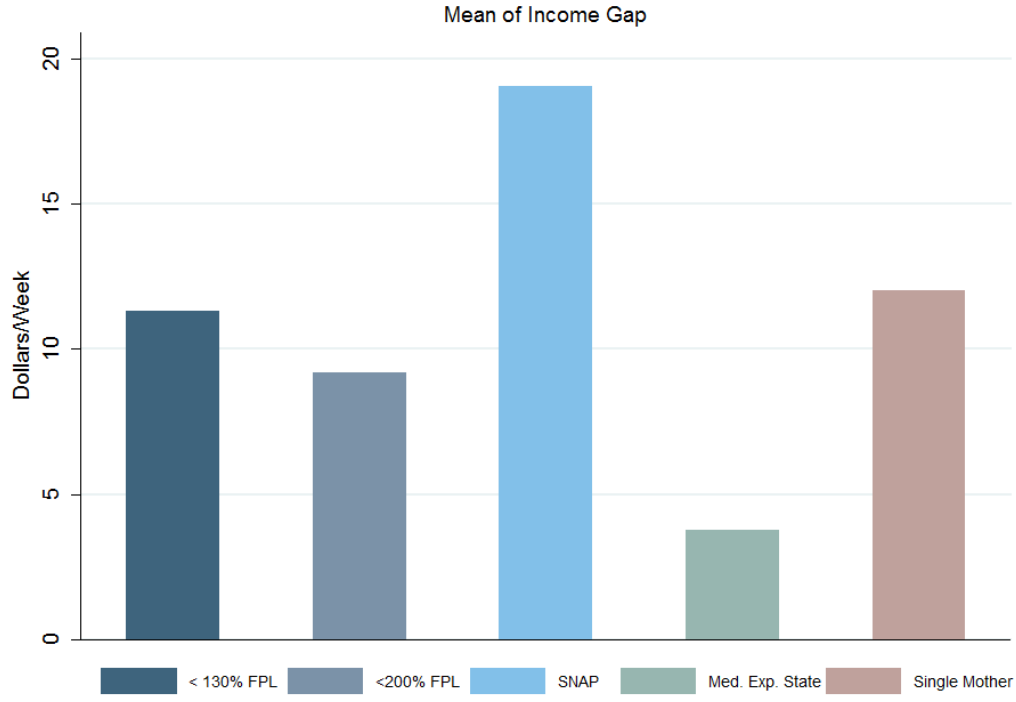


Table 1: Food Insecurity Questions

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?
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?
3	"We couldn't afford to eat balanced meals." Was that often, sometimes, or never true for you in the last 12 months?
4	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)
5	(If yes to question 4) How often did this happen—almost every month, some months but not every month, or in only 1 or 2 months?
6	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)
7	In the last 12 months, were you ever hungry, but didn't eat, because there wasn't enough money for food? (Yes/No)
8	In the last 12 months, did you lose weight because there wasn't enough money for food? (Yes/No)
9	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)
10	(If yes to question 9) How often did this happen—almost every month, some months but not every month, or in only 1 or 2 months?
	Questions 11-18 were asked only if the household included children age 0-17
11	"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?
12	"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?
13	"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?
14	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)
15	In the last 12 months, were the children ever hungry but you just couldn't afford more food? (Yes/No)
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)
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?
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)

Table 2: Summary Statistics by Medicaid Expansion and SNAP Receipt

	ACA		No ACA	
	SNAP	No SNAP	SNAP	No SNAP
<130% Pov. Line	0.75	0.13	0.76	0.15
<185% Pov. Line	0.85	0.22	0.87	0.26
<200% Pov. Line	0.88	0.24	0.90	0.28
WIC	0.29	0.08	0.27	0.08
Free Lunch	0.82	0.36	0.83	0.36
Free Break.	0.81	0.69	0.87	0.77
Age	44.15	50.44	43.99	49.95
High School	0.36	0.28	0.36	0.29
Some College	0.27	0.28	0.26	0.29
College	0.06	0.34	0.05	0.30
Hisp	0.21	0.11	0.19	0.11
White	0.67	0.83	0.61	0.82
Black	0.26	0.10	0.35	0.14
Unemp.	6.86	6.55	6.43	6.05
ln(50/10)	1.63	1.65	1.53	1.54
25th pctile	17010.58	17153.87	16145.02	16252.44
Emp./Pop.	0.46	0.47	0.46	0.46
Num. in HH	3.04	2.48	3.07	2.43
Num. Child	1.06	0.52	1.05	0.50
Female	0.68	0.48	0.69	0.47
Married	0.26	0.53	0.27	0.54
Metro	0.82	0.87	0.74	0.80
Obs.	34,057	422,632	21,365	231,340

Note: Household survey weights used.

Table 3: IV Summary by Medicaid Expansion

	Medicaid Expansion	Non-Expansion
Broad Based Categorical Eligibility	0.56	0.50
	(0.49)	(0.49)
Excl. All Vehicles	0.72	0.57
	(0.43)	(0.49)
Higher Vehicle Exemption	0.03	0.29
	(0.15)	(0.45)
Requires Fingerprinting	0.23	0.13
	(0.42)	(0.33)
Child Non-Cit. Elig	0.89	0.86
	(0.30)	(0.33)
Adult Non-Cit. Elig	0.27	0.06
	(0.44)	(0.23)
Online Application	0.57	0.55
	(0.48)	(0.48)
Digital Signiture	0.41	0.49
	(0.48)	(0.49)
Max SNAP Benefit	3.60	3.56
	(1.55)	(1.50)
ln(Min. Wage)	1.95	1.87
	(0.12)	(0.09)

Note: Household survey weights used.

Table 4: First Stage Results, Food Rank Second Stage Dependent Variable

	SNAP (1)	ACA × SNAP (2)
Broad Based Categorical Eligibility	0.008	−0.004**
	(0.006)	(0.002)
Excl. All Vehicles	0.002	−0.001
	(0.006)	(0.002)
Higher Vehicle Exemption	−0.002	0.001
	(0.012)	(0.002)
Requires Fingerprinting	−0.003	0.009
	(0.008)	(0.006)
Child Non-Cit. Elig	0.012	−0.003
	(0.012)	(0.002)
Adult Non-Cit. Elig	−0.002	0.001
	(0.014)	(0.002)
Online Application	−0.001	−0.003*
	(0.006)	(0.002)
Digital Signiture	0.007	0.001
	(0.007)	(0.002)
Max SNAP Benefit	0.017***	−0.003***
	(0.003)	(0.000)
ln(Min. Wage)	−0.032	−0.008
	(0.027)	(0.011)
ACA × BBCE	−0.004	0.042*
	(0.010)	(0.021)
ACA × Excl. All Vehicles	0.003	−0.016
	(0.014)	(0.021)
ACA × Fingerprint	0.004	−0.053***
	(0.013)	(0.012)
ACA × Online App.	0.024	−0.083
	(0.048)	(0.068)
ACA × Adult Non-Cit. Elig	0.051**	−0.084**
	(0.021)	(0.033)
ACA × Digital Sig.	0.005	0.024
	(0.016)	(0.019)
ACA × Max SNAP Benefit	−0.026***	0.030***
	(0.002)	(0.005)
ACA × ln(Min. Wage)	−0.039	0.212***
	(0.052)	(0.066)
F Stat.	75.4488	3,145.5295
	(0.0000)	(0.0000)
Obs.	290,707	290,707

Note: standard errors clustered at the state level, * p <0.10, ** p <0.05, *** p <0.01. Household survey weights used. Controls include gender, household size, number of children, marital status, age, age squared, disability status, race, education, urban/rural status, number of medicaid beneficiaries in the state, governor party affiliation, the 50/10 income ratio, the 25th percentile of income, and the unemployment rate. F statistic p-value in parentheses.

Table 5: Ordered Probit Coefficients and Marginal Effects: Two-Stage

	Coeffs. (1)	Marginal FS (2)	Low FS (3)	Very Low FS (4)
ACA	0.082	0.006	0.014	0.013
	(0.051)	(0.003)	(0.009)	(0.008)
SNAP	−0.940***	−0.064***	−0.160***	−0.150***
	(0.230)	(0.016)	(0.039)	(0.037)
ACA × SNAP	−0.481***	−0.033***	−0.082***	−0.077***
	(0.165)	(0.011)	(0.028)	(0.026)
Obs.	284,804	284,804	284,804	284,804

Note: standard errors clustered at the state level, * p <0.10, ** p <0.05, *** p <0.01. Ordering for probit is 0—fully food secure, 1—marginal food security, 2—low food security, 3—very low food security. Household survey weights used. Controls include gender, household size, number of children, marital status, age, age squared, disability status, race, education, urban/rural status, number of medicaid beneficiaries in the state, governor party affiliation, the 50/10 income ratio, the 25th percentile of income, and the unemployment rate

Table 6: Triple Difference LPM: IV

	Food Insecure (1)	Marginal FI (2)	Very Low FI (3)
ACA	0.030	−0.015	0.058
	(0.038)	(0.035)	(0.038)
SNAP	−0.184***	0.332***	−0.743***
	(0.055)	(0.081)	(0.079)
ACA × SNAP	−0.172**	−0.265***	−0.044
	(0.086)	(0.088)	(0.103)
Under ID Kleibergen	27.4528	27.4528	27.4528
	(0.0518)	(0.0518)	(0.0518)
Hansen J	20.9529	23.7661	14.8943
	(0.1803)	(0.0947)	(0.5324)
Obs.	284,804	284,804	284,804

Note: standard errors clustered at the state level, * p <0.10, ** p <0.05, *** p <0.01. P-values in parentheses for first stage statistics. Household survey weights used. Controls include gender, household size, number of children, marital status, age, age squared, disability status, race, education, urban/rural status, number of medicaid beneficiaries in the state, governor party affiliation, the 50/10 income ratio, the 25th percentile of income, and the unemployment rate

Table 7: ACA Mechanisms

	Avg. Weekly Spending (1)	SNAP Take-Up LPM (2)	SNAP Take-Up Probit (3)
ACA	–21.628**	0.078***	0.276***
	(10.144)	(0.009)	(0.033)
SNAP	164.315***		
	(26.972)		
ACA × SNAP	59.863*		
	(31.171)		
Obs.	96,522	290,707	290,707

Note: standard errors clustered at the state level, * p <0.10, ** p <0.05, *** p <0.01. Household survey weights used. Controls include gender, household size, number of children, marital status, age, age squared, disability status, race, education, urban/rural status, number of medicaid beneficiaries in the state, governor party affiliation, family income (spending), the 50/10 income ration, the 25th percentile of income, and the unemployment rate. Years for spending 2011-2016.

Table 8: Alternative Measures of Food Hardship

	FI Gap (1)	FI Gap Squared (2)	Inc. Gap (3)
ACA	0.069**	0.072***	0.181
	(0.030)	(0.027)	(1.596)
SNAP	–0.423***	–0.327***	16.683**
	(0.060)	(0.052)	(7.995)
ACA × SNAP	–0.161**	–0.173**	–6.921
	(0.079)	(0.074)	(5.005)
Under ID Kleibergen	28.0890	28.0890	27.7125
	(0.0439)	(0.0439)	(0.0484)
Hansen J	17.8778	17.3594	13.6181
	(0.3311)	(0.3627)	(0.6271)
Obs.	194,565	194,565	264,521

Note: standard errors clustered at the state level, * p <0.10, ** p <0.05, *** p <0.01. P-values in parentheses for first stage statistics. Household survey weights used. Controls include gender, household size, number of children, marital status, age, age squared, disability status, race, education, urban/rural status, number of medicaid beneficiaries in the state, governor party affiliation, the 50/10 income ratio, the 25th percentile of income, and the unemployment rate

Appendix A.-Additional Tables and Figures

Figure 12

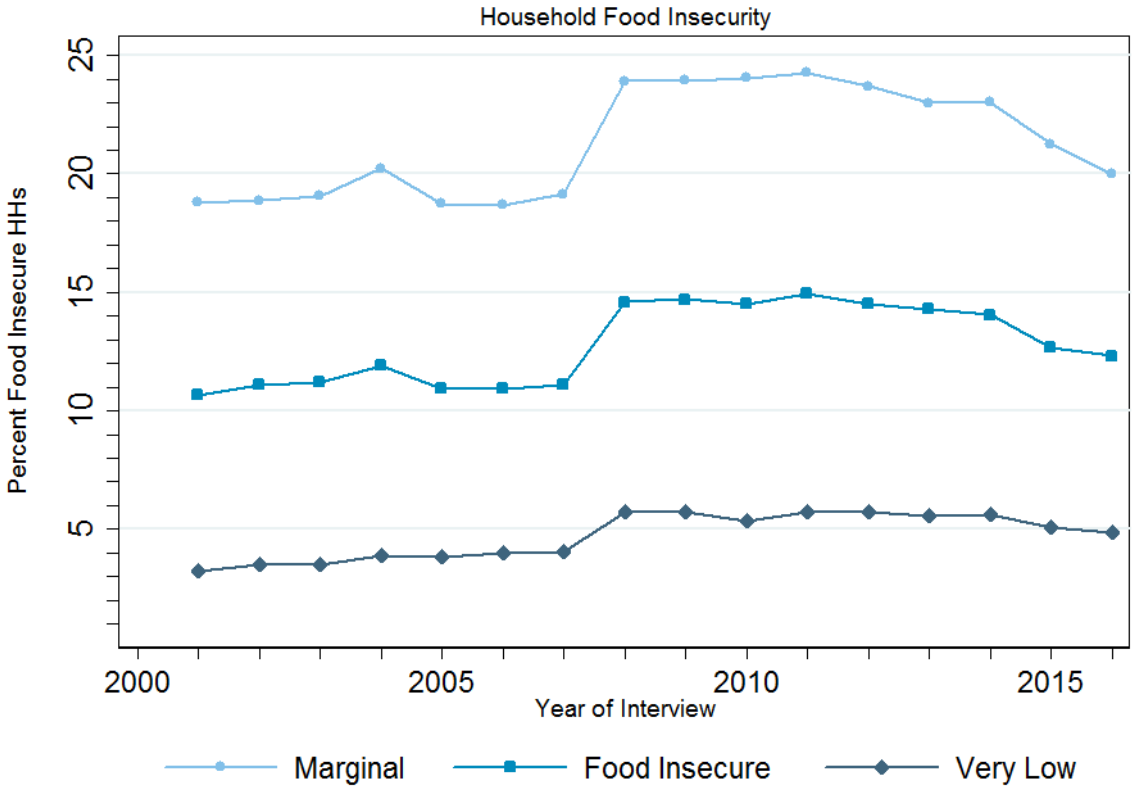


Table A1: Ordered Probit Coefficients and Marginal Effects

	Coeffs. (1)	Marginal FS (2)	Low FS (3)	Very Low FS (4)
ACA	−0.221***	−0.015***	−0.038***	−0.035***
	(0.033)	(0.002)	(0.006)	(0.005)
SNAP	0.609***	0.042***	0.104***	0.097***
	(0.010)	(0.001)	(0.001)	(0.002)
ACA × SNAP	0.136***	0.009***	0.023***	0.022***
	(0.030)	(0.002)	(0.005)	(0.005)
Obs.	284,804	284,804	284,804	284,804

Note: standard errors clustered at the state level, * p <0.10, ** p <0.05, *** p <0.01. Ordering for probit is 0—fully food secure, 1—marginal food security, 2—low food security, 3—very low food security. Household survey weights used. Controls include gender, household size, number of children, marital status, age, age squared, disability status, race, education, urban/rural status, number of medicaid beneficiaries in the state, governor party affiliation, the 50/10 income ratio, the 25th percentile of income, and the unemployment rate

Table A2: Triple Differece: LPM

	Food Insecure (1)	Marginal FI (2)	Very Low FI (3)
ACA	−0.064***	−0.108***	−0.024***
	(0.008)	(0.011)	(0.005)
SNAP	0.219***	0.241***	0.117***
	(0.003)	(0.003)	(0.003)
ACA × SNAP	0.039***	0.066***	0.013
	(0.010)	(0.011)	(0.008)
Obs.	284,804	284,804	284,804

Note: standard errors clustered at the state level, * p <0.10, ** p <0.05, *** p <0.01. Household survey weights used. Controls include gender, household size, number of children, marital status, age, age squared, disability status, race, education, urban/rural status, number of medicaid beneficiaries in the state, governor party affiliation, the 50/10 income ratio, the 25th percentile of income, and the unemployment rate

Table A3: Alternative Measures of Food Hardship: LPM

	FI Gap (1)	FI Gap Squared (2)	Inc. Gap (3)
ACA	−0.018***	−0.002	−1.535***
	(0.006)	(0.004)	(0.375)
SNAP	0.111***	0.088***	8.823***
	(0.004)	(0.003)	(0.269)
ACA × SNAP	−0.009	−0.032***	0.697
	(0.006)	(0.005)	(0.701)
Obs.	194,565	194,565	264,521

Note: standard errors clustered at the state level, * p <0.10, ** p <0.05, *** p <0.01. Household survey weights used. Controls include gender, household size, number of children, marital status, age, age squared, disability status, race, education, urban/rural status, number of medicaid beneficiaries in the state, governor party affiliation, the 50/10 income ratio, the 25th percentile of income, and the unemployment rate

Table A4: Real Average Weekly Food Expenditure 2011-2016: OLS

	OLS Avg. Weekly Spending
ACA	−1.468
	(1.031)
SNAP	−0.778
	(0.969)
ACA × SNAP	−0.737
	(1.533)
Obs.	96,522

Note: standard errors clustered at the state level, * p <0.10, ** p <0.05, *** p <0.01. Household survey weights used. Controls include gender, household size, number of children, marital status, age, age squared, disability status, race, education, urban/rural status, number of medicaid beneficiaries in the state, governor party affiliation, family income, the 50/10 income ration, the 25th percentile of income, and the unemployment rate.