VARIATION IN SUPPLEMENTAL SECURITY INCOME TAKEUP AMONG QUALIFYING LOW BIRTHWEIGHT INFANTS:

EVIDENCE FROM TWO STATES

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Abstract

In this paper, we explore county-level variation in Supplemental Security Income (SSI) take-up among categorically eligible low birthweight infants in two states: Massachusetts and South Carolina. This paper makes three important contributions. First, it highlights that there is substantial county-level variation in SSI take-up among qualifying low birthweight infants for whom the opportunity cost of missed benefits could be substantially large over the life course. Second, it highlights that this county-level variation in SSI take-up is not readily explained by county-level characteristics and that individual-level factors should be explored. Finally, consistent with other recent findings, our results suggest that the association between county-level factors and SSI take-up may vary across states. A national model that averages variation across states may obscure county-level factors that are important in some states but not in others. Future research should model this heterogeneity to capture accurately how these relationships may vary across states and/or regions.

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Introduction

Babies born with extremely low birthweight (LBW) into low-income families are doubly disadvantaged. Low-income infants have worse health and economic outcomes throughout their life course compared to their more affluent counterparts (Almond & Currie, 2011; Almond, Currie, & Duque, 2017; Berkman, Kawachi, & Glymour, 2014; Currie, 2011). Independent of income, there is also evidence that low birthweight babies face an increased risk of disease, disability and mortality (Institute of Medicine, 2007; McCormick, 1985; McCormick, Gortmaker, & Sobol, 1990).

A growing body of evidence suggests that public investments, in particular direct material and financial support, may be an effective means for improving child health and development for low-income families (Akee, Copeland, Keeler, Angold, & Costello, 2010; Duncan, Morris, & Rodrigues, 2011; Guldi, Hawkins, Hemmeter, & Schmidt, 2018). Income supports during early childhood have been linked to long-term improvements in academic achievement, school completion, employment and earnings, suggesting that timely support may be a cost-effective strategy (Almond & Currie, 2010; Duncan et al., 2011). Research continues to confirm that early childhood is an especially sensitive period for brain development and for establishing the neural connections that shape future cognitive, social, emotional, and health outcomes (National Scientific Council on the Developing Child, 2007).

Families of extremely low birthweight infants may especially benefit from income supports (Guldi et al., 2018). Nearly all infants with extremely low birthweight will be admitted to a Neonatal Intensive Care Unit (NICU) for the first weeks or months of their lives. NICU stays are often unexpected, stressful, and expensive events for families (Lewis et al., 2019). Studies have found that stays in the NICU lead to substantial out-of-pocket costs for the family, with approximately a quarter of gross weekly income going to cover additional costs related to food, transport, accommodations, extra-child care for their other children and loss of income (Argus, Dawson, Wong, Morley, & Davis, 2009; Lewis et al., 2019). Parents with infants in the NICU also experience higher levels of stress, traumatic symptoms, depression, anxiety, and physical weakness and weariness than parents of full-term infants (Clottey & Dillard, 2013; Ionio et al., 2016; Müller-Nix & Ansermet, 2009).

Caring for a disabled infant in the first year of life also presents many demands on a family, including additional appointments with doctors, therapists and other health professionals, as well as unexpected emergencies for acute health care needs (Chung et al., 2007; Corry, 2013; Mcloughlin, Hillier, & Robinson, 1993). Low birthweight infants often have higher needs of daily living and require more monitoring and long-term follow-up care than full-term infants (American Academy of Pediatrics, 2008; Angert & Adam, 2009; March of Dimes, 2018; Purdy, Craig, & Zeanah, 2015). These additional demands are compounded for low-income families that are less likely to have jobs with flexible schedules, sick days, and paid family and medical

leave, and are more likely to work irregular schedules (Morsey & Richard, 2015). Low-income families are also less likely to be able to afford the help of caregivers or convenient transportation, making it more difficult to work (Lewis et al., 2019; Romig, 2017). Loss of parental income can exacerbate the financial strain and stress a family bears, making it even more difficult to make ends meet (Lewis et al., 2019).

Economists and psychologists theorize that cash transfers improve child health and development by alleviating financial hardship, reducing family stress and increasing parental investments in child health (Becker, 1965; McLoyd, 1990). Recent work by Guldi, et al. shows that for very low birthweight infants, Supplemental Security Income (SSI) improves child outcomes and parenting behaviors and temporarily shifts maternal labor supply from full to part time (Guldi et al., 2018). Together, the evidence on the effectiveness of income supports during early childhood suggests that there may be substantial welfare gains to eligible infants of receiving SSI.

However, little systematic evidence exists on how many families eligible to receive SSI benefits take them up. While a significant body of research has been dedicated to explaining the growth in the child SSI program (Sevak & Bruns, 2018), less attention has been paid to whether the program is being used *too little* by certain groups. Removing obstacles and providing additional support may be necessary to help low-income families with low birthweight infants access SSI benefits for which they are eligible. The first steps are to identify the magnitude of the coverage gap and to illuminate the reasons for or drivers of geographic disparities in access to SSI benefits. Incomplete take-up of social safety net programs in the U.S. is pervasive as most programs require individuals to apply and demonstrate eligibility (Currie, 2004). We provide the first estimates of SSI take-up rate among families with categorically eligible low birthweight infants, evaluate whether take-up rates vary significantly across geographical areas, and explore the factors that might explain the geographic variation.

Our research has a number of important policy implications. First, geographic variation in SSI take-up undermines the core objective of standardizing support, as it's possible that geographic differences in SSI receipt may contribute to geographic and racial/ethnic disparities in infant health and mortality that persist in the United States (CDC, 2019). Second, the welfare loss of missed benefits could be substantially large over the life course (Almond et al., 2017; Prinz, Chernew, Cutler, & Frakt, 2018). According to a recent report, SSI payments lift nearly half of the 1.2 million child beneficiaries out of poverty, holding other household income constant (Romig, 2017).

Finally, studies have shown that very simple interventions can increase take-up of public assistance. For example, recent behavioral research has found that notifying individuals that they may be eligible, providing information about the generosity of public programs, assisting with the application process, or providing a small, financial incentive at sign-up can increase

take-up of public programs (Barr & Turner, 2017; Volpp et al., 2009; Bettinger, et al. 2012; Farrell et al. 2016; Finkelstein & Notowidigdo, 2018). In 2018, the Social Security Administration (SSA) and the Office of Evaluation Sciences conducted a large randomized trial to test the effectiveness of a letter campaign on SSI take-up among the elderly. Over 4 million individuals age 65-80 who were potentially eligible for SSI were identified and randomized either to a control group or to one of four treatment groups that received letters with varying amounts of information about the program. They found that all of the letters had large and statistically significant impacts on applications and awards compared to the control group. Of beneficiaries who received a letter, 6.0 percent applied for SSI within 9 months of the mailing compared with 1.0 percent of beneficiaries who did not receive a letter. Similarly, 2.3 percent of beneficiaries who received a letter were awarded SSI during this time, compared with 0.5 percent of beneficiaries who did not receive a letter, an increase of 340% (Office of Evaluation Sciences, 2018). Targeting similar interventions to parents of low birthweight infants may expand coverage among eligible infants and produce long-term cost-savings for federal and state governments by providing timely assistance.

In this paper, we explore county-level variation in SSI take-up among categorically eligible low birthweight infants in two states: Massachusetts and South Carolina. We selected these two states because they vary considerably in terms of geography, demography, and social and economic conditions. Massachusetts is known for its high quality healthcare services and resource-rich environment for families. Massachusetts has 38 NICUs across the state, with rates of preterm birth (8.4%) and low birthweight (7.5%) that are lower than the national averages (March of Dimes 2017). In contrast, South Carolina consistently ranks among the lowest-ranking states for healthy birth outcomes (March of Dimes 2017, Annie E. Casey Foundation, 2017). South Carolina is more racially and socio-economically diverse than Massachusetts and its higher rates of preterm birth are largely driven by racial/ethnic disparities.

In terms of state policy, nearly half of all states (N=23) provide State Supplemental Payments (SSP) to SSI child recipients, with monthly payment amounts ranging from $2.45 to $64.35 among the states that explicitly list the SSP payment amount in state law (N=8) (Policy Surveillance Program and CDC Staff, 2018). Massachusetts is a state that offers a SSP, but does not list the payment amount or provide the formula to calculate the payment amount in the state law. South Carolina does not offer a SSP. The average federal payment to a LBW recipient and the continuation of benefits after one year also varies across the two states. In Massachusetts, the average federal payment to a LBW recipient in the first year of life from 2011 to 2016 was $2,699 (in 2018 dollars) and $5,278 in South Carolina (Social Security Administration, 2019). After one year, 55% of LBW recipients were still receiving a federal payment in Massachusetts compared to 79% in South Carolina (Social Security Administration, 2019).

Background

Within the economics literature, Moffit originated the a model of take-up of means-tested social programs primarily driven by costs and benefits, in which individuals carefully weigh the pros and cons of enrolling in social programs (Moffitt, 1983). In this model, Moffit emphasized stigma as the main cost of participating in means-tested social programs. Over time, researchers have expanded his model to include other costs associated with the take-up of social programs, such as the costs of learning about and applying for programs (Currie, 2004). This theory posits that the neediest individuals will take-up social benefits because they have the most to gain. Recent theory and empirical research, however, suggest that the neediest individuals may be disproportionately burdened by complexity and more likely to underestimate the expected benefits of programs (Deshpande & Li, 2017; Finkelstein & Notowidigdo, 2018; Mullainathan & Shafir, 2014). This research highlights that federal standardization of program requirements may not be sufficient for equitably distributing funds and that additional targeting may be necessary.

Previous literature has documented patterns in take-up of social services along racial/ethnic lines and immigrant status. For example, people of Hispanic origin have been found to be under-represented in disability populations (Ben-Shalom & Stapleton, 2014), and immigrants have been found to have lower participation rates in social safety net programs despite being eligible (Bitler & Hoynes, 2011). A host of factors, including policies, discrimination against racial and foreign-born individuals, and the influence of social networks likely drive these patterns of take-up. For example, researchers have found that the types of benefits received by earlier immigrants strongly predicts the benefits received by newly arrived immigrants (Borjas & Hilton, 1996), and that speaking the same language as high means tested program-using groups is associated with higher levels of program use (Bertrand, Luttmer, & Mullainathan, 1998). In a recent analysis, Schmidt and Sevak find that counties with a higher share of African Americans also have higher rates of child SSI participation which may reflect differences in disability prevalence, in income eligibility, or levels of outreach and knowledge about the program (Schmidt & Sevak, 2017).

County economic conditions such as the unemployment rate, the share of children living in poverty, and the share of children living in single-parent households are directly related to the income eligibility for SSI. Previous research has found that county-level poverty is significantly and positively associated with SSI caseloads, but that the magnitude of the relationship varies across states (Schmidt & Sevak, 2017). Although counter-intuitive, higher unemployment rates during economic downturns have been found to be associated with significantly lower SSI caseloads, specifically among women and children (Schmidt, 2013, Rupp, 2012; Schmidt & Sevak, 2017). Schmidt & Sevak find that this relationship varies, however, across regions: unemployment is positively associated with caseloads in the Midwest, but negatively associated with caseloads in the South (Schmidt & Sevak, 2017). Relatedly, rural counties have the highest disability rates (defined as participation in SSI, Social Security Disability Insurance (SSDI), or

both) among working-age adults and have experienced the highest rate of growth over the past decade (McCoy, 2017). These patterns are also hypothesized to be driven by the (lack of) economic opportunities in rural areas.

We sought to explore variation in SSI take-up across states and counties among qualifying low birthweight infants, with the hypothesis that some of this variation would be associated with social and economic factors operating at these levels. We consider whether SSI take-up varies across counties that are more economically and socially disadvantaged, e.g. in counties with a larger share of children living in poverty, higher unemployment rates, higher percent of the population living in rural areas, a larger share of single-parent households, and with a larger share of the population that is black. We also consider whether SSI take-up will differ in counties with a larger share of the population that is Hispanic and a larger share of the population that is not proficient in English. Given recent evidence that there is substantial heterogeneity in child SSI participation rates both within and across states (Schmidt & Sevak, 2017; Wittenburg et al., 2015), we also explore the possibility that the importance of some county-level associations may vary across states.

Identifying variation in SSI take-up has direct implications for developing policy or programmatic changes that will promote equity, one of the original goals of the program (Duggan, Kearney, & Rennane, 2015). Differences in take-up across geographic areas may point toward areas where interventions to ensure proper understanding and support of available social programs are available and effective. How families in the NICU learn about SSI, the eligibility requirements, and the potential benefits is not well understood. The application process itself is lengthy, requiring parents to complete the equivalent of over 40 pages of paperwork (over the phone or in-person) under significant time pressure. Specifically, SSI benefits commence on the first of the month, and are back-dated only to the date of application, meaning that delay can result in missed months of potential benefits.

In addition, the magnitude of the benefits may be opaque to those applying; the expected benefits are not typically made available to families because they are subject to change and depend on the financial resources of the family and the health of the infant. The complexity and time sensitivity of completing the SSI application within the child's first weeks of life is likely a major barrier. Behavioral science has shown that stressful situations tax people's "mental bandwidth," which in turn, alters their decision-making processes and reduces their capacity to take action to improve their situation (Mullainathan & Shafir, 2013). For families who have just undergone the stress of having had a complicated pregnancy and/or delivery, and of now caring for a sick infant (whose health may be in limbo), their bandwidth to complete the SSI application is likely taxed. In addition, weighing the present burden of completing the application versus the long wait time before actually receiving benefits may lead parents to undervalue the SSI benefits from which they would actually benefit. This phenomenon, often referred to as present-bias or

hyperbolic discounting (Laibson, 1997; Rabin & O'Donoghue, 1999), is the tendency of people to avoid an unpleasant task now at the expense of future benefits.

Methodology

Study Population

The population of our study consists of infants in Massachusetts and South Carolina who meet SSA's criteria for low birthweight between the years of 2011-2016. In practice, the eligibility criteria are determined at the federal level and are evaluated at local SSA field offices. SSA evaluates LBW in infants from birth to attainment of age one. SSA defines birthweight as the first weight recorded after birth and gestational age as the infant's age based on the date of conception as recorded in the medical record or birth certificate. Acceptable documentation for an infant's birthweight and gestational age includes an original or certified copy of the infant's birth certificate or a medical record signed by a physician. Infants meet the LBW criteria if: 1) the infant weighs less than 1200 grams (about 2 pounds, 10 ounces) at birth, or 2) the infant weighs between 1200 and 2000 grams (about 4 pounds, 6 ounces) at birth and is considered small for his or her gestational. Table A1 in Appendix A shows the gestational ages at birth and corresponding birthweight necessary for a child to meet the *disability determination*.

Infants who meet the LBW criteria described above are eligible to receive payments more quickly under a determination of Presumptive Disability (PD) (SSA, 2019). This means that the family can start receiving SSI benefits for up to 6 months while they wait for the Disability Determination Services (DDS) to make a final decision. The decision to grant PD payments is based on the medical evidence available that the infant meets the LBW criteria, and the high likelihood that the claim will be ultimately approved. (However, parents may be asked to repay PD payments if it is later determined that they received overpayment because of excess income or assets.)

While in a medical treatment facility, SSI benefits are limited to the $30 reduced benefit rate plus any optional State Supplementary Payment (SSP). Once the infant leaves a medical treatment facility, SSI benefits are based on the family's income and assets. The asset limit for children is the same as the asset limit for adults ($2,000) and includes both assets in the child's name and parental assets "deemed" to the child. Parents are allowed to subtract the amount of the adult asset limit -- $2,000 for a single parent, $3,000 for a married couple -- from total parental assets. There is also a set of excludable assets including, but not limited to: a house, one vehicle, and educational grants. The remaining asset balance is deemed to the child. If the child's assets exceed the $2000 limit, the child is considered ineligible for SSI benefits.

Similarly, countable income for infant applicants is based on parental income deemed to the child. In the simplest case, if a child's parent(s) would be eligible for SSI based on their own income, then none of the parental income is deemed to the child. If parental income exceeds the

threshold for adult SSI eligibility, any income above that threshold is deemed to the child. This amount is then compared to the maximum monthly federal benefit rate (FBR). The difference is the amount an eligible child would receive as a monthly SSI benefit amount.

There is one nuanced exception to the parental deeming rules as described above. If an infant is determined to be disabled; and received one or more months of SSI benefits limited to the $30 reduced benefit rate while in a medical treatment facility (plus any federally-administered optional SSP); and is eligible for Medicaid under a State home care plan; and would be *ineligible* for SSI benefits because of deemed parental income or resources, or would be eligible for less SSI than he/she would receive under this provision (usually $30 plus any applicable SSP), then parental income and assets are ***not*** deemed to the child. When a child is eligible for SSI under this deeming waiver provision, payment is based on the Federal reduced benefit rate ($30 payment limit), plus any applicable federally-administered SSP. These SSI benefits are also known as the "personal needs allowance"(SSA, 1997). If the child's countable income (excluding deemed income) exceeds the Federal $30 payment limit, then the child is ineligible for SSI. However, it is very unlikely for an infant to have countable income. Therefore all infants who meet the LBW eligibility criteria and apply for SSI benefits while in a medical facility would be eligible for at least the Federal reduced benefit rate ($30 payment limit), plus any applicable State supplementary payments, even if parental income and assets exceed the limits.

Data & Measurement

To quantify SSI take-up across geographical regions and to identify the compositional and the county-level factors that may explain the variation, we will combine information from three types of data sources: 1) birth records, 2) administrative data from the SSA on recipient counts and 3) data from the Robert Wood Johnson Foundation (RWJF) on county-level characteristics. We restrict the sample to live births between the years 2011 and 2016 (inclusive) and only include infants with in-state maternal residential addresses as reported on the birth certificate.

Our main outcome of interest is the county-level proportion of LBW-eligible infants who receive SSI in their first year of life for the years 2011 to 2016, combined. Consistent with the SSA's disability determination process, we will use birthweight and gestational age as recorded on the birth certificate to identify the pool of infants who meet the LBW eligibility criteria. For the same period (2011-2016, combined), the SSA provided the SSI recipient counts at the county level for all infants who were awarded benefits within the first 12 months of life (including the 12th month) for a primary or secondary diagnosis of low birthweight or small for gestational age. We then use maternal county of residence to match the eligible counts to the SSI recipient counts and calculate the county-level SSI take-up rate. As a sensitivity analysis, we also calculate a second version of the SSI take-up rate by restricting the eligible pool of infants to those who

meet both the LBW eligibility criteria and have an indicator on their birth certificate that a government entity paid for their delivery. We apply this second condition as a proxy for assessing whether the child would have also met the means-tested criteria. In most states, the Medicaid means test for disabled people is similar, but not identical, to the SSI means test (Rupp & Riley, 2012). Estimates suggest that nearly 90 percent of those eligible for Medicaid are income-eligible for SSI (Levere, Orzol, Leininger, & Early, 2019). In both Massachusetts and South Carolina, SSI eligibility automatically confers Medicaid coverage (Social Security Administration, 2017).

Our county-level factors come from the RWJF County Health Rankings Database. RWJF collates county-level data from multiple data sources into county-level profiles. The variables included in the dataset include: demographic characteristics from Census Population Estimates and the American Community Health Survey; social and economic factors from the Bureau of Labor Statistics and Small Area Income and Poverty Estimates; and health-related data from the CDC and Behavioral Risk Factor Surveillance System. Table A2 provides an overview of the county-level variables used in our analysis including a formal definition and the data source.

Analytic strategy

In this paper, we use standard descriptive statistics (mean, standard deviation, min, max, quartiles) to describe the distribution of county-level SSI take-up. We also use weighted bivariate regression to assess the relationship between county-level characteristics and SSI take-up using the county-level data pooled across both states. The regressions are weighted by the number of categorically eligible infants in each county. Finally, we use GIS techniques to visualize state and county variation.

Results

Among the infants in South Carolina for whom we could make a determination (N=344,080), 5,412 (1.57%) met SSA's low birthweight childhood impairment listing. In Massachusetts (N= 420,441), a smaller number of infants, 3,646 (0.87%) met the low birthweight childhood impairment listing. Table B1 in Appendix B presents the characteristics of these categorically eligible infants in each state. In both states, a little over half of the infants were female, and the majority qualified for the low birthweight childhood impairment listing by weighing less than 1200 g at birth. In Massachusetts, larger fractions of the qualifying infants are non-Hispanic white (49.6%) or Hispanic (21.6%), compared to South Carolina where the largest fraction of qualifying infants are non-Hispanic black (54.4%). In Massachusetts, larger fractions of the qualifying infants are born to mothers with post-secondary degrees and fewer births are paid for by Medicaid (44%) compared to South Carolina (62%).

Figures B1 and B2 reveal substantial variation in the county-level SSI take-up rates among infants who meet SSA's low birthweight impairment listing. In Massachusetts, the average county-level SSI take-up rate is 52% with a minimum of 0% to a maximum of 100%. In South Carolina, the average county-level SSI take-up rate is 44% with a minimum of 25% and a maximum of 86%. Even when we restrict the eligible pool of infants to those who meet the categorical eligibility requirements *and* have their birth paid for by Medicaid (as a proxy for the income qualification), the county-level variation in SSI take-up remains substantial.

Descriptive statistics in Figure B3 highlight the variation in county-level characteristics across the two states. Compared to Massachusetts, a larger percentage of the population in South Carolina is black, and a smaller percentage are Hispanic or not proficient in English. Across the 14 counties in Massachusetts, the mean percentage of the population that is non-Hispanic black is 6% with a minimum of 1% and a maximum of 21%. In South Carolina, the mean percentage of the population that is non-Hispanic black is 36% with a minimum of 7% and a maximum of 72%. The mean teen birth rate in Massachusetts (17 per 1,000 females age 15-19) is substantially lower than the mean teen birth rate in South Carolina (50 per 1,000 females age 15-19), as is the percentage of babies born with low birthweight (7% in Massachusetts vs. 11% in South Carolina). In terms of geography, the mean percent of the population living in a rural area in South Carolina is 55% with a minimum of 9% and a maximum of 100%. In Massachusetts, the mean percent of the population living in a rural area is only 17% with a minimum of 0% and a maximum of 54%. The median household income is $73,367 in Massachusetts compared to $44,505 in South Carolina. Similarly, the mean percent unemployed, the mean percent of children living in poverty, and the mean percent of uninsured children are all higher in South Carolina.

Figure B4 shows the bivariate relationships between county-level characteristics and the county SSI take-up rates in Massachusetts and South Carolina combined. The coefficients are largely insignificant (with exceptions noted), but in a direction that is consistent with previous findings. Consistent with previous findings on the take-up of public assistance programs, counties with a higher share of Hispanics and people who are not proficient in English have lower SSI take-up rates (Ben-Shalom & Stapleton, D., 2014; Bitler, Currie, & Scholz, 2003), whereas counties with a higher share of non-Hispanic blacks have higher SSI take-up rates (p-value=0.022) (Schmidt, 2013). Counties with a higher share of high school graduates have lower SSI take-up rates (p-value=0.08), as do those counties with higher median household incomes (p-value=0.04). In contrast, counties with a higher share of single parent households have higher SSI take-up rates (p-value=0.08), as do counties with a higher share of residents who are food insecure (p-value=0.05), and who report a higher average number of mentally unhealthy days per month (p-value=0.05). Interestingly, some of the county-level variables that might be expected to be directly related to income eligibility for SSI, such as the percent unemployed, the percent of children living in poverty, and the percent of children uninsured are not statistically significant. Contrary to the adult population where rural counties have the highest rates of disability

participation (McCoy, 2017), we find no statistically significant relationship between rurality and county SSI take-up in Massachusetts and South Carolina (Figure B5).

Finally, in Figure B6, we provide some examples of county-level associations that appear to vary across states. In South Carolina, the association between SSI take-up and the percent non-Hispanic black is positive such that counties with a larger share of non-Hispanic blacks have higher rates of SSI take-up. In Massachusetts, this relationship appears to trend in the opposite direction. Similarly, the association between SSI take-up and the average number of self-reported, poor mental health days appears to be positive in Massachusetts but negative in South Carolina.

Discussion and Conclusion

SSI is designed to standardize support across states for low-income individuals with disabilities, but geographic variation in caseload rates have been documented in both adult and child populations (Gettens, Lei, & Henry, 2018; Schmidt & Sevak, 2017; Sevak & Bruns, 2018). Assessing the variation in SSI caseload is inherently difficult because it requires measuring the underlying disability status of the population. The advantage of exploring variation in SSI take-up among categorically eligible low birthweight infants is two-fold. First, we can reliably identify the pool of infants who are medically eligible for the low birthweight disability category using birth records, and this approach is consistent with SSA's disability determination process. Second, while most adult and child disability categories require extensive documentation of the severity and expected duration of the disability, the low birthweight criteria are explicit and exempt from the discretion of local medical examiners. This allows us to understand variation in SSI take-up apart from concerns about accurately measuring the underlying population distribution of disability status, accounting for the discretion of medical reviewers or considering the ability of households to access medical services that would allow them to be appropriately diagnosed.

This paper makes three important contributions. First, it highlights that there is substantial county-level variation in SSI take-up among qualifying low birthweight infants for whom the opportunity cost of missed benefits could be substantially large over the life course. Second, it highlights that this county-level variation in SSI take-up is not readily explained by county-level characteristics suggesting that there may be other drivers of variation at the individual level that should be explored. Finally, consistent with other recent findings, our results suggest that the association between county-level factors and SSI take-up may vary across states. A national model that averages variation across states may obscure county-level factors that are important in some states but not in others. Future research should model this heterogeneity to capture accurately how these relationships may vary across states and/or regions.

This paper also has a number of limitations. First, the analysis is limited to two states with a small number of counties. Therefore, the observed bivariate associations between county-

level factors and SSI take-up should be interpreted with caution both because of the small number of counties, and because of the possibility of confounding. Second, since matching at the individual level was not feasible within the scope of this project, we are not able to consider smaller units of aggregation. The aggregate units considered here (state & county) may conceal important differences in SSI take-up at higher or lower levels. The main risk of aggregated analyses is the invalid transfer of results observed at the aggregate level to the individual level (aka ecological fallacy). The bi-variate associations observed between the county-level predictors and SSI take-up, may not be relevant at the individual level. Third, our outcome measure collapses data from a six-year period (2011-2016) into a single metric, and many of our covariates are measured only in a single year. This may mask important variation and temporal changes that should be explored further with panel data. Finally, future research should also consider other contextual levels (such as hospital catchment areas or Neonatal Intensive Care Regions) and their relative contributions in accounting for variation in SSI take-up. A better understanding of variation in the SSI coverage gap among categorically eligible infants at the national scale could inform interventions targeted at multiple levels to support eligible families in accessing benefits.

Appendix A: Background Tables

Table A1. SSA requirements for meeting the low birthweight childhood impairment listing

Gestational Age (weeks)	Birthweight (grams)
37-40	2000 or less
36	1875 or less
35	1700 or less
34	1500 or less
33	1325 or less
32	1250 or less
N/A	1200 or less

Table A2: County-level variables and data sources

Measure	Description	Source	Year(s)
Health			
Poor or fair health	Percentage of adults reporting fair or poor health (age-adjusted)	Behavioral Risk Factor Surveillance System	2014
Poor physical health days	Average number of physically unhealthy days reported in past 30 days (age-adjusted)	Behavioral Risk Factor Surveillance System	2014
Poor mental health days	Average number of mentally unhealthy days reported in past 30 days (age-adjusted)	Behavioral Risk Factor Surveillance System	2014
Adult smoking	Percentage of adults who are current smokers	Behavioral Risk Factor Surveillance System	2014
Adult obesity	Percentage of adults that report a BMI of 30 or more	CDC Diabetes Interactive Atlas	2012
Food insecurity	Percentage who report food insecurity	Map the Meal Gap	2013
Teen births	Teen birth rate per 1,000 female population, ages 15-19	National Center for Health Statistics - Natality files	2007-2013
Low birthweight	Percentage of live births with low birthweight (< 2500 grams)	National Center for Health Statistics - Natality files	2007-2013
Social and Economic Environment			
High school graduation	Percentage of ninth-grade cohort that graduates in four years	EDFacts	2012-2013
Unemployment	Percentage of population ages 16 and older unemployed but seeking work	Bureau of Labor Statistics	2014
Children in poverty	Percentage of children under age 18 in poverty	Small Area Income and Poverty Estimates	2014

Children in single-parent households	Percentage of children that live in a household headed by single parent	American Community Survey	2010-2014
Children uninsured	Percentage of Children uninsured	Small Area Health Insurance Estimates	2013
Median household income	Median household income	Small Area Income and Poverty Estimates	2014
Children eligible for free lunch	Percentage of children eligible for free or reduced price lunch	National Center for Education Statistics	2012-2013
SNAP participation	Percentage participating in Supplemental Nutrition Assistance Program (SNAP)	Food Research and Action Center	2012-2016
Births covered by Medicaid	Percent of births paid for by Medicaid	Birth records	2011-2016
Severe housing problems	Percentage of households with at least 1 of 4 housing problems: overcrowding, high housing costs, or lack of kitchen or plumbing facilities	Comprehensive Housing Affordability Strategy (CHAS) data	2008-2012
Demographics			
% Non-Hispanic African American	Percentage Non-Hispanic African American	Census Population Estimates	2014
% Hispanic	Percentage Hispanic	Census Population Estimates	2014
% not proficient in English	Percentage not proficient in English	American Community Survey	2010-2014
% Rural	Percentage Rural	Census Population Estimates	2010

Appendix B: Results Tables and Figures

Table B1. Characteristics of infants categorically eligible for SSI (2011-2016 combined)

Characteristics	MA	SC
N	3,646	5,412
Female (%)	52.6	51.6
Race (%)		
Non-Hispanic White	49.6	38.4
Non-Hispanic Black	17.8	54.4
Hispanic	21.6	5.1
Other	11.0	2.1
Maternal Education (%)		
Less than HS	12.9	18.6
High School graduate or GED completed	22.2	27.7
Some college	27.0	34.7
Bachelor's degree	18.3	11.5
Graduate or professional degree	17.3	6.3
Unknown	2.3	1.2
Delivery Paid by Government (%)	44.0	61.7
Low birthweight eligibility categories (%)		
Less than 1200 g	64.4	77.0
37 to 40 weeks and less than or equal to 2000 g	16.5	10.9
36 weeks and less than or equal to 1875 g	8.8	5.3
35 weeks and less than or equal to 1700 g	4.4	3.1
34 weeks and less than or equal to 1500 g	3.6	2.4
33 weeks and less than or equal to 1325 g	1.4	0.7
32 weeks and less than or equal to 1250 g	0.8	0.5

Figure B1. Variation in county SSI take-up rates by quintile (2011-2016 combined)

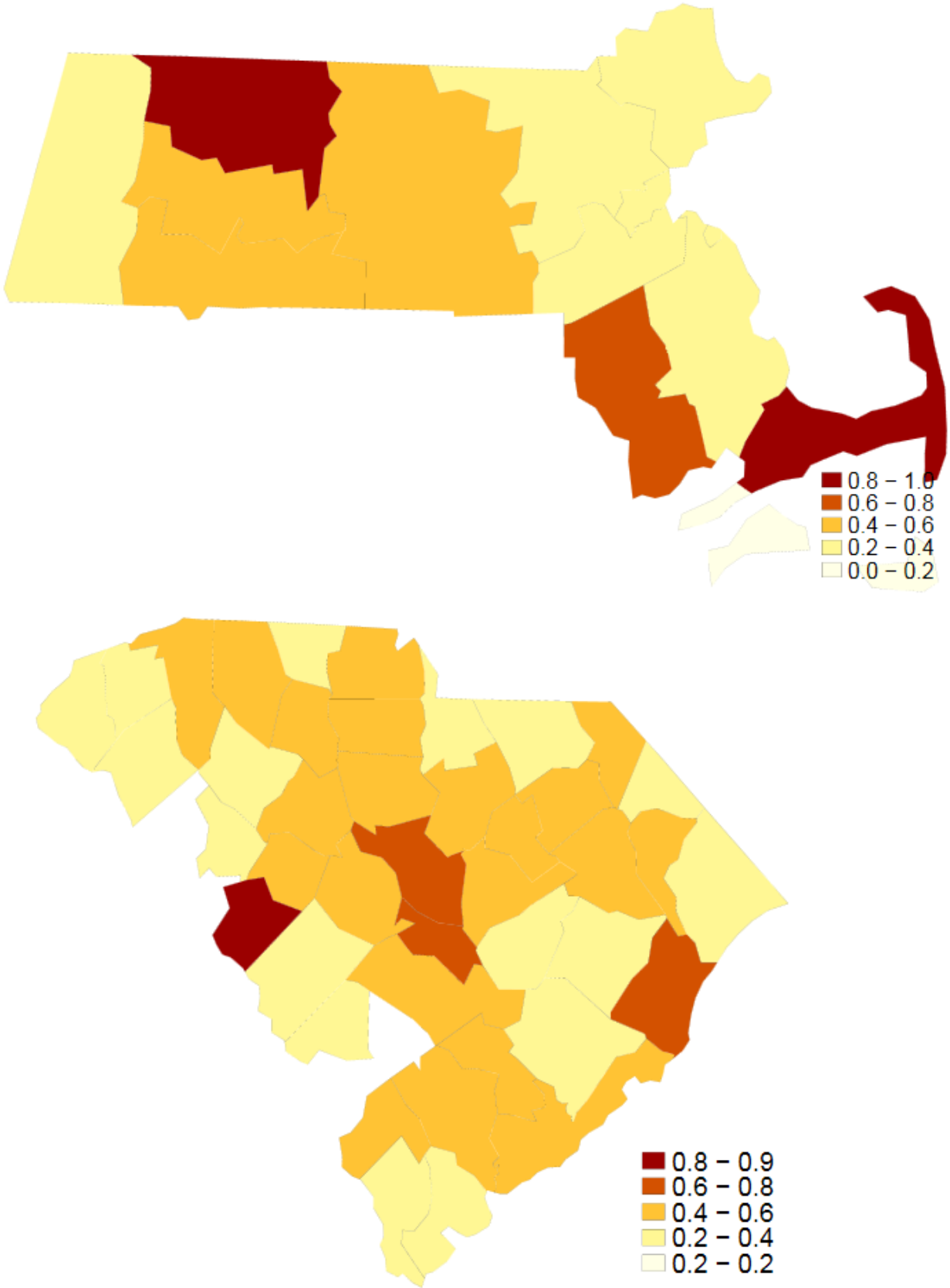


Figure B2. Variation in county SSI take-up rates by state (2011-2016 combined)

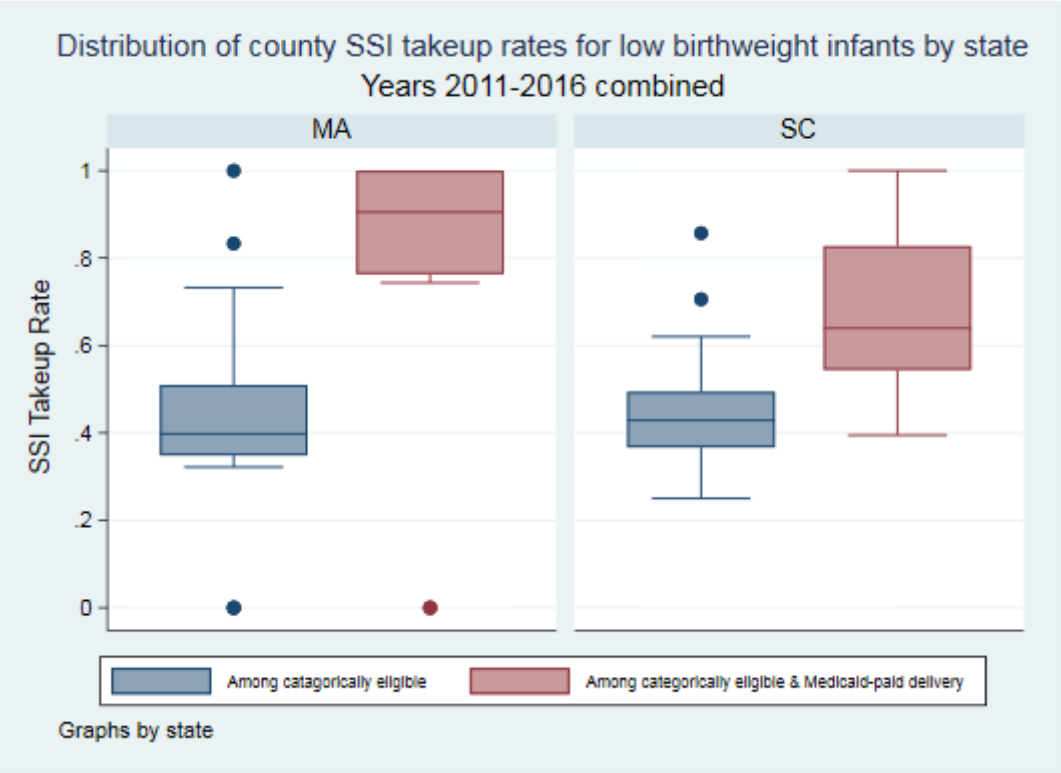


Table B3. Summary statistics of county characteristics by state

	Massachusetts (N=14 counties)				South Carolina (N=46 counties)			
Variable	Mean	Std.Dev.	Min	Max	Mean	Std.Dev.	Min	Max
% Black	0.06	0.05	0.01	0.21	0.36	0.16	0.07	0.72
% Hispanic	0.09	0.07	0.03	0.23	0.05	0.03	0.01	0.15
% Not proficient in English	0.03	0.03	0.01	0.11	0.01	0.01	0.00	0.06
% High School Graduates	0.85	0.08	0.66	0.92	0.79	0.05	0.65	0.93
Teen Birth Rate (per 1000)	16.76	8.33	4.50	36.70	49.85	12.23	28.20	80.50
% Low birth weight	0.07	0.01	0.05	0.09	0.11	0.02	0.08	0.14
% Single parent households	0.33	0.09	0.18	0.52	0.46	0.09	0.30	0.64
% Living in rural area	0.17	0.16	0.00	0.54	0.55	0.24	0.09	1.00
% Food insecure	0.11	0.02	0.09	0.16	0.18	0.04	0.12	0.28
% Severe housing problems	0.20	0.04	0.16	0.26	0.16	0.02	0.11	0.21
% Reporting fair or poor health	0.13	0.03	0.09	0.19	0.20	0.04	0.13	0.29
Physically unhealthy days per month	3.37	0.43	2.90	4.40	4.20	0.44	3.30	5.30
Mentally unhealthly days per month	3.87	0.39	3.20	4.60	4.13	0.27	3.40	4.70
% Adults smoking	0.15	0.02	0.12	0.19	0.20	0.02	0.15	0.25
% Obese	0.23	0.03	0.20	0.29	0.35	0.05	0.23	0.44
% Unemployed	0.06	0.01	0.05	0.08	0.08	0.02	0.05	0.12
% Children living in poverty	0.16	0.07	0.07	0.32	0.32	0.08	0.19	0.49
% Children uninsured	0.02	0.01	0.01	0.03	0.07	0.01	0.05	0.12
Median Household Income ($)	73,367	15,318	51,850	100,710	44,505	9,271	28,135	63,269
% Births paid by Medicaid	0.43	0.11	0.21	0.59	0.61	0.14	0.36	0.88
% SNAP recipients	0.12	0.05	0.03	0.22	0.19	0.06	0.08	0.33
% Children eligible for FRPL	0.31	0.15	0.14	0.66	0.61	0.14	0.36	0.90

Figure B4: Factors associated with county SSI take-up rate

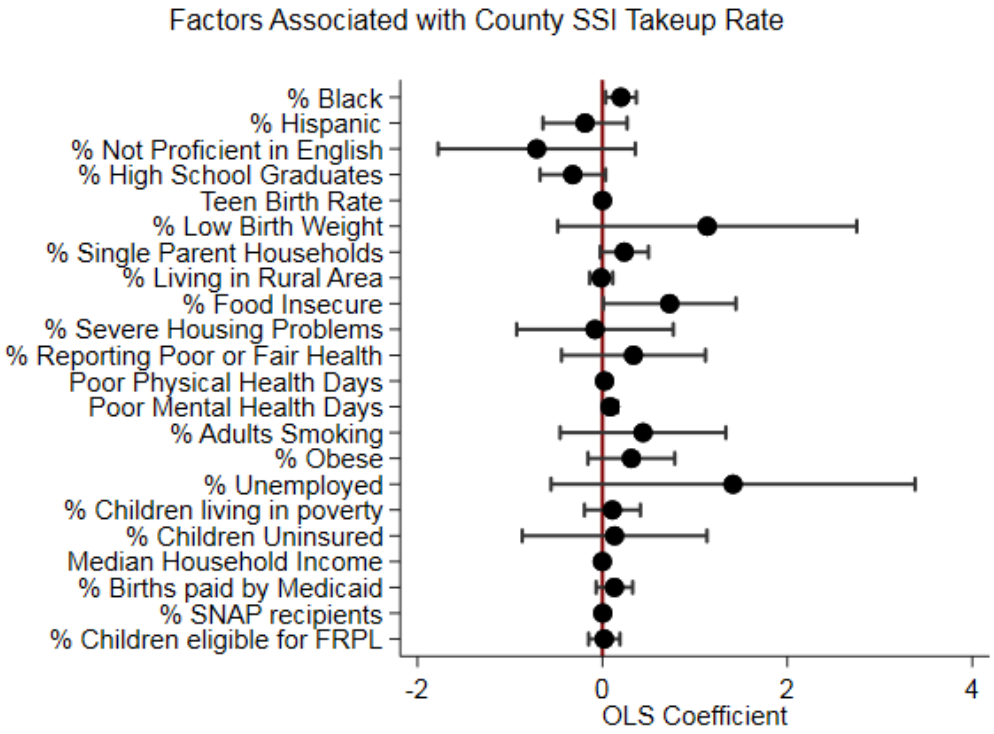
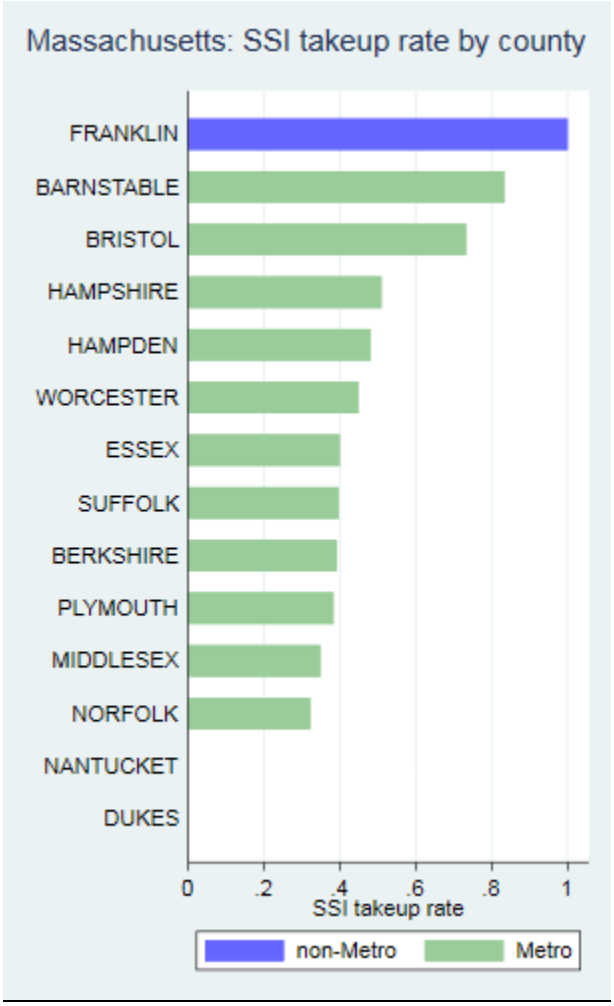


Figure B5. County SSI take-up rate rankings among categorically eligible by state (2011-2016 combined)



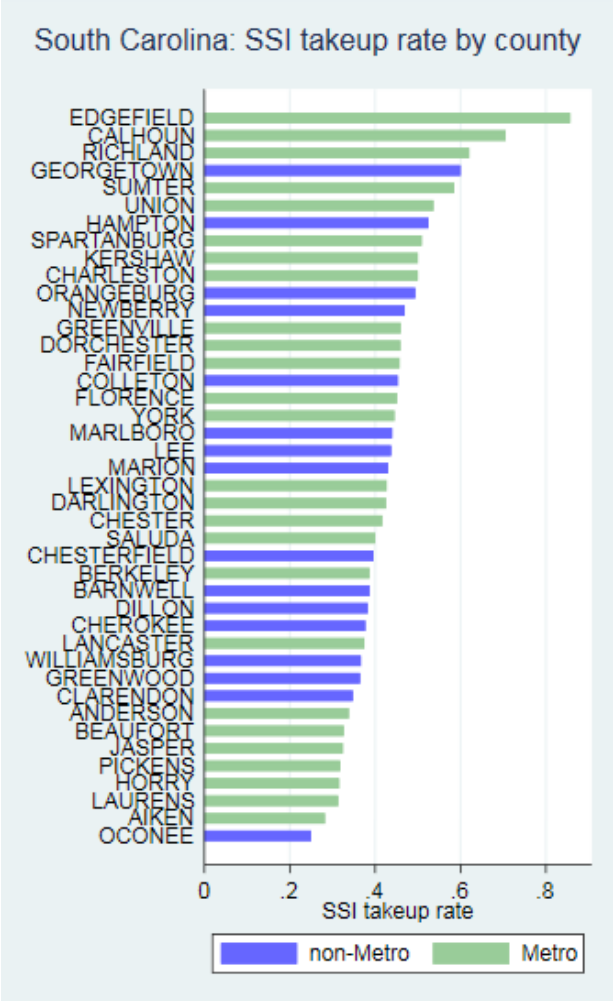
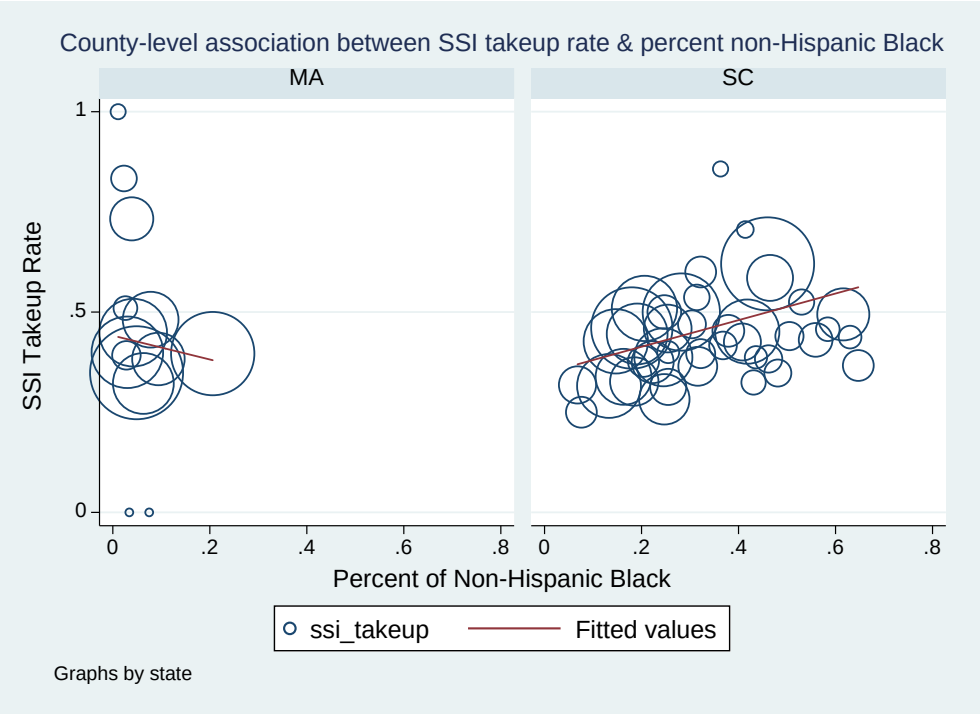
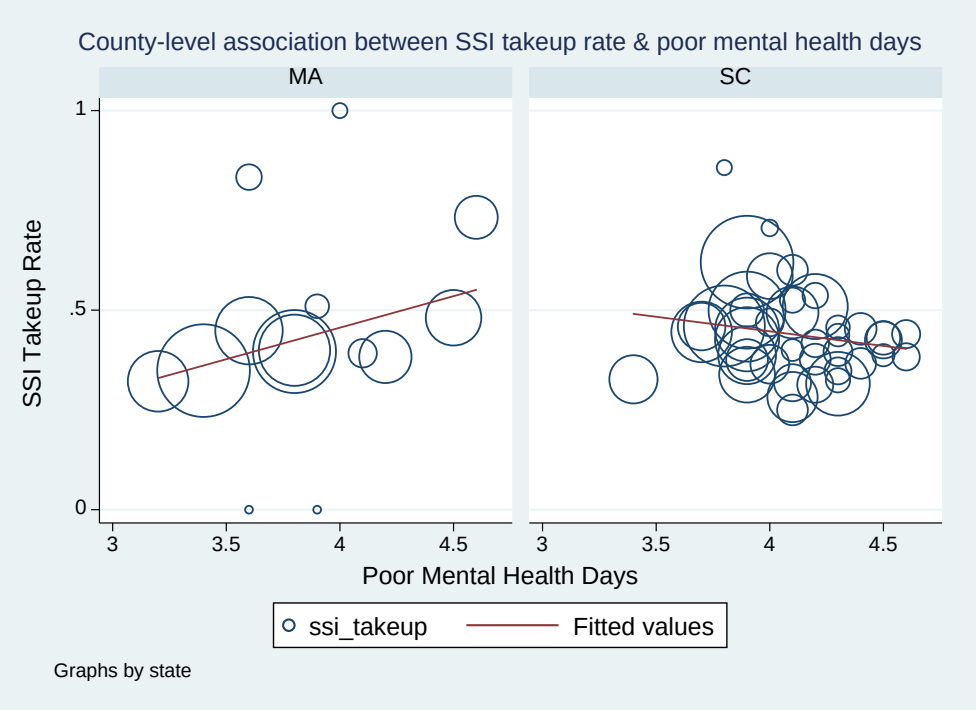


Figure B6: County-level associations by state





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