# THE EFFECTS OF RURALITY ON HEALTH OUTCOMES FOR CHILDREN WITH SPECIAL HEALTH CARE NEEDS

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Charles G. Ellsworth, B.A.

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Thesis Advisor: Dr. Andrew Wise, PhD.

ABSTRACT

This paper considers the effects of rurality on health outcomes and key health indicators for children with special health care needs (CSHCN), who utilize health services in greater frequency and intensity than children generally. My thesis is that CSHCN living in rural areas are associated with poorer individual health care indicators and outcome measurements than their urban counterparts, including the critical needs of receiving adequate care coordination and receiving care through a "medical home." To test this hypothesis, I completed a multivariate analysis of 2009-2010 National Survey of Children with Special Health Care Needs (NS-CSHCN), conducted by the National Center for Health Statistics, accounting for rurality as well as controlling for income, education, race, ethnicity, insurance coverage and health status. I conducted 21 separate regressions using logit and ordered logit analyses, with odds-ratio output. The regression analysis does not support my hypothesis, and shows that for almost all instances, CSHCN living in rural areas are not less likely to achieve the key health outcomes and are not less likely to be associated with negative health indicators than their urban counterparts. I recommend that better publicly-available data are needed to isolate the true effects of rurality in this population and that further research should be conducted.

The research and writing of this thesis
is dedicated to my parents, Jane and John; my brother, Jay; and my wife, Caitlin;
for all their support throughout the process.

Many thanks,
Charles G. Ellsworth

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## I. Introduction

The intent of my thesis is to study the health care indicators and outcomes of children with special health care needs living in rural America. Children with special health care needs (CSHCN) are defined as a population of individuals under the age of 19 "who have or are at increased risk for a chronic physical, developmental, behavioral, or emotional condition and who also require health and related services of a type or amount beyond that required by children generally."[1] My study will be the first to consider the health indicators and outcomes of rural CSHCN using data collected from the 2009-2010 National Survey of Children with Special Health Care Needs (NS-CSHCN), conducted by the National Center for Health Statistics. My hypothesis is that CSHCN living in rural areas are associated with poorer individual health care indicators and outcome measurements than their urban counterparts, including the critical needs of receiving adequate care coordination and receiving care through a "medical home." To test this hypothesis, I will complete a multivariate analysis of the data in the NS-CSHCN.

The medical demographic of CSHCN is broad, encompassing an array of conditions and diagnoses, all the way from asthma to congenital heart defects. Government estimates show that 11.2 million children (or 15.1 percent) under the age of 18 fall under the definition of CSHCN, figures that have grown in the last decade. Additionally, approximately one-in-five U.S. households with children have at least one child with special health care needs (Data Resource Center, 2012). Meanwhile, rural America is shrinking. The 2010 U.S. Census data show that fewer Americans than ever before – 16 percent – live in nonmetro areas with fewer than 50,000 people, down from 20 percent in 2000 (Yen, 2011).

[1] Definition provided by the U.S. Department of Health and Human Services, Health Resources and Services Administration, Maternal and Child Health Bureau (MCHB).

More than two decades ago (and updated in 2002), the American Academy of Pediatrics proposed that all CSHCN should have a "medical home," a concept of providing care that is "accessible, continuous, comprehensive, family centered, coordinated, compassionate, and culturally effective," with definitions provided for each one of those terms (American Academy of Pediatrics (AAP), 2002).[2] The term "medical home," sometimes called a "patient-centered medical home," is a bit of a misnomer, and the concept has evolved over time. It is not intended to imply that the patient is located in a home, but rather that all the physicians who are involved in the care of that child are aware of the patient's medical information and that each physician involved should be able to develop a partnership of mutual responsibility and trust with the child and the family. Oftentimes, a dedicated care coordinator, who may or may not be a physician, is assigned to the needs of the family and works with the child's specialists to coordinate his or her care. This model stands in contrast to uncoordinated care provided through emergency departments, clinics and other urgent-care facilities (AAP, 2002). The medical home relies heavily on care coordination, an approach ensuring that the many individuals who have some responsibility for the patient's health – not just physicians, but also parents, siblings, teachers and friends – are all aware of the patient's care plan and working toward the same goal. Care coordination is especially worthwhile for CSHCN, as some patients may have upwards of half-a-dozen pediatric specialists and therapists, who, without a care coordination plan, may not be aware of what the others are doing with the child. Poorly coordinated care can result in unnecessary treatment, increased hospitalizations, worse health outcomes, and higher costs.

[2] "Culturally effective" was added in the 2002 update.

In 2000, the U.S. Department of Health and Human Services (HHS) issued a goal of having all CSHCN within a medical home by 2010. HHS, through the U.S. Maternal and Child Health Bureau (MCHB), also established six core criteria (or outcomes) for CSHCN, including participation in a medical home (HHS, 2000). Various organizations and researchers are working to understand how care coordination methods are used in practice and their accessibility to different populations (McDonald et al., 2010). The purpose of my study is to investigate whether or not CSHCN living in rural areas, specifically, are achieving the medical home standard, other core criteria and their standing within other key child health indicators. The NS-CSHCN investigates, among many other things, whether or not this population is achieving the MCHB's six core outcomes and 15 key child health indicators.[3] It has produced some data regarding whether or not rural CSHCN have achieved these goals, but the 2009-2010 survey has not been subject to a regression analysis. This is the dataset from which I will produce a mulitivariate regression analysis to test my hypothesis. Skinner and Slifkin (2007) looked at similar questions regarding rural CSHCN, but using the 2001 version of the NS-CSHCN, and there have been significant changes to rural America and the population of CSHCN since then.

In the next section, I review the relevant literature and background information surrounding care coordination, rural health needs and outcomes, and children with special health care needs. In Section III, I outline the theoretical framework for testing my hypothesis. In Section IV, I describe in detail the data from the NS-CSHCN 2009-2010 dataset. In Section V, I

[3] The MCHB's six core outcomes are "used to monitor our progress toward the goal of a comprehensive, family-centered, community-based, coordinated system of care for CSHCN." The MCHB created the 15 key health indicators to capture "indicators of the impact of children's conditions on their functional abilities, their health insurance coverage, access to care, family-centered care, and the impact of their conditions on their families." (MCHB, Chartbook 2005-2006)

propose an empirical model to test my hypothesis that CSHCN in rural areas have reduced health care indicators and outcomes than their urban counterparts. In Section VI, I report and analyze my regression results and in Section VII, I discuss my conclusions and possible policy implications for resulting from this analysis.

## II. Background and Literature Review

In this chapter, I will provide a background on children living in rural America, children with special health care needs and the relatively sparse research on the intersection of these two populations – rural CSHCN.

### Rural children

According to the U.S. Health Resources and Services Administration (HRSA), children living in rural areas possess characteristics that reduce their access to needed health care and reduce positive health care outcomes.[4] Compared to their urban counterparts, children in rural areas are more likely to be poor and must travel greater distances for health care services (HRSA, 2011). The discrepancy between urban and rural locations of pediatrician-to-child population ratios reached a threefold difference by 1996 (Randolph, Pathman, 2001). And children living in rural areas have reduced access to dental providers and are less likely to make a dental visit (Byck, Walton, Cooksey, 2002; Vargas, Dye Hayes, 2003).

[4] The U. S. Maternal and Child Health Bureau is an organization housed within the Health Resources and Services Administration of the U.S. Department of Health and Human Services (HHS). The MCHB conducts the National Survey of Children's Health (NSCH), which includes zip code data, allowing children to be sorted into urban areas, large rural areas and small rural areas, the latter categories incorporating measures of distance to a city or large town. Using the NSCH, HRSA issues a report on the health and well-being of children living in rural areas.

Children in rural areas also have greater health risks and may have greater health complications. For example, children in rural areas are less likely to be breastfed as infants, are more likely to be obese, and are more likely to live with someone who smokes (HRSA, 2011). Rural children may also be more likely to have a mental health problem than urban children, have reduced access to all needed mental health services, and need more time for care coordination (Lenardson et al., 2010). Rural children have complicating factors beyond the traditional health system. Children in rural areas are more likely to repeat a school grade, more likely to spend more than an hour each weekday watching television, and less likely to have access to a community recreation center, park, or playground (HRSA, 2011).

However, some positive indicators are also present amongst rural children, including an increased connectedness to their families and communities, expressed by a larger percentage of children who shared a meal with their families every day in the past week; increased rates of physical activity and religious service attendance; and an increased likelihood of living in a safe and supportive community, as judged by their parents (HRSA, 2011).

**Children with special health care needs**

Children with special health care needs are defined as, "those who have or are at increased risk for a chronic physical, developmental, behavioral, or emotional conditions and who also require health and related services for a type or amount beyond that required by children generally (McPherson et al., 1998)." MCHB describes this definition as purposely broad and inclusive, intending to capture the common characteristics of this population (MCHB, Chartbook, 2005-2006). Bethell and colleagues developed a screening instrument to use in

identifying these children in national surveys studying this population including the NS-CSHCN (Bethell et al., 2002).

According to the most recent data from the NS-CSHCN, which is sponsored by the MCHB, 15.1 percent of all children in the U.S. meet the definition, an increase from 13.9 percent in 2005-2006 survey and 12.8 percent in the 2001 survey (Data Resource Center, 2012). The MCHB said the reasons for the increase between the 2001 and 2005-2006 surveys were unclear, noting the possibility that diagnoses could have increased, rather than the actual number of children with special health care needs (MCHB, Chartbook 2005-2006). However, some researchers concluded that the "relative medical complexity of hospitalized pediatric patients has increased in the last 15 years" after studying the hospitalization rates of children with complex chronic conditions, a subset of CSHCN with the most intensive health care needs (Burns et al., 2010). And the number of children with complex chronic conditions may be increasing due to increased survival rates for members of this population (Cohen et al., 2011). As their numbers increase, CSHCN may also have difficulties accessing appropriate care. Research shows that CSHCN may be twice as likely to have an unmet need for health care services as the general pediatric population (Skinner, Slifkin, Mayer, 2004).

The costs of caring for CSHCN are higher than average children. One study found that 20 percent of children in the U.S. account for approximately 80 percent of all children's health care expenditures (Elixhauser et al., 2002). These costs also weigh on public insurance programs. Of all children enrolled in Medicaid and the State Children's Health Insurance Program (CHIP), approximately 10 percent, most of whom are chronically ill (and would meet the CSHCN

definition), account for 72 percent of the costs of those programs (Kenney, Ruhter, Selden, 2009).

**The medical home and care coordination**

In 1992, the AAP issued a policy statement that all children should have a "medical home," resulting in care that is continuous, comprehensive, family centered, coordinated, compassionate, and culturally effective (AAP, 2002). This concept has been adopted and furthered by the federal government, the pediatric community, and related advocacy groups since then. In 2000, HHS issued a goal of having all CSHCN within a medical home by 2010. HHS, through the MCHB, also established six core criteria (or outcomes) for CSHCN, including participation in a medical home (HHS, 2000):

1. Families of children and youth with special health care needs partner in decision making at all levels and are satisfied with the services they receive;
2. Children and youth with special health care needs receive coordinated ongoing comprehensive care within a medical home;
3. Families of CSHCN have adequate private and/or public insurance to pay for the services they need;
4. Children are screened early and continuously for special health care needs;
5. Community-based services for children and youth with special health care needs are organized so families can use them easily; and
6. Youth with special health care needs receive the services necessary to make transitions to all aspects of adult life, including adult health care, work, and independence.

The NS-CSHCN surveys families with CSHCN to determine whether or not these goals are being met. The survey breaks down the core outcomes into additional components. For example, the core outcome of having a medical home is broken down into five parts: 1) having a usual source of care; 2) having a personal doctor or nurse; 3) receiving all needed referrals for specialty care; 4) receiving help as needed in coordinating health-related care; and 5) receiving

family-centered care. In the 2005-2006 survey, most children were receiving at least one of these components, but only 47 percent achieved all five (Strickland et al., 2009). In the 2009-2010 survey, only 43 percent achieved all five (DRC, 2013).[5]

In the study by Strickland et al., the component of a medical home that was least often achieved was whether the children and family were receiving effective care coordination when needed, with just 59 percent of respondents answering yes. Care coordination is a critical component of the medical home model, described by the AAP as "the key to efficient management of the many complex issues surrounding the care of children with special health care needs within the context of the medical home" (AAP, 1999). The AAP wrote that care coordination "occurs when a specified care plan is implemented by a variety of service providers and programs in an organized fashion." Thus, it is marked not just by coordination within the health care system, but also by utilizing the educational system, the social service and public health systems, and the family/home setting (AAP, 1999). In practice, the definition of care coordination is somewhat vague, but policymakers have coalesced around some common elements. For example, a recent survey of five states that employed care coordination models for CSHCN showed that all the states' models included the following five features: 1) developing and maintaining resource lists for providers; 2) working closely with community service providers and agencies to facilitate links to providers and families; 3) informing pediatric providers of patient status regarding services referred and obtained, evaluation results, and so forth; 4) allowing flexibility at community or practice level to best meet the patient's needs; and

[5] 2009/2010 National Survey of Children with Special Health Care Needs, Nationwide Profile, Data Resource Center.

5) systematically tracking barriers and service gaps to address with stakeholders (Silow-Carroll, Hagelow, 2010).

Research shows various benefits for CSHCN who participate in a medical home model or care coordination strategy. Children who received care coordination have reported shorter hospital lengths-of-stay and associated costs; improved parent satisfaction with pediatric primary care; a reduction in parents' days of missed work and reduced need for their child's hospitalization; reduced school absences and ambulatory visits; reduced emergency department visits; and an increase in less-costly outpatient care coupled with a reduction in inpatient hospital admissions resulting in reduced average payments per claim (Liptak et al., 1998; Palfrey et al., 2004; Farmer et al., 2005; Klitzner et al., 2010; Tinajero, Garneau, 2009).[6]

**Rural CSHCN**

Given the known benefits of the medical home and care coordination efforts for CSHCN and the known problems with health care access for rural children, I now turn to the needs of CSHCN living in rural areas. The lack of available data presents an obstacle to analyzing the traits and needs of CSHCN living in rural areas. By far the best data source of CSHCN nationally is the NS-CSHCN. However, access to the geographic location data, which would indicate the rurality of respondents, is greatly limited due to privacy concerns.

The National Center for Health Statistics (NCHS), a division of the Centers for Disease Control and Prevention, conducts the NS-CSHCN and has control over the use of the survey's data. The NCHS has a contractual agreement with the Data Resource Center for Child and

[6] These studies and others looking at care coordination strategies for CSHCN were summarized in a work by Wise, Huffman and Brat (2007) on behalf of the Agency for Healthcare Research and Quality, an organization within HHS.

Adolescent Health (DRC) to receive confidential data and display high-level analysis to the users of its website. Among the confidential data provided to the DRC includes a measure of rurality for each child surveyed, designated by Rural-Urban Community Area (RUCA) codes.[7] (While there are many definitions of "rural" to choose from, these codes have been in use for more than a decade and are used to determine eligibility for many federal programs.) The RUCA codes are developed by looking at the relationships between cities and towns as measured by work community flows. There are 33 different RUCA codes assigned to 10 categories, ranging from "metropolitan area core" to "rural areas." The Data Resource Center then further reduced these 10 categories into four categories, based on usage recommendations from the Rural Health Research Center, at the University of Washington: 1) urban core, contiguous built-up areas of 50,000 persons or more; 2) suburban, areas where 30 percent to 49 percent of the population commutes to urban areas for work; 3) large rural town, including towns of populations between 10,000 and 49,000 and their surrounding areas; and 4) small town/rural, including towns with populations below 10,000 and other isolated areas more than an hour's drive to the nearest city. Unfortunately, the Data Resource Center cannot associate the RUCA codes with the individual respondents in the NS-CSHCN dataset due to privacy issues, meaning that even this basic definition of rurality cannot be used on an individual bases for analysis. Therefore, the Data Resource Center's analysis of these data is limited to percentages of the groups involved and does not include regression analysis.

[7] The Data Resource Center for Child and Adolescent Health (DRC) is a project of the Child and Adolescent Health Measurement Initiative, housed at the Oregon Health & Science University. Its mission is "to advance the effective use of public data on the status of children's health and health-related services for children, youth and families in the United States."

The Data Resource Center produced a breakdown of how CSHCN nationwide performed on various health outcome and performance indicators the through the lens of those four population designations. In several cases, children living in the category designated for small town and rural areas performed below their urban counterparts. For example, CSHCN in small town/rural areas were screened early and continuously for special health care needs 12 percentage points less often than children living in an urban core (one of the MCHB core outcomes); the families of CSHCN in rural areas were four percentage points more likely to spend 11 hours or more per week providing or coordinating their child's health care than children living in an urban core; and in small town/rural areas, the conditions of CSHCN caused financial problems for the family more than three percentage points more often than children living in an urban core area. However, CSHCN in small town/rural areas received coordinated, ongoing, comprehensive care within a medical home 2.5 percentage points more often than children living in an urban core (DRC, 2012).

Because of the limited availability of the geographic location data, researchers have utilized other methods to define the rurality of the CSHCN population, using the resources that are available in the NS-CSHCN. Most notably, Skinner and Slifkin (2007) used the available data on whether or not the child surveyed lived in a metropolitan statistical area (MSA) of more than or fewer than 500,000 individuals to analyze the differences in barriers to care and burden of care between rural and urban CSHCN, using the 2001 NS-CSHCN as their dataset. [8] The authors

[8] These data also had limitations. The NCHS suppressed the relevant variable (MSASTATR) whenever the "sum total population for all MSA areas in a given state was less than 500,000 persons, or whenever the sum total population for all the non-MSA areas in a given state was less than 500,000 persons. In the 2005-2006 Survey, this resulted in the suppression of the MSA identifier in 16 states" (Blumberg et al., 2008). As a result, Skinner and Slifkin imputed data for respondents living in those states. Based on

acknowledge the lack of precision in using this measure as a proxy for rural or not-rural observations; they also used additional control variables of poverty, insurance status, race, and mother's education due to their relatedness to the health outcomes of interest and rurality.

With this methodology, Skinner and Slifkin found that rural CSHCN are less likely than their urban counterparts to be seen by a pediatrician and more likely to have unmet health needs due to transportation difficulties or because care was unavailable in the area and more likely to forego needed dental care and have unmet dental needs due to the difficulty of accessing care and lack of parental health literacy. The researchers also found that their parents were more likely to report financial difficulties associated with their children's medical needs and more likely to provide care at home for their children (Skinner, Slifkin, 2007; Skinner, Slifkin, Mayer, 2006). Importantly, the authors note that these consequences remained after adjusting for socioeconomic effects, indicating that health system changes may be necessary for improvement. The authors recommended further research on whether or not a medical home could exist in a rural area, given that general practitioners may not have the "experience, facilities and proximity to other providers necessary to manage special health care needs as well as pediatricians, particularly to a medical home (Skinner, Slifkin 2007)."

Regardless of the obstacles, the outcomes described by Skinner and Slifkin as well as their observation that a change in health systems may be necessary to improve outcomes implies that pursuing medical homes and care coordination efforts in rural areas would be a step in the right

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recommendations from the NCHS staff, respondents living in the predominantly metropolitan states of Connecticut, Delaware, Hawaii, Massachusetts, Marlyand, New Hampshire, Nevada and Rhode Island were categorized as residing in an MSA; while those living in the predominantly rural states of Alaska, Idaho, Maine, Montana, North Dakota, South Dakota, Vermont and Wyoming were categorized as residing outside an MSA.

direction for this population. McClune (2009) suggested that a medical home for rural CSHCN might be developed by using a pediatric nurse practitioner as a care coordination worker, theorizing this would reduce unmet therapeutic and supportive needs and increase satisfaction with the accessibility of healthcare and a perception of improved self-efficacy on the part of the parents of CSHCN. Others have concluded that comprehensive care is a worthwhile endeavor for CSHCN in rural areas, showing significant positive outcomes after deploying a care coordination program in a rural state. Results included "significant increases in satisfaction with care coordination and access to mental health services," as well as "decreases in family needs caregiver strain, parents' missed work days, children's school absences and utilization of ambulatory services (Farmer et al., 2005)."

**Original contribution**

My thesis will be the first to look at the 2009-2010 NS-CSHCN from a rural perspective, studying the health care needs and outcomes of this especially needy population of children. I will incorporate the method of measuring rurality utilized by Skinner and Slifkin plus additional control variables from the 2009-2010 NS-CSHCN, including some that were not included in the Skinner and Slifkin model.

## III. Theoretical Framework

In my thesis, I seek to determine the connection between living in a rural area and various health indicators and outcomes for children with special health care needs. I present the following theoretical model as a simple construct to establish the framework for the types of variables that will be used in this analysis.

$$\text{Health outcomes} = f(\text{Rurality, Control variables, } \mu) \quad (1)$$

The logic of the model is that rural areas present factors for CSHCN that reduce their health care outcomes. These include social, behavioral and economic factors of the kind discussed in the literature review as well as definitional characteristics of rural areas (lack of population, transportation, etc.) that present barriers to appropriate and sufficient health care access. Once implemented as an empirical model, I must also account for variables that may already include some of the variability represented in rural areas, such as income, education, race, ethnicity and insurance status. Most importantly, I must consider for the broad array of severity of conditions that the definition of CSHCN encompasses, in other words, their health status; I can do this by accounting for the functional, emotional and activity limitations that each child surveyed reported to experience.

## IV. Data and Descriptive Statistics

I use data from the NS-CSHCN conducted in 2009 and 2010. The survey was performed using the State and Local Area Integrated Telephone Survey (SLAITS) mechanism, which was developed by the National Center for Health Statistics (NCHS) of the Centers for Disease Control and Prevention and is an oft-used method for gathering information on health topics nationwide. As noted previously, this is the third time this survey has been conducted, after surveys in 2001 and 2005-to-2006. The NCHS oversees the sampling and telephone interviews of the survey, under the direction and sponsorship of the MCHB. The telephone survey was conducted with independent random-digit-dial samples in all 50 states and the District of Columbia, resulting in a total of 40,242 detailed interviews nationwide, with at least 750 interviews in each state and the District of Columbia.

Using the aforementioned Bethell screening methodology, the NS-CSHCN survey determines whether or not a child qualifies under these criteria based on the presence of the following five measures: the need for or use of prescription medications; the elevated need for or use of medical, mental health, or educational services; functional limitations; the need for or use of special therapies; or emotional, developmental or behavioral conditions that require treatment. Parents of children under 18 years of age who have one or more of these signs are then asked whether these characteristics are attributable to a medical, behavioral or other health condition and whether the condition has lasted or is expected to last for at least 12 months. If the answer to this follow-up question is yes, then the child is considered to have special health care needs and the interview proceeds (Child and Adolescent Health Measurement Initiative, 2012).

Survey topics are broken down into categories of questions, including: the child's health and functional status; the child's health insurance status and adequacy of coverage; the child's access to health care, including types of health care services needed and any unmet needs for care; preventive medical and dental care and specialty services received; the family-centeredness of the child's health care and care coordination; the child's access to community-based services; the child's readiness for his or her transition to adulthood; the impact of the child's health on his or her family; and, lastly, the demographics of the child and his or her family (DRC, 2012).

These questions allow researchers to ascertain whether or not CSHCN are receiving care that reflects the six core outcome measurements and 15 key child health indicators developed by the MCHB. As I discussed earlier, the NS-CSHCN breaks down the core outcomes into subcomponents; again, the core outcome of having a medical home is broken into five parts: 1) having a usual source of care; 2) having a personal doctor or nurse; 3) receiving all needed referrals for specialty care; 4) receiving help as needed in coordinating health-related care; and 5) receiving family-centered care. The variable in the data set indicating whether or not a child's care meets all components of the medical home is Outcome2. The descriptive statistics for this variable and the other key child health indicators, outcomes and socio-demographic and health stratifiers are listed in the table at the end of this section.

The main policy variable in my regressions is a dummy variable indicating whether or not the child lives in a metropolitan statistical area of 500,000 people; if the child does live in an area of 500,000 people or more, they are assigned a 1; and if they live in an area with less than 500,000 people, they are assigned a 0. This is the same measure of rurality employed by Skinner and Slifkin and the only approximation of rurality that can be obtained through the NS-CSHCN

without a special research waiver request. Additionally, as was the case with Skinner and Slifkin, this dataset contains MSA status observations that were withheld for states where the "sum total population for all MSA areas in a given state was less than 500,000 persons, or whenever the sum total population for all the non-MSA areas in a given state was less than 500,000 persons." As a result, similar to the methodology used by Skinner and Slifkin, I have imputed data for withheld observations in 16 states in the following manner: respondents living in the predominantly metropolitan states of Connecticut, Delaware, Hawaii, Massachusetts, Marlyand, New Hampshire, Nevada and Rhode Island were categorized as residing in an MSA; while those living in the predominantly rural states of Alaska, Idaho, Maine, Montana, North Dakota, South Dakota, Vermont and Wyoming were categorized as residing outside an MSA.

I use additional control variables in each of my regressions to account for variance unrelated to rurality so as to better isolate the effects of the main policy variable. These control variables are the following: the highest education level of a parent in the child's household; the current poverty level of the household; whether or not the child is black, non-Hispanic; whether or not the child is of another minority race, other than black; whether or not the child is Hispanic; whether or not the child is uninsured; whether or not the child has problems with one or more body functions; whether or not the child has problems with one or more emotional functions; and whether or not the child has problems with certain activities. A further description of these control variables is available in Appendix B.

Some of these control variables contained missing observations that were coded as "99" in the Stata output. As a result, these observations were dropped for all variables, reducing the total sample size from 40,242 to 39,195. The variable accounting for the most missing

observations, by far, was the measure of whether or not a child between ages 18 months and 17 years demonstrated emotional difficulties; since the entire dataset is from birth to 17 years, the cohort of children from 0-to-18 months was skipped when this question was asked; therefore, these 922 observations were coded as "legitimate skip" and the entries of the children paired with those observations were dropped from the sample. I tested for correlation between this cohort and the outcome variables and did not find any, so I have no reason to believe that omitting these variables would create a biased sample.

The descriptive statistics for the independent (outcome) variables and dependent variables are listed below, in Tables 4.1 and 4.2. In table 4.2, the outcome variables for which I later report regression results are listed in **bold**.

**Table 4.1**

| **Metric** | **Rural** | **Urban** |
|---|---|---|
| Sample size | 11,963 | 27,232 |
| Poverty | | |
| Below 100 | 20.13 | 15.64 |
| 100-200 | 24.56 | 16.74 |
| 200-300 | 19.32 | 15.75 |
| 300-above | 36.00 | 51.86 |
| Uninsured | 3.4 | 2.6 |
| Race | | |
| White | 82.61 | 73.81 |
| Black | 5.42 | 12.56 |
| Other minority | 11.97 | 14.63 |
| Ethnicity | | |
| Hispanic | 7.16 | 12.78 |
| Education | | |
| Less than high school | 5.68 | 5.07 |
| High school graduate | 18.08 | 13.53 |
| More than high school | 76.24 | 81.40 |
| A little or a lot of functional difficulties | | |
| Emotional difficulties | 42.03 | 44.61 |
| Activity difficulties | 40.42 | 41.88 |
| Body difficulties | 32.12 | 33.86 |
| | | |

**Table 4.2**

| Variable | Observations | Mean | Std. Dev. | Min. | Max. | % Missing, Don't Know, Refused, Skip |
|---|---|---|---|---|---|---|
| outcome1 | 38839 | 0.7375576 | 0.4399675 | 0 | 1 | 0.91 |
| **outcome2** | **37946** | **0.4688241** | **0.4990337** | **0** | **1** | **3.19** |
| outcome3 | 38750 | 0.6241032 | 0.4843598 | 0 | 1 | 1.14 |
| **outcome4** | **38865** | **0.8026502** | **0.3980037** | **0** | **1** | **0.84** |
| outcome5 | 38952 | 0.6749846 | 0.4683866 | 0 | 1 | 0.62 |
| outcome6 | 16183 | 0.4439226 | 0.4968607 | 0 | 1 | 58.71 |
| indic1_0 | 39099 | 1.876953 | 0.7703955 | 1 | 3 | 0.24 |
| indic2_0 | 34064 | 1.916217 | 1.094497 | 1 | 4 | 13.09 |
| indic3_0 | 39120 | 0.0764059 | 0.2656499 | 0 | 1 | 0.19 |
| indic4_0 | 39195 | 0.0288302 | 0.1673312 | 0 | 1 | 0.00 |
| **indic5_0** | **37679** | **0.6678256** | **0.4709994** | **0** | **1** | **3.87** |
| indic6_0 | 38478 | 0.2775092 | 0.585998 | 0 | 2 | 1.83 |
| indic7_0 | 39099 | 0.0639147 | 0.244604 | 0 | 1 | 0.24 |
| indic8_0 | 12727 | 0.1986328 | 0.3989866 | 0 | 1 | 67.53 |
| ercare | 39119 | 0.0802423 | 0.2716715 | 0 | 1 | 0.19 |
| indic10_ | 39144 | 0.9388923 | 0.2395308 | 0 | 1 | 0.13 |
| indic11_ | 38647 | 0.6824333 | 0.4655359 | 0 | 1 | 1.40 |
| indic12_ | 38634 | 2.255785 | 1.215035 | 1 | 4 | 0.71 |
| **indic13_** | **38918** | **0.2024256** | **0.4018129** | **0** | **1** | **1.43** |
| indic14_ | 37729 | 1.870312 | 0.9693462 | 1 | 4 | 3.74 |
| **indic15_** | **38934** | **0.2231469** | **0.4163614** | **0** | **1** | **0.67** |
| msastatr | 39195 | 0.6947825 | 0.4605054 | 0 | 1 | -- |
| educ_09 | 39195 | 2.745631 | 0.5429913 | 1 | 3 | -- |
| povleve0 | 39195 | 6.360352 | 2.762505 | 1 | 9 | -- |
| hispani0 | 39195 | 0.1106264 | 0.3136729 | 0 | 1 | -- |
| black | 39195 | 0.1037887 | 0.3049902 | 0 | 1 | -- |
| other | 39195 | 0.1381809 | 0.3450941 | 0 | 1 | -- |
| uninsured | 39195 | 0.0288302 | 0.1673312 | 0 | 1 | -- |
| insured | 39195 | 0.9711698 | 0.1673312 | 0 | 1 | -- |
| body_ICF | 39195 | 0.6667177 | 0.4713925 | 0 | 1 | -- |
| activity | 39195 | 0.5856614 | 0.4926138 | 0 | 1 | -- |
| emot_ICF | 39195 | 0.5618064 | 0.4961716 | 0 | 1 | -- |

## V. Empirical Model

The empirical model I use to determine the effects of rurality on health indicators and outcomes for children with special health care needs will use several regressions, each looking at whether rurality impacts a different indicator or outcome. The model of independent variables will not differentiate much between each of these equations, and an example is below:

$$\textit{Dependent variable} = \beta_1 msastatr + \beta_2 educ\_09 + \beta_3 povleve0 + \beta_4 hispani0 + \beta_5 black + \beta_6 other + \beta_7 uninsured + \beta_8 body\_ICF + \beta_9 activity + \beta_{10} emot\_ICF + \mu \quad (2)$$

Where: *msastatr* is a dichotomous variable showing whether or not the CSHCN was living in a metropolitan statistical area of 500,000 or greater persons; this is the main policy variable I am studying. My hypothesis is that children living in rural areas (designated as those metropolitan statistical areas with less than 500,000 persons) are associated with reduced health outcomes and health indicators.

*educ_09* is an ordinal variable showing how much education the person with the most education in the household has obtained with categories for less than high school (1), high school graduate (2) and more than high school (3). Since these categories are not uniform in their parameters (there are many levels of post-high school education, hence tremendous variation), then there is a non-linear relationship between the co-efficient of the independent variable and the dependent variable. However, the sign and magnitude of the relationship is still worthwhile. It should be expected that education has a direct correlation with improved health outcomes and a negative correlation with adverse health outcomes and indicators. This would mean that as the education level of a household increases, the more likely that the child living in that household will have positive health outcomes and vice-versa.

*poveleve0* is an ordinal, non-continuous variable assigning a poverty score for each household based on income relative to federal poverty guidelines. As household income increases, the poverty score assigned to that family does as well; for example, households with income at or below 50 percent of the federal poverty level are assigned a 1, while households with income at or above 400 percent of the federal poverty level are given a 9. However, it is important to note that observations are sorted into categories with non-uniform parameters; for example, children of families between 50 percent and 100 percent of the federal poverty level (a 50-point difference) are assigned a 2, and children of families between 100 and 133 of the federal poverty level (a 33-point difference) are assigned a 3.[9] Therefore, the regression results don't offer a linear relationship between the co-efficient of the independent variable and the dependent variable. Still, like measuring for education, the sign and magnitude of the relationship is still worthwhile. It should be expected that poverty level has a direct correlation with improved health outcomes and a negative correlation with adverse health outcomes and indicators. This would mean that as the poverty score of a household increases, the more likely that the child living in that household will have positive health outcomes and vice-versa.

Research indicates that disparities exist between racial and ethnic minorities and the national average in critical health indicators and outcomes, such as health insurance coverage, influenza vaccination coverage, infant deaths, asthma rates and other areas (CDC, 2011). Therefore, I account for the factors of race and ethnicity by including the dichotomous variables of *hispani0*, which indicates whether or not the child is of Hispanic ethnic origin; *black*, which indicates whether or not the child is of African-American race, non-Hispanic; and *other*, which

[9] Each category of povleve0 is outlined in Appendix B.

indicates whether or not the child is of another minority race other than African-American, inclusive of Latinos, Asian Americans, American Indians, Alaskan Natives, Hawaiian Natives and other races.[10] For each of these control variables, I expect that the signs of their coefficients will have a negative correlation with positive health indicators and a positive correlation with negative health indicators. However, given that this model adjusts for poverty level and education attainment, any remaining variation explained by race and ethnic origin may be small.

*uninsured* is a dichotomous variable reflecting whether or not the child is uninsured, which equals 1 if the child is uninsured.[11] Children who are uninsured have reduced access to medical care and are more likely to get their care through the emergency room (19.82 percent of the time compared to 6.5 percent for privately insured children and 9.7 percent for publicly insured children in this sample); their families are more likely to have financial problems due to their conditions (46.28 percent versus 17.51 percent for privately insured children and 20.29 percent for publicly insured children); and are less likely to have their care coordinated through a medical home model (27.52 percent versus 51.95 percent for privately insured children and 36.07 percent for publicly insured children).

*body_ICF* is a dichotomous variable measuring whether or not the child has either no difficulties involving bodily functions or a little/a lot of difficulty with one or more bodily functions, defined as the following: breathing or respiration, swallowing or digestion, blood

[10] I created the dummy variables for black and other by deconstructing the racer_im variable provided in the dataset. In the original variable, white respondents were coded as 1, black respondents coded as 2 and other minorities coded as 3. Using these data, I created a dummy variable for each of these responses.

[11] I created the dummy variable for uninsured by deconstructing the typeins variable provided in the dataset that describes what type of insurance the child has. With the original variable, private insurance was coded as 1; public insurance as 2; both public and private as 3; other comprehensive insurance as 4; and uninsured as 5. Using these data, I created a dummy variable for each of these responses.

circulation, chronic physical pain including headaches, seeing even when wearing glasses or contacts, hearing even when using a hearing aid. This variable equals one if the child has such difficulties and zero otherwise. Because CSHCN is a wide-ranging population with conditions varying in severity from asthma to congenital heart defects, this is a crucial variable to account for in regressions. A large amount of the child's health outcomes and indicators can be explained by the severity of their illness. It should be expected that as the severity of the child's condition worsens, then they are more likely to have negative health outcomes and indicators, and vice-versa.

*activity* is a dichotomous variable measuring whether or not the child years has either no difficulties with activities or participation, defined as the following: self care, coordination or moving around, using hands, learning, understanding or paying attention, speaking, communicating or being understood. This variable equals one if the child has such difficulties and zero otherwise. While this measures different functional difficulties than the *body_ICF* variable, we can expect it to behave in the same way, carrying a negative correlation with health outcomes and indicators, and vice-versa.

*emot_ICF* is a dichotomous variable measuring whether or not the child, aged 18 months-to-17 years has either no emotional or behavioral difficulties or a little/a lot of difficulty with one or more emotional or behavioral factors, defined as: feeling anxious or depressed, acting-out, fighting, bullying or arguing, making and keeping friends. This variable equals one if the child has such difficulties and zero otherwise. While this measures different functional difficulties than the *body_ICF* and *activity* variables, we can expect it to behave in the same ways, carrying a negative correlation with health outcomes and indicators, and vice-versa.

As I stated earlier, unfortunately, there were a large number of emot_ICF observations scored as missing due to being legitimate skips as the child was not old enough to meet the criteria for this variable. As a result, 922 observations were emot_ICF was missing were dropped. These observations were dropped throughout the dataset, resulting in a total population that is aged 18 months or older. I ran test regressions against all of my outcome variables before and after omitting these observations to see if omitting these children from the dataset would introduce bias; it did not. All of the correlations and magnitudes were roughly equivalent before and after dropping these observations.

I conducted 21 separate regressions, one for each six core outcomes and 15 key child health indicators developed by the Maternal and Child Health Bureau. I ran these regressions using logit and ordered logit analyses, for dichotomous or ordinal dependent variables, respectively, with odds-ratio output. All analyses are performed using Stata 12.0 and were adjusted for survey design using the survey's probability weights and stratum and primary sampling unit variables. In the next section, I report the regression results with statistics for joint significance for each regression and the coefficients, standard deviation and significance for each individual independent variable in the regression. Later in the section, I discus how the signs of the independent variable coefficients compared with my expected results and hypothesis.

## VI. Regression Results

Of the 21 regressions I completed, I report five for further discussion below. I chose these five regressions because of their joint significance and because of the importance of rurality to each regression; in each case, the effect of *msastatr* is significant at the 95-percent level. The F-statistic of joint significance for each of the regressions below is well beyond the 99-percent confidence level, indicating joint significance of the explanatory variables on the dependent (or outcome) variables. The regressions I do not report either did not carry joint significance; rurality itself was not significant at the 95-percent level; or I prioritized other more interesting results to report (which occurred in three cases)[12]. Each of these regressions were tested for omitted variable bias, and none was present in any case. In the following tables, I present the five outcome variables that were tested and the reported co-efficients, standard errors and t-values; after all of these tables, I discuss these results.

The first regression I report is on the outcome variable of whether or not the child received care through a medical home model. This is a key outcome variable to report, since as I have explained in my literature review, CSHCN who receive care through a medical home have improved health outcomes. As a result, the children who achieve this outcome variable (they receive care through a medical home) are likely to be correlated with achievement in the other outcome variables that I report. The only other of the six MCHB key outcomes that I report for discussion is whether is whether or not the child received preventive medical and dental visits in

[12] The regressions for Outcome 1, Outcome 3, and Indicator 8 also showed joint significance and msastatr was significant at the 95-percent level, but I do not discuss those results here. All regressions are reported in Appendix C.

the past 12 months. In the regression for this measure (MCHB Core Outcome 4) rurality carried a higher significance than for any other regression.

The remaining three outcome variables are all key health indicators for CSHCN where rurality displays significant correlation. It is expected that these key health indicators would also be associated with the core outcome of whether or not the child receives care through a medical home. For example, families with children who receive care through a medical home model would receive support for coordinating the care of their child between the different specialists the child must see. As a result, those parents may have to spend less time coordinating care for their child on their own and may be less likely to reduce their working hours as a result, which is what Key Health Indicator 15 measures. The tables that follow report the results of each regression, with a detailed definition of the dependent variable first.

**Table 6.1 – MCHB Core Outcome 2**

This outcome variable measures whether or not the child receives care that meets the medical home criteria as defined by the American Academy of Pediatrics and adopted by the MCHB. This is a composite measure comprising of 33 different survey items, reflecting five different sub-component topics assessing the following: the child has at least one personal doctor or nurse; the child has a usual source(s) for both sick and well care; the child receives family-centered care; the child receives needed referrals; and the child receives effective care coordination. In order to be classified as having a medical home, the child must meet both of the first two criteria (at least one personal doctor or nurse and a usual source(s) for both sick and well care) and meet the other three subcomponent criteria or qualify as a legitimate skip for those questions.[13] This is described by the MCHB as the "on every" scoring approach to whether or not the child received care through a medical home (CAHMI, 2009). The scoring for the variable is below:

0 = Child DID NOT receive adequate care on all needed components of medical home assessed by the survey;

1 = Child DID receive adequate care on all needed components of medical home assessed by the survey;

**F Test= 96.67****

| Variable | Linearized odds ratio | Standard Error | T | P>\|t\| |
|---|---|---|---|---|
| msastatr | 0.8959413 | 0.0418545 | -2.35* | 0.019 |
| educ_09 | 1.09387 | 0.0434039 | 2.26* | 0.024 |
| povleve0 | 1.052157 | 0.0088286 | 6.06** | 0.000 |
| hispani0 | 0.7544116 | 0.0519147 | -4.10** | 0.000 |
| black | 0.6290591 | 0.0387882 | -7.52** | 0.000 |
| other | 0.7264355 | 0.0480493 | -4.83** | 0.000 |
| uninsured | 0.5068513 | 0.0610057 | -5.65** | 0.000 |
| body_ICF | 0.7749331 | 0.0326785 | -6.05** | 0.000 |
| activity | 0.5936583 | 0.0267654 | -11.57** | 0.000 |
| emot_ICF | 0.5347258 | 0.0237715 | -14.08** | 0.000 |
| _cons | 1.342771 | 0.1572158 | 2.52* | 0.012 |

[13] A response may be classified as a legitimate skip if the child did not use services in the past 12 months, or didn't need a referral for services; or, as a result of not using services in the past 12 months, would not measure whether the care was coordinated or not.

**Table 6.2 – MCHB Core Outcome 4**

This outcome variable measures whether or not the child received early and continuous screening for special health care needs. Children were classified as meeting Outcome 4 if they received at least 1 preventive medical visit and 1 preventive dental visit in the last 12 months. Parents answering "don't know" or "refused" to either of the items used for the measure were not included in the scoring of the outcome and were set to missing. The scoring for the variable is below:

0 = Child DID NOT receive both preventive medical and dental visits in the past 12 months;
1 = Child DID receive both preventive medical and dental visits in the past 12 months;

**F Test = 29.86****

| **Variable** | **Linearized odds ratio** | **Standard Error** | **T** | **P>\|t\|** |
|---|---|---|---|---|
| msastatr | 1.248174 | 0.0681754 | 4.06** | 0.000 |
| educ_09 | 1.163851 | 0.0516584 | 3.42** | 0.001 |
| povleve0 | 1.06886 | 0.010305 | 6.91** | 0.000 |
| hispani0 | 0.9250904 | 0.0741573 | -0.97 | 0.331 |
| black | 1.187989 | 0.0867968 | 2.36* | 0.018 |
| other | 1.151643 | 0.0893744 | 1.82 | 0.069 |
| uninsured | 0.2962844 | 0.0347557 | -10.37** | 0.000 |
| body_ICF | 1.011473 | 0.0520709 | 0.22 | 0.825 |
| activity | 0.9390258 | 0.0521978 | -1.13 | 0.258 |
| emot_ICF | 1.002034 | 0.0549883 | 0.04 | 0.970 |
| _cons | 1.546263 | 0.1998509 | 3.37** | 0.001 |

**Table 6.3 – Key Health Indicator 5**

This outcome variable measures whether or not the child's insurance coverage was deemed "adequate." This indicator is a composite variable stemming from three questions in the NS-CSHCN about the adequacy of a child's insurance. The respondent's choices were either never, sometimes, usually or always. If the respondent answered never or sometimes to any of the three items, the child's insurance was coded as not adequate. The items were whether the current insurance covers services; whether the insurance has reasonable out of pocket expenses; and whether the insurance allows the child to see need health providers. If any response was coded as don't know or refused, then the observation was set to missing. The scoring for the variable is below:

0 = Current insurance is NOT adequate;
1 = Current insurance is adequate;

**F test = 25.08**

| **Variable** | **Linearized odds ratio** | **Standard Error** | **T** | **P>\|t\|** |
|---|---|---|---|---|
| msastatr | 0.8504193 | 0.0408796 | -3.37** | 0.001 |
| educ_09 | 0.9608694 | 0.0409888 | -0.94 | 0.349 |
| povleve0 | 0.9805479 | 0.0089583 | -2.15* | 0.032 |
| hispani0 | 0.8319932 | 0.0576158 | -2.66* | 0.008 |
| black | 0.8603181 | 0.0552617 | -2.34* | 0.019 |
| other | 0.9483605 | 0.0644777 | -0.78 | 0.435 |
| body_ICF | 0.7912061 | 0.0344026 | -5.39** | 0.000 |
| activity | 0.7313575 | 0.0349645 | -6.54** | 0.000 |
| emot_ICF | 0.6909336 | 0.0325116 | -7.86** | 0.000 |
| _cons | 5.146192 | 0.6208212 | 13.58** | 0.000 |

**Table 6.4 – Key Health Indicator 13**

This outcome variable measures whether or not the child's family experienced financial problems due to the child's health needs. This variable was a simple re-coding of the original survey question, "Have [your child's] health conditions caused financial problems for your family?" The scoring for the variable is below:

0 = No financial problems due to child's health;
1 = Yes, financial problems;

**F test = 75.35**

| Variable | Linearized odds ratio | Standard Error | T | P>\|t\| |
|---|---|---|---|---|
| msastatr | 1.145686 | 0.0634907 | 2.45* | 0.014 |
| educ_09 | 1.37783 | 0.069929 | 6.32** | 0.000 |
| povleve0 | 0.9627291 | 0.0093164 | -3.93** | 0.000 |
| hispani0 | 1.187443 | 0.0937494 | 2.18* | 0.030 |
| black | 0.8261999 | 0.066383 | -2.38* | 0.017 |
| other | 0.9765596 | 0.0800399 | -0.29 | 0.772 |
| uninsured | 3.438761 | 0.4631948 | 9.17** | 0.000 |
| body_ICF | 1.977674 | 0.1058698 | 12.74** | 0.000 |
| activity | 1.949582 | 0.1169727 | 11.13** | 0.000 |
| emot_ICF | 2.234513 | 0.12875 | 13.95** | 0.000 |
| _cons | .0287112 | 0.0044549 | -22.88** | 0.000 |

**Table 6.5 – Key Health Indicator 15**

This outcome variable measures whether or not the child's family members cut back and/or stopped working because of the child's health needs. This variable is a composite measure of two questions related to family employment resulting from the health of their child. The questions were asked sequentially in the survey as follows, "Have you or other family members stopped working because of [your child]'s health conditions?" and "Have you or other family members cut down on the hours you work because of [your child]'s health conditions?"

0 = employment not affected;
1 = family cut back hours or stopped working or both.

**F test = 91.02**

| **Variable** | **Linearized odds ratio** | **Standard Error** | **T** | **P>\|t\|** |
|---|---|---|---|---|
| msastatr | 1.160306 | 0.0639588 | 2.70* | 0.007 |
| educ_09 | 1.159051 | 0.0537054 | 3.19* | 0.001 |
| povleve0 | 0.942345 | 0.0092341 | -6.06* | 0.000 |
| hispani0 | 1.501581 | 0.1135393 | 5.38* | 0.000 |
| black | 0.9945245 | 0.0740082 | -0.07 | 0.941 |
| other | 1.250413 | 0.0930495 | 3.00* | 0.003 |
| uninsured | 1.40643 | 0.1899332 | 2.53* | 0.012 |
| body_ICF | 1.79332 | 0.0947234 | 11.06** | 0.000 |
| activity | 3.04754 | 0.1823862 | 18.62** | 0.000 |
| emot_ICF | 1.785316 | 0.1009267 | 10.25** | 0.000 |
| _cons | 0.0508638 | 0.0072852 | -20.80** | 0.000 |

* = significant at the 95-percent level;
** = significant at the 99-percent level.

## VII. Discussion

As shown in my empirical model, each regression intends to describe the effect that living in a rural area has on children with special health care needs (CSHCN) reaching the Maternal and Child Health Bureau's (MCHB) six core outcomes for family-centered, community-based, coordinated care as well as various associated health care indicators.

My hypothesis is that CSHCN living in rural areas are associated with reduced achievement of the MCHB's six core outcomes as well as negative health care indicators.

### Effects of control variables

First and foremost, I will explain the effects of the control variables aside from the main policy variable of rurality.

Adverse conditions and functional difficulties: It is clear that the three variables measuring the presence and impact of adverse conditions and functional difficulties were by far the most significant factors associated with the dependent variables. This makes intuitive sense since the CSHCN included in the survey range in severity from those with asthma or ADHD to much more complicated conditions or diseases such as cerebral palsy and sickle cell disease. These variables accounting for adverse conditions and functional difficulties had the expected signs, correlating with reduced likelihood of achieving the MCHB's six core outcomes and increased likelihood of the presence of negative health care indicators.

Families were much more likely to report financial problems due to their child's health if their child had difficulty with day-to-day activities (95 percent more likely), difficulties with body functions (98 percent), or emotional or behavioral difficulties (123 percent). Families also were much more likely to cut back working hours if their children had these conditions, with a

200-percent increase for families with children who exhibited difficulties with day-to-day activities. Unfortunately, while it is clear that these children were the most in need of a medical home and care coordination, my results show that they were much less likely to achieve this outcome – 23 percent less likely for children with body function difficulties, 41 percent less likely for children with difficulties in day-to-day activities, and 47 percent less likely for children with emotional difficulties. These families were also less likely to report their current insurance as adequate – 21 percent less so for families with children with body function difficulties, 27 percent less likely for children with difficulties in day-to-day activities, and 31 percent less likely for children with emotional difficulties.

Poverty level: The family's reported poverty level also carried a significant impact on correlation throughout all regressions, although the size of this impact varied. It maintained the expected sign in four of the five regressions reported. Better financial health correlated with increased likelihood of achieving the MCHB's core outcomes reported, and in two of the three key health indicators, increased income carried a positive correlation with better health indicators. The importance of the co-efficient of poverty cannot be exactly explained, since the categories are non-uniform in their parameters. However, roughly, the regressions show that for each increase up the poverty scale, children from higher income families were 5 percent more likely to receive care through a medical home and 7 percent more likely to have received both preventive medical and dental visits in the last 12 months. Likewise, for each move up the income scale, families of these children were 4 percent less likely to report financial problems due to their child's health and 6 percent less likely to cut back hours or stop working due to their child's health.

In the one instance in which increased income did not carry the expected sign, it was in its relationship to whether or not the child had adequate insurance coverage (Indicator 5). In this case, each climb up the poverty scale, income was associated with a 2-percent decrease in likelihood of having adequate insurance. In addition, other indicators looking at insurance – whether or not the child had been uninsured at one point in the year, Indicator 3; and whether or not the child was currently insured, Indicator 4 – both carried the expected signs, with increased income correlated with likelihood of being insured. Returning to poverty level's impact on Indicator 5, it may be that some CSHCN have income too high to qualify for public insurance, such as Medicaid or the Children's Health Insurance Program, but not high enough to afford comprehensive private insurance.

Education: We would expect that education and poverty would be highly correlated, as generally individuals with more education have higher income, and vice-versa. However, somewhat surprisingly, the education variable did not track along the same lines of correlation as poverty level in all cases. The education variable and the poverty variable carried the same sign for three of the five regressions reported. I believe that this randomness is due to a flawed education variable. Due to privacy concerns, the dataset only allows researchers to view respondent answers grouped into three categories of the highest education obtained in the household surveyed: education before high school, high school graduation and education after high school graduation. It is the third category of this variable that contains the greatest number of respondents and has the most variation, with everyone from car mechanics to physicians contained in it.

Increased education among parents of CSHCN was associated with increased likelihoods of children receiving care in a medical home (9 percent increase per category) and receiving both preventive medical and dental visits in the last 12 months (16 percent). However, this variable was also associated with increased likelihoods of reporting financial problems due to their child's health (38 percent) and of cutting back work hours or stopping work entirely (16 percent).

Ethnicity and race: The variable of ethnicity – whether or not the child is Hispanic – carried significance for four of the five of the outcome variables and its sign tracked closely with poverty level, indicating that many of the Hispanic children are from low-income families. Hispanic children were 25 percent less likely to receive care through a medical home and, thus, not surprisingly, were 50 percent more likely to have family members cut back working hours due to their child's condition. Hispanic children were also 17 percent less likely to have adequate insurance and their families were 18 percent more likely to have financial problems due to the child's health.

The variables for race, being *black* and *other*, tracked with one another, but were not significant in all cases, indicating that variables accounting for poverty and education levels may have already accounted for much of the variation that these measures would describe. Additionally, the race variables did not always track with the ethnicity variable of whether or not the child was Hispanic. For instance, while ethnicity was a significant factor for whether the family cut back their work hours, it was not if the child was black; this could indicate that language barriers were a significant factor in employment.

Insurance: Whether or not the child was uninsured was a very significant variable in every regression. Uninsured children were nearly 50 percent less likely to receive coordinated

care as their insured counterparts and were more than 70 percent less likely to have a preventive medical and dental visit in the last year. Families with uninsured children were nearly two-and-a-half times more likely to have financial problems due to their child's health than those who were insured; and were 40 percent more likely to cut back working hours or stop working to care for their child's health. I did not include this variable in the measurement of whether or not the child had "adequate insurance" as described in Key Health Indicator 5, as that would result in perfect collinearity.

**Effects of rurality**

In these five regressions, rurality had a significant impact on all of them at the 95-percent confidence level. In most cases, the results were surprisingly at odds with my hypothesis.

In two MCHB core outcomes reported, rurality carried a positive correlation with one (rural children were 10.4 percent more likely to receive care through a medical home, $p=0.019$) and a negative correlation with another (rural children were 24.8 percent less likely to have received both a preventive medical and dental visit in the last 12 months, $p=0.001$). These two results of themselves are worth discussing further. In a medical home model, care coordination and preventive care methods are paramount. Therefore, a child in a medical home would be much more likely to receive preventive medical and dental visits in the last year than a child who is not in a medical home. However, these two regressions tell us the opposite conclusion.

Interestingly, when I compare these regressions with the Data Resource Center's descriptive statistics for rural areas that I reported in my literature review, my results are strikingly similar. For example, looking at the DRC's statistics, CSHCN living in areas designated as small town/rural areas were screened early and continuously for special health care

needs 12 percentage points less often than children living in an urban core; this statistic echoes my result that rural CSHCN would be less likely to be screened early and continuously for special health care needs than kids living in an urban area. And, according to the DRC's measurement, CSHCN in small town/rural areas received coordinated, ongoing, comprehensive care within a medical home 2.5 percentage points more often than children living in an urban core; this also echoes my result that children living in a rural area are 10.4 percent more likely to achieve this outcome than children living in an urban area.

With respect to the three key health indicators reported, rurality carried a positive correlation. For example, children living in rural areas were 15 percent more likely to have adequate insurance ($p=0.001$), their families were 14.6 percent less likely to have financial problems due to their health ($p=0.014$), and 16 percent less likely to have their families cut back hours or stop working on account of their health ($p=0.007$). With these variables, the DRC's descriptive statistics do not paint as compelling of a picture of correlation as in only one case is the difference between CSHCN in small town/rural areas and their urban core counterparts more than one percentage point. In that case, the DRC's statistics showed that in small town/rural areas, the conditions of CSHCN caused financial problems for the family more than three percentage points more often than children living in an urban core area. These statistics run contrary to my results.

In the next section, I further discuss these apparent contradictions in data and what policy recommendations I can develop from these results moving forward.

## VIII. Conclusions and Policy Recommendations

In this paper, I studied the effects rurality has on the health outcomes and indicators of children with special health care needs. Based on the existing research of the negative effects that living in rural areas has on health outcomes; the challenges faced by CSHCN; and the research available on the intersection of these topics, I hypothesized that rurality would be negatively associated with the health indicators and health outcomes of CSHCN. I used data from the 2009-2010 version of the National Survey of Children with Special Health Care Needs, administered by the National Center for Health Statistics, and created 21 regressions to study these effects of rurality. To account for rurality, I used the variable *msastatr*, which indicated whether the child at the subject of the survey lived in in a metropolitan statistical area with less than 500,000 people (which I designated as rural), or one with more than 500,000 people (urban). This proxy for rurality had also been used by other researchers using previous years' versions of this dataset. I also controlled for the effects of poverty, education, race, ethnicity, insurance status and health status.

This paper contributes to the field of research as it is the first to use regression analysis on the 2009-2010 NS-CSHCN to investigate the impact of rurality on this population. It is also, to my knowledge, the first to account for health status when considering the impact of rurality on CSHCN, using the NS-CSHCN as its dataset.

In the 21 regressions I completed, my measurement of rurality, *msastatr*, carried significance at the 95-percent confidence level in only eight cases, and in only one of those cases was living in a rural area associated with a negative health outcome or indicator: a 24.8 percent reduction in the likelihood of being screened early and continuously for special health care needs

(tested as whether the child had received preventive medical and dental visits in the last 12 months). This outcome was supported by the DRC's descriptive statistics for CSHCN broken down by four categories of rurality, in which CSHCN living in areas designated as small town/rural areas were screened early and continuously for special health care needs 12 percentage points less often than children living in an urban core. Additionally, in an analysis of rural and urban CSHCN by Skinner and Slifkin using the 2001 NS-CSHCN dataset, the authors found that rural CSHCN were less likely to receive needed dental care than their urban counterparts. In their findings, the authors said this was due to two factors: limited access to dental care in rural areas, and a perceived lack of need by rural parents for dental care, particularly preventive care (Skinner, Slifkin and Mayer, 2006).

In all other regressions for my analysis in which *msastatr* was significant at the 95-percent level, this variable was associated with improved health outcomes and positive health indicators for rural children compared to urban children. This presents seemingly contradictory data against the result that rural CSHCN have reduced likelihood of receiving preventive medical and dental care. In particular, one of my regressions showed that CSHCN living in rural areas were 10.4 percent more likely to receive care through a medical home. It should be expected that the trends of receiving care through a medical home and obtaining preventive medical and dental visits would track along with one another, since preventive care and screening is a central point of maintaining a medical home, but my regressions show otherwise. Interestingly, though, this apparent contradiction was also present when looking at the DRC's descriptive statistics for these metrics, where rurality had a more refined definition and yet carried the same associations as those I reported for these two regressions.

It is difficult to reconcile the apparent contradiction between these results when considering the regressions at face value. Why would rural CSHCN be less likely to receive preventive screenings, but more likely to have health care through a medical home? Looking deeper at the national descriptive statistics for CSHCN and these outcomes, one can make the somewhat implausible case that both can be true at the same time. Unfortunately, medical home adoption is still limited amongst CSHCN nationally, as only 43 percent in the 2009-2010 survey were classified as receiving care in a medical home. Meanwhile, preventive medical and dental testing is much more common, with 78.6 percent of children nationwide achieving the standard set forth by the MCHB. So, we could have a phenomenon in which a small subset of well-informed parents in rural areas represent both the population who have their children receiving care within a medical home and the population that receives preventive care, while in the urban areas, a broad spectrum of parents of CSHCN may be likely to understand the importance of having their children receive preventive care, but, as a population, less likely to be aware of the importance of a medical home. In essence, this would be a case in which the subset of rural parents whose children receive care within a medical home is skewed toward the more affluent and well-educated, who may also have reduced barriers to accessing preventive medical and dental care in rural areas, unlike the general rural population. It may also be that these data are skewed in rural areas by parents with children who have less severe cases of special health needs and are less likely to pursue a medical home and preventive dental and medical care because of access issues or perceived lack of need.

If I set aside the contradiction between the likelihood of receiving preventive medical and dental care and the likelihood of receiving care through a medical home, there is still the problem

that seven of the eight regressions produced data demonstrating that rural CSHCN have better outcomes and health indicators than urban CSHCN, which goes against the existing research literature.

A possible explanation for this is that the sickest of the rural population may decide to move to urban areas for treatment, thereby producing a less-healthy population of CSHCN in urban areas than in rural areas. I discussed this possibility with health researchers affiliated with Boston Children's Hospital, one of the preeminent children's hospitals in the nation. While they acknowledged that this possibility does exist, they did not have any data to support this theory. To further test this concept, I ran regressions of health status against rurality to test for correlation between these variables and found none.

We should also think about the possibility that *msastatr* is a better measure of measure of whether or not a child lives in an urban area than as a measure of rurality. While those children living in an MSA of less than 500,000 people might not be classified as rural citizens, we know that, by any reasonable definition, any child who lives in an MSA of more than 500,000 people is living in an urban area. If we look again at my data and regression results through this lens, it could be interpreted that CSHCN living in urban areas are 15 percent less likely to have adequate insurance, their families are 14.6 percent more likely to have financial problems to their health, 16 percent more likely to have their families cut back hours or stop working on account of their health, and are 10.4 percent less likely to have a medical home than children not living in an urban area.

Based on these results, we could declare that urban CSHCN are in greater need for health services and supports than their non-urban counterparts. If the goal is to improve health

outcomes amongst this population, policymakers should consider investing in programs to provide better health insurance options to urban families of CSHCN, which would also likely reduce their financial strain. Additionally, a medical home would provide urban families support in care coordination for their child, likely leading to reduced need to have parents cut back working hours or stop working entirely on account of their child's health.

However, while all of these recommendations for urban and rural families may be perfectly good policy prescriptions, I can only arrive at those conclusions by considering my regression results on face value, which is difficult to do given the existing research literature that compelled my hypothesis that rural CSHCN have reduced health outcomes and health indicators. It is difficult to accept these regression results because I'm concerned that *msastatr* may not be a strong enough measure of rurality.

I used the variable of whether or not a child is living in an MSA of less than 500,000 people as a measurement of rurality, as other researchers have, but reflecting upon my regression results, I do not believe it holds up to scrutiny. This measurement of rurality includes too much variation, ranging from cities such as Lansing, Michigan, and Lincoln, Nebraska, homes of two state capitals and Big Ten Universities, to parts of the country where children must travel dozens of miles to simply get to school in the morning. The Data Resource Center, which analyzes the NS-CSHCN for public consumption, doesn't even begin its categorization of rurality until the population of a town is below 50,000 people, ten times below the threshold at which rurality is measured in my analysis.

To get a better understanding of the implications that living in rural or urban areas has on CSHCN, the administrators of the survey, the National Center for Health Statistics, should

provide better access to more specific geographic location data to the public. It's understandable that for privacy rules the NCHS would prohibit the public from accessing zip code data, but the public should be able to access the RUCA codes assigned to each of the subject interview files created by the Data Resource Center. Given that there are four designations of population areas, it seems implausible that anyone would be able to ascertain the identity of a child based on that data. When releasing these data, I would recommend a simple ordinal, non-continuous variable coded as follows: 1, urban core; 2, suburban; 3, large town; and 4, small town/rural.

In conclusion, I am unable to reject my hypothesis that children with special health care needs in rural areas suffer worse health outcomes and have worse health indicators than urban CSHCN. I cannot reject this hypothesis because I believe that the data used to test my hypothesis may be flawed. Further research should be done on this population but with more refined data for measuring rurality, such as the RUCA codes which have been created by the DRC for its own statistical analysis, but not for public consumption.

**Appendix A**

Any observations that were missing or the respondent answered "don't know" or refused to answer were coded in STATA with non-meaningful numbers to set aside these observations, most often "99." In each of these cases, these numbers were set to "missing" in STATA and their values were excluded from analysis.

| Dep. variable | Description | Values reported |
|---|---|---|
| Indicator 1 (indic1_0) | Activity limitations: CSHCN whose health conditions consistently affect daily activities. | 1 = daily activities never affected;<br>2 = daily activities moderately affected some of the time;<br>3 = daily activities consistently affected, often a great deal; |
| Indicator 2 (indic2_0)[14] | Missed school days: CSHCN ages 5-17 with 11 or more school absences due to illness. | 1 = 0-3 days missed;<br>2 = 4-6 days missed;<br>3 = 7-10 days missed;<br>4 = 11 or more days missed; |
| Indicator 3 (indic3_0) | Inconsistently insured: CSHCN without insurance at some point during the past year. | 0 = Insured entire year;<br>1 = NOT insured at some point during year; |
| Indicator 4 (indic4_0) | Currently insured: CSHCN without insurance at time of the survey | 0 = Currently insured;<br>1 = Currently uninsured; |
| Indicator 5 (indic5_0) | Adequacy of current insurance coverage; Currently insured CSHCN whose insurance coverage is not adequate | 0 = Current insurance is NOT adequate;<br>1 = Current insurance is adequate; |
| Indicator 6 (indic6_0) | Unmet needs for care: CSHCN with any unmet need for any of 14 specific health care services or equipment; past 12 monts. | 0 = No unmet needs 14 specific health care services;<br>1 = 1 unmet need for services or equipment;<br>2 = 2 or more unmet needs; |

[14] 5,354 observations were excluded because the child was less than 5 years old, and were not coded as skipped in the dataset.

| Dep. variable | Description | Values reported |
|---|---|---|
| Indicator 7 (indic7_0) | Unmet needs for family support services: CSHCN with any unmet needs for family support services | 0 = No unmet needs for specific family support services or did not need;<br>1 = One or more unmet needs for family support services; |
| Indicator 8 (indic8_0) | Problems obtaining referral: CSHCN needing specialty care who had problems getting a referral. | 0 = Needed referral, NO problems getting it;<br>1 = Needed referral, YES problems getting it; |
| Indicator 9 (indic9_0) | Usual source for sick care: CSHCN without a usual source of care or who rely on the emergency room. | 1 = Docs office is usual source for sick care;<br>2 = Clinic, health center or other regular source for sick care;<br>3 = No usual source for sick care – or ER, Mexico or no one place most often; |
| Indicator 10 (indic10_) | Personal doctor or nurse: CSHCN without a personal doctor or nurse | 0 = No, does not have a personal doctor or nurse;<br>1 = Yes, has one or more personal doctors or nurses; |
| Indicator 11 (indic11_) | Family centered care: CSHCN without family-centered care. | 0 = Does NOT have family centered care;<br>1 = Yes, has family centered care |
| Indicator 12 (indic12_) | Out of pocket expenses: CSHCN whose families pay more than $1000 per year out-of-pocket for child's medical expenses. | 1 = Less than $250;<br>2 = $250-$500;<br>3 = $501-$1000;<br>4 = More than $1000; |
| Indicator 13 (indic13_) | Family financial burden: CSHCN whose families experienced financial problems due to child's health needs. | 0 = No financial problems due to child's health;<br>1 = Yes, financial problems; |
| Indicator 14 (indic14_) | Hours per week providing care: CSHCN whose families spend 11 or more hours per week | 1 = Less than 1 hour;<br>2 = 1-4 hours per week; |

| Dep. variable | Description | Values reported |
|---|---|---|
| | providing and/or coordinating health care for child | 3 = 5-10 hours per week;<br>4 = 11 or more hours per week; |
| Indicator 15 (indic15_) | Impact on family work life: CSHCN whose family members cur back and/or stopped working because of child's health issues | 0 = employment not affected;<br>1 = family cut back hours or stopped working or both; |
| Outcome 1 (outcome1) | CSHCN whose families are partners in decision-making for child's optimal health | 0 = Child's family DOES NOT usually or always feel that they are partners in decision making around issues important to their child's health;<br>1 = Child's family DOES usually or always feel that they are partners in decision making around issues important to their child's health; |
| Outcome 2 (outcome2) | CSHCN receiving ongoing, coordinated and comprehensive care within a medical home | 0 = Child DID NOT receive adequate care on all needed components of medical home assessed by the survey;<br>1 = Child DID receive adequate care on all needed components of medical home assessed by the survey; |
| Outcome 3 (outcome3) | CSHCN whose private and/or public insurance coverage is continuous and adequate to meet the child's health needs | 0 = Child's insurance coverage WAS NOT continuous and adequate to meet the child's health needs;<br>1 = Child's insurance coverage WAS continuous and adequate to meet the child's health needs; |
| Outcome 4 (outcome4) | CSHCN who are screened early and continuously for special health care needs | 0 = Child DID NOT receive both preventive medical and |

| Dep. variable | Description | Values reported |
|---|---|---|
| | | dental visits in the past 12 months;<br>1 = Child DID receive both preventive medical and dental visits in the past 12 months; |
| Outcome 5 (outcome5) | CSHCN whose families report no difficulties or frustration accessing services needed for their child in the past 12 months. | 0 = Families DID have difficulties or frustration with accessing services needed for their child in the past 12 months;<br>1 = Families DID NOT have difficulties or frustration with accessing services needed for their child in the past 12 months; |
| Outcome 6 (outcome6) | Youth (ages 12-17) with special health care needs who receive the necessary services for transition to adulthood | 0 = Child DID NOT receive necessary services for adult transition;<br>1 = Child DID receive necessary services for adult transition; |

**Appendix B**

*Dependent variable* = $\beta_1$msastatr + $\beta_2$educ_09 + $\beta_3$povleve0 + $\beta_4$hispani0 + $\beta_5$black + $\beta_6$other + $\beta_7$uninsured + $\beta_8$body_ICF + $\beta_9$activity + $\beta_{10}$emot_ICF + $\mu$

| **Independent variable** | **Description** | **Values reported** |
|---|---|---|
| Rural status (msastatr) | Whether or not the respondent lives in a Metropolitan Statistical Area with 500,000 people or more. | 0 = Does not live in an MSA with more than 500,000 people;<br>1 = Does live in an MSA with more than 500,000 people. |
| Education status (educ_09) | The highest level of education of parents in household | 1 = less than high school;<br>2 = high school graduate;<br>3 = more than high school. |
| Poverty level (povleve0) | The current poverty level of the household. | 1= At or below 50% poverty level;<br>2 = Above 50% to at or below 100% poverty level;<br>3 = Above 100% to at or below 133% poverty level;<br>4 = Above 134% to at or below 150% poverty level;<br>5 = Above 150% to at or below 185% poverty level;<br>6 = Above 185% to at or below 200% poverty level;<br>7 = Above 200% to at or below 300% poverty level;<br>8 = Above 300% to at or below 400% poverty level;<br>9 = Above 400% poverty level. |
| Hispanic dummy (hispani0) | Whether or not the child is Hispanic/Latino. | 0 = child is not Hispanic/Latino;<br>1 = child is Hispanic/Latino. |
| Black | Whether or not the child is black, non-Hispanic | 0 = child is not black;<br>1 = child is black. |

| Independent variable | Description | Values reported |
|---|---|---|
| Other | Whether or not the child is of a minority race other than black. | 0 = child is not of another minority race other than black;<br>1 = child is of a minority race other than black. |
| Uninsured | Whether or not the child is uninsured. | 0 = insured;<br>1 = uninsured |
| Difficulty with one or more body functions (body_ICF) | Whether or not the child age 0-17 years has either no difficulties involving bodily functions or a little/a lot of difficulty with one or more bodily functions, defined as the following: breathing or respiration, swallowing or digestion, blood circulation, chronic physical pain including headaches, seeing even when wearing glasses or contacts, hearing even when using a hearing aid. | 0 = no difficulties involving bodily functions;<br>1 = a little or a lot of difficulty with one or more bodily functions;<br>. = don't know, refused or missing.[15] |
| Difficulty with one or more activities or participation (activity) | Whether or not the child age 0-17 years has either no difficulties with activities or participation, defined as the following: self care, coordination or moving around, using hands, learning, understanding or paying attention, speaking, communicating or being understood. | 0 = no difficulties involving activities;<br>1 = a little or a lot of difficulty with one or more activities;<br>. = don't know, refused or missing.[16] |
| Difficulty with one or more emotional functions (emot_ICF) | Whether or not the child age 18 months-17 years has either no emotional or behavioral difficulties or a little/a lot of difficulty with one or more emotional or behavioral factors, defined as: feeling anxious or depressed, acting-out, fighting, bullying or arguing, making and keeping friends. | 0 = no emotional or behavioral difficulties;<br>1 = a little or a lot of difficulty with one or more emotional or behavioral factors;<br>. = don't know, refused, missing or not in age range.[17] |

[15] For body_ICF, there was 1 missing observation.
[16] For activity, there was 1 missing observation.
[17] For emot_ICF, there were 922 observations labeled as don't know, refused or not in age range (2.29 percent of the total). Upon further investigation, in 916 of these observations, the child was labeled as either 0 years of age or 1 year old, indicating that the vast majority of these observations were legitimate skips because the child was not older than 18 months.

**Appendix C**

**Final results**

**Outcome 1**

Number of strata = 101 Number of obs = 38123
Number of PSUs = 38123 Population size = 10607365
Design df = 38022
F( 10, 38013) = 50.81**
Prob > F = 0.0000

| Variable | O.R. | Std.Err. | t | P>t | Confidence Interval | |
|---|---|---|---|---|---|---|
| msastatr | 0.8811581 | .0456316 | -2.44* | 0.015 | 0.7961084 | 0.9752939 |
| educ_09 | 1.109389 | .0469853 | 2.45* | 0.014 | 1.021016 | 1.205412 |
| povleve0 | 1.035317 | .009837 | 3.65** | 0.000 | 1.016215 | 1.054779 |
| hispani0 | 0.8320757 | .0607011 | -2.52* | 0.012 | 0.7212145 | 0.9599778 |
| black | 0.7222459 | .0484609 | -4.85** | 0.000 | 0.633242 | 0.8237595 |
| other | 0.7726214 | .0554636 | -3.59** | 0.000 | 0.6712128 | 0.8893511 |
| uninsured | 0.6779704 | .0873139 | -3.02** | 0.003 | 0.5267244 | 0.872646 |
| body_ICF | 0.8594064 | .0407575 | -3.19** | 0.001 | 0.783121 | 0.9431228 |
| activity | 0.6559982 | .0338542 | -8.17** | 0.000 | 0.5928886 | 0.7258255 |
| emot_ICF | 0.5899584 | .0299132 | -10.41** | 0.000 | 0.534147 | 0.6516013 |
| _cons | 3.861092 | .4869695 | 10.71** | 0.000 | 3.015444 | 4.9438 |

**Outcome 2**

Number of strata = 101 Number of obs = 37245
Number of PSUs = 37245 Population size = 10354781
Design df = 37144
F( 10, 37135) = 96.67**
Prob > F = 0.0000

| Variable | O.R. | Std.Err. | t | P>t | Confidence Interval | |
|---|---|---|---|---|---|---|
| msastatr | 0.8959413 | 0.0418545 | -2.35* | 0.019 | 0.817549 | 0.9818504 |
| educ_09 | 1.09387 | 0.0434039 | 2.26* | 0.024 | 1.012021 | 1.182338 |
| povleve0 | 1.052157 | 0.0088286 | 6.06** | 0.000 | 1.034994 | 1.069604 |
| hispani0 | 0.7544116 | 0.0519147 | -4.10** | 0.000 | 0.6592213 | 0.8633473 |
| black | 0.6290591 | 0.0387882 | -7.52** | 0.000 | 0.5574476 | 0.7098699 |
| other | 0.7264355 | 0.0480493 | -4.83** | 0.000 | 0.6381069 | 0.8269909 |
| uninsured | 0.5068513 | 0.0610057 | -5.65** | 0.000 | 0.4003362 | 0.6417062 |
| body_ICF | 0.7749331 | 0.0326785 | -6.05** | 0.000 | 0.7134579 | 0.8417052 |
| activity | 0.5936583 | 0.0267654 | -11.57** | 0.000 | 0.5434485 | 0.648507 |
| emot_ICF | 0.5347258 | 0.0237715 | -14.08** | 0.000 | 0.4901053 | 0.5834088 |
| _cons | 1.342771 | .1572158 | 2.52** | 0.012 | 1.067425 | 1.689143 |

**Outcome 3**

Number of strata = 101 Number of obs = 38040
Number of PSUs = 38040 Population size = 10569869
Design df = 37939
F( 9, 37931) = 32.98**
Prob > F = 0.0000

| Variable | O.R. | Std.Err. | t | P>t | Confidence Interval | |
|---|---|---|---|---|---|---|
| msastatr | 0.8908993 | 0.0410464 | -2.51* | 0.012 | 0.813973 | 0.9750957 |
| educ_09 | 0.9712946 | 0.0386347 | -0.73 | 0.464 | 0.8984461 | 1.05005 |
| povleve0 | 1.014153 | 0.0086467 | 1.65 | 0.099 | 0.9973463 | 1.031243 |
| hispani0 | 0.7413931 | 0.0486383 | -4.56** | 0.000 | 0.6519354 | 0.8431261 |
| black | 0.8946561 | 0.0545232 | -1.83 | 0.068 | 0.7939251 | 1.008168 |
| other | 0.9828762 | 0.0638913 | -0.27 | 0.790 | 0.8652969 | 1.116432 |
| body_ICF | 0.7858471 | 0.0326849 | -5.79** | 0.000 | 0.7243255 | 0.8525941 |
| activity | 0.7383638 | 0.033873 | -6.61** | 0.000 | 0.6748693 | 0.8078322 |
| emot_ICF | 0.6865475 | 0.0309091 | -8.35** | 0.000 | 0.6285609 | 0.7498836 |
| _cons | 3.209914 | .3637359 | 10.29** | 0.000 | 2.570604 | 4.00822 |

**Outcome 4**

Number of strata = 101 Number of obs = 38160
Number of PSUs = 38160 Population size = 10607144
Design df = 38059
F( 10, 38050) = 29.86**
Prob > F = 0.0000

| Variable | O.R. | Std. Err. | t | P>t | Confidence Interval | |
|---|---|---|---|---|---|---|
| msastatr | 1.248174 | 0.0681754 | 4.06** | 0.000 | 1.121453 | 1.389215 |
| educ_09 | 1.163851 | 0.0516584 | 3.42** | 0.001 | 1.066879 | 1.269638 |
| povleve0 | 1.06886 | 0.010305 | 6.91** | 0.000 | 1.048852 | 1.08925 |
| hispani0 | 0.9250904 | 0.0741573 | -0.97 | 0.331 | 0.7905837 | 1.082482 |
| black | 1.187989 | 0.0867968 | 2.36* | 0.018 | 1.029485 | 1.370897 |
| other | 1.151643 | 0.0893744 | 1.82** | 0.069 | 0.9891397 | 1.340845 |
| uninsured | 0.2962844 | 0.0347557 | -10.37** | 0.000 | 0.2354265 | 0.3728742 |
| body_ICF | 1.011473 | 0.0520709 | 0.22 | 0.825 | 0.9143932 | 1.118861 |
| activity | 0.9390258 | 0.0521978 | -1.13 | 0.258 | 0.8420932 | 1.047116 |
| emot_ICF | 1.002034 | 0.0549883 | 0.04 | 0.970 | 0.8998498 | 1.115823 |
| _cons | 1.546263 | 0.1998509 | 3.37** | 0.001 | 1.200229 | 1.992061 |

**Outcome 5**

Number of strata = 101 Number of obs = 38241
Number of PSUs = 38241 Population size = 10630815
Design df = 38140
F( 10, 38131) = 102.88**
Prob > F = 0.0000

| Variable | O.R. | Std. Err. | t | P>t | Confidence Interval | |
|---|---|---|---|---|---|---|
| msastatr | 0.9336275 | 0.0479764 | -1.34 | 0.181 | 0.844173 | 1.032561 |
| educ_09 | 0.7879344 | 0.0336933 | -5.57** | 0.000 | 0.7245865 | 0.8568205 |
| povleve0 | 1.055077 | 0.0096472 | 5.86** | 0.000 | 1.036336 | 1.074156 |
| hispani0 | 0.842077 | 0.0599723 | -2.41* | 0.016 | 0.7323653 | 0.9682241 |
| black | 0.9833527 | 0.0661684 | -0.25 | 0.803 | 0.8618493 | 1.121986 |
| other | 0.8472219 | 0.0582993 | -2.41* | 0.016 | 0.7403246 | 0.9695544 |
| uninsured | 0.2270381 | 0.0275767 | -12.21** | 0.000 | 0.1789394 | 0.2880657 |
| body_ICF | 0.5822657 | 0.0270405 | -11.65** | 0.000 | 0.5316063 | 0.6377528 |
| activity | 0.5068689 | 0.025878 | -13.31** | 0.000 | 0.4586025 | 0.5602151 |
| emot_ICF | 0.4872971 | 0.0238532 | -14.69** | 0.000 | 0.442717 | 0.5363663 |

**Outcome 6**

Number of strata = 101 Number of obs = 15910
Number of PSUs = 15910 Population size = 4231415.8
Design df = 15809
F( 10, 15800) = 38.35**
Prob > F = 0.0000

| Variable | O.R. | Std. Err. | t | P>t | Confidence Interval | |
|---|---|---|---|---|---|---|
| msastatr | 1.048243 | 0.0738059 | 0.67 | 0.503 | 0.9131142 | 1.20337 |
| educ_09 | 1.134413 | 0.0748191 | 1.91 | 0.056 | 0.9968431 | 1.290969 |
| povleve0 | 1.082715 | 0.0142499 | 6.04** | 0.000 | 1.055141 | 1.11101 |
| hispani0 | 0.5376733 | 0.0701035 | -4.76** | 0.000 | 0.4164164 | 0.6942394 |
| black | 0.5760338 | 0.0563876 | -5.63** | 0.000 | 0.4754643 | 0.6978756 |
| other | 0.8967555 | 0.1088451 | -0.90 | 0.369 | 0.7068873 | 1.137622 |
| uninsured | 0.5022501 | 0.1243428 | -2.78** | 0.005 | 0.309151 | 0.815961 |
| body_ICF | 0.8725032 | 0.0544348 | -2.19* | 0.029 | 0.7720708 | 0.986 |
| activity | 0.6831016 | 0.045627 | -5.71** | 0.000 | 0.5992746 | 0.7786544 |
| emot_ICF | 0.57436 | 0.0385547 | -8.26** | 0.000 | 0.503549 | 0.6551286 |
| _cons | 0.6466111 | 0.1218516 | -2.31* | 0.021 | 0.446915 | 0.935538 |

**Indicator 1**

Number of strata = 101 Number of obs = 38382
Number of PSUs = 38382 Population size = 10673247
Design df = 38281
F( 10, 38272) = 273.11**
Prob > F = 0.0000

| Variable | O.R. | Std. Err. | t | P>t | Confidence Interval | |
|---|---|---|---|---|---|---|
| msastatr | 1.060016 | 0.0466743 | 1.32 | 0.186 | 0.9723697 | 1.155562 |
| educ_09 | 1.009945 | 0.0363766 | 0.27 | 0.784 | 0.9411042 | 1.083821 |
| povleve0 | 0.9345301 | 0.0075542 | -8.38** | 0.000 | 0.9198403 | 0.9494544 |
| hispani0 | 1.121115 | 0.07263 | 1.76 | 0.078 | 0.9874255 | 1.272904 |
| black | 1.019626 | 0.061527 | 0.32 | 0.747 | 0.9058903 | 1.147642 |
| other | 1.092239 | 0.0666811 | 1.45 | 0.148 | 0.9690591 | 1.231077 |
| uninsured | 1.212034 | 0.1300278 | 1.79 | 0.073 | 0.9821879 | 1.495668 |
| body_ICF | 2.082246 | 0.0863594 | 17.68** | 0.000 | 1.919676 | 2.258583 |
| activity | 4.347229 | 0.1881451 | 33.95** | 0.000 | 3.993668 | 4.732091 |
| emot_ICF | 2.236859 | 0.0951798 | 18.92** | 0.000 | 2.057872 | 2.431414 |

**Indicator 2**

Number of strata = 101 Number of obs = 33447
Number of PSUs = 33447 Population size = 9077935.7
Design df = 33346
F( 10, 33337) = 82.55**
Prob > F = 0.0000

| Variable | O.R. | Std. Err. | t | P>t | Confidence Interval | |
|---|---|---|---|---|---|---|
| msastatr | 1.029214 | 0.0464135 | 0.64 | 0.523 | 0.9421466 | 1.124328 |
| educ_09 | 1.022588 | 0.0406547 | 0.56 | 0.574 | 0.945929 | 1.10546 |
| povleve0 | 0.9473038 | 0.0080447 | -6.37** | 0.000 | 0.9316665 | 0.9632036 |
| hispani0 | 0.8661173 | 0.0600684 | -2.07 | 0.038 | 0.7560329 | 0.9922309 |
| black | 0.6163635 | 0.0382207 | -7.80** | 0.000 | 0.5458232 | 0.6960202 |
| other | 0.9060467 | 0.0567339 | -1.58 | 0.115 | 0.8013993 | 1.024359 |
| uninsured | 1.010305 | 0.1358394 | 0.08 | 0.939 | 0.7762494 | 1.314935 |
| body_ICF | 2.823944 | 0.1182881 | 24.78** | 0.000 | 2.601358 | 3.065576 |
| activity | 1.218104 | 0.0546927 | 4.39** | 0.000 | 1.115486 | 1.330162 |
| emot_ICF | 1.390227 | 0.0624151 | 7.34** | 0.000 | 1.273119 | 1.518107 |

**Indicator 3**

Number of strata = 101 Number of obs = 38403
Number of PSUs = 38403 Population size = 10677576
Design df = 38302
F( 9, 38294) = 39.84**
Prob > F = 0.0000

| Variable | O.R. | Std. Err. | t | P>t | Confidence Interval | |
|---|---|---|---|---|---|---|
| msastatr | 0.9374885 | 0.0778212 | -0.78 | 0.437 | 0.7967191 | 1.10313 |
| educ_09 | 0.9977981 | 0.064538 | -0.03 | 0.973 | 0.878992 | 1.132662 |
| povleve0 | 0.8580224 | 0.012171 | -10.79** | 0.000 | 0.8344955 | 0.8822126 |
| hispani0 | 1.765211 | 0.1816726 | 5.52** | 0.000 | 1.442745 | 2.159751 |
| black | 0.9724336 | 0.1211158 | -0.22 | 0.822 | 0.7617986 | 1.241309 |
| other | 1.005021 | 0.1080016 | 0.05 | 0.963 | 0.8141425 | 1.240652 |
| body_ICF | 1.309009 | 0.1007181 | 3.50** | 0.000 | 1.125764 | 1.522082 |
| activity | 1.155838 | 0.1011225 | 1.66 | 0.098 | 0.9736978 | 1.372049 |
| emot_ICF | 1.32921 | 0.1132473 | 3.34** | 0.001 | 1.124786 | 1.570787 |
| _cons | 0.1342777 | 0.0249361 | -10.81** | 0.000 | 0.0933096 | 0.1932332 |

**Indicator 4**

Number of strata = 101 Number of obs = 38477
Number of PSUs = 38477 Population size = 10702542
Design df = 38376
F( 9, 38368) = 13.04**
Prob > F = 0.0000

| Variable | O.R. | Std. Err. | t | P>t | Confidence Interval | |
|---|---|---|---|---|---|---|
| msastatr | 0.9771846 | 0.1360545 | -0.17 | 0.868 | 0.7438051 | 1.28379 |
| educ_09 | 0.8883783 | 0.0960039 | -1.10 | 0.273 | 0.7188011 | 1.097962 |
| povleve0 | 0.9072908 | 0.021756 | -4.06** | 0.000 | 0.8656351 | 0.9509511 |
| hispani0 | 2.035647 | 0.3511428 | 4.12** | 0.000 | 1.451671 | 2.854544 |
| black | 1.04185 | 0.2035244 | 0.21 | 0.834 | 0.7104259 | 1.527889 |
| other | 1.017847 | 0.1790481 | 0.10 | 0.920 | 0.7210145 | 1.436881 |
| body_ICF | 1.1172 | 0.1420535 | 0.87 | 0.383 | 0.8707547 | 1.433394 |
| activity | 1.091045 | 0.163903 | 0.58 | 0.562 | 0.8127669 | 1.4646 |
| emot_ICF | 1.317205 | 0.1789421 | 2.03* | 0.043 | 1.009286 | 1.719066 |
| _cons | 0.0506763 | 0.0159156 | -9.50** | 0.000 | 0.027382 | 0.0937874 |

**Indicator 5**

Number of strata = 101 Number of obs = 36985
Number of PSUs = 36985 Population size = 10218253
Design df = 36884
F( 9, 36876) = 25.08**
Prob > F = 0.0000

| Variable | O.R. | Std. Err. | t | P>t | Confidence Interval | |
|---|---|---|---|---|---|---|
| msastatr | 0.8504193 | 0.0408796 | -3.37** | 0.001 | 0.7739531 | 0.9344405 |
| educ_09 | 0.9608694 | 0.0409888 | -0.94 | 0.349 | 0.8837972 | 1.044663 |
| povleve0 | 0.9805479 | 0.0089583 | -2.15* | 0.032 | 0.9631456 | 0.9982645 |
| hispani0 | 0.8319932 | 0.0576158 | -2.66** | 0.008 | 0.7263934 | 0.9529446 |
| black | 0.8603181 | 0.0552617 | -2.34* | 0.019 | 0.7585448 | 0.9757463 |
| other | 0.9483605 | 0.0644777 | -0.78 | 0.435 | 0.830041 | 1.083546 |
| body_ICF | 0.7912061 | 0.0344026 | -5.39** | 0.000 | 0.7265694 | 0.8615929 |
| activity | 0.7313575 | 0.0349645 | -6.54** | 0.000 | 0.665939 | 0.8032023 |
| emot_ICF | 0.6909336 | 0.0325116 | -7.86** | 0.000 | 0.6300602 | 0.7576883 |
| _cons | 5.146192 | 0.6208212 | 13.58** | 0.000 | 4.062527 | 6.518922 |

**Indicator 6**

Number of strata = 101 Number of obs = 37771
Number of PSUs = 37771 Population size = 10486223
Design df = 37670
F( 10, 37661) = 109.94**
Prob > F = 0.0000

| Variable | O.R. | Std. Err. | t | P>t | Confidence Interval | |
|---|---|---|---|---|---|---|
| msastatr | 1.115341 | 0.0650276 | 1.87 | 0.061 | 0.994898 | 1.250365 |
| educ_09 | 1.188592 | 0.0573949 | 3.58** | 0.000 | 1.081256 | 1.306583 |
| povleve0 | 0.8974115 | 0.009522 | -10.20** | 0.000 | 0.8789409 | 0.9162702 |
| hispani0 | 1.104744 | 0.0922356 | 1.19 | 0.233 | 0.9379771 | 1.301162 |
| black | 1.174014 | 0.0868627 | 2.17* | 0.030 | 1.01553 | 1.357231 |
| other | 1.139893 | 0.09354 | 1.60 | 0.111 | 0.9705367 | 1.338802 |
| uninsured | 4.415988 | 0.4973566 | 13.19** | 0.000 | 3.541254 | 5.506792 |
| body_ICF | 1.724544 | 0.0961444 | 9.78** | 0.000 | 1.546029 | 1.923671 |
| activity | 1.978036 | 0.1236387 | 10.91** | 0.000 | 1.749958 | 2.235841 |
| emot_ICF | 2.130633 | 0.1237783 | 13.02** | 0.000 | 1.901327 | 2.387594 |

**Indicator 7**

Number of strata = 101 Number of obs = 38382
Number of PSUs = 38382 Population size = 10673191
Design df = 38281
F( 10, 38272) = 61.79**
Prob > F = 0.0000

| Variable | O.R. | Std. Err. | t | P>t | Confidence Interval | |
|---|---|---|---|---|---|---|
| msastatr | 1.160571 | 0.1196647 | 1.44 | 0.149 | 0.9482062 | 1.420498 |
| educ_09 | 1.470849 | 0.1303194 | 4.35** | 0.000 | 1.236368 | 1.749799 |
| povleve0 | 0.9692207 | 0.0165019 | -1.84 | 0.066 | 0.9374102 | 1.002111 |
| hispani0 | 0.9530953 | 0.1294525 | -0.35 | 0.724 | 0.7303309 | 1.243807 |
| black | 1.012266 | 0.1155237 | 0.11 | 0.915 | 0.8093741 | 1.266019 |
| other | 1.138618 | 0.1629763 | 0.91 | 0.364 | 0.860077 | 1.507366 |
| uninsured | 2.872756 | 0.5129003 | 5.91** | 0.000 | 2.024514 | 4.076398 |
| body_ICF | 1.877199 | 0.1764218 | 6.70** | 0.000 | 1.561387 | 2.256887 |
| activity | 5.2286 | 0.8005433 | 10.80** | 0.000 | 3.873068 | 7.058555 |
| emot_ICF | 6.077494 | 0.798124 | 13.74** | 0.000 | 4.698263 | 7.861614 |
| _cons | .0011192 | 0.0003307 | -23.00** | 0.000 | 0.0006272 | 0.0019973 |

**Indicator 8**

Number of strata = 101 Number of obs = 12493
Number of PSUs = 12493 Population size = 3537430.2
Design df = 12392
F( 10, 12383) = 12.52**
Prob > F = 0.0000

| Variable | O.R. | Std. Err. | t | P>t | Confidence Interval | |
|---|---|---|---|---|---|---|
| msastatr | 1.237372 | 0.1285847 | 2.05* | 0.040 | 1.009338 | 1.516923 |
| educ_09 | 0.9453586 | 0.0739585 | -0.72 | 0.473 | 0.810957 | 1.102035 |
| povleve0 | 0.9645665 | 0.016013 | -2.17* | 0.030 | 0.9336838 | 0.9964707 |
| hispani0 | 1.500761 | 0.1799328 | 3.39** | 0.001 | 1.186444 | 1.898348 |
| Black | 0.8813209 | 0.1092135 | -1.02 | 0.308 | 0.6912621 | 1.123636 |
| other | 1.179291 | 0.1364608 | 1.43 | 0.154 | 0.9399729 | 1.479541 |
| uninsured | 2.632937 | 0.6140259 | 4.15** | 0.000 | 1.666913 | 4.158801 |
| body_ICF | 1.356873 | 0.1252167 | 3.31** | 0.001 | 1.132348 | 1.625918 |
| activity | 1.54631 | 0.148517 | 4.54** | 0.000 | 1.280955 | 1.866634 |
| emot_ICF | 1.408328 | 0.1285468 | 3.75** | 0.000 | 1.177611 | 1.684247 |
| _cons | 0.1436078 | 0.034385 | -8.11** | 0.000 | 0.089815 | 0.2296184 |

**Indicator 9 – Emergency Room care**

Number of strata = 101 Number of obs = 38402
Number of PSUs = 38402 Population size = 10684089
Design df = 38301
F( 10, 38292) = 21.63**
Prob > F = 0.0000

| Variable | O.R. | Std. Err. | t | P>t | Confidence Interval | |
|---|---|---|---|---|---|---|
| msastatr | 1.011115 | 0.0820831 | 0.14 | 0.892 | 0.8623768 | 1.185506 |
| educ_09 | 0.6986515 | 0.0379585 | -6.60** | 0.000 | 0.6280763 | 0.777157 |
| povleve0 | 0.9464512 | 0.0128486 | -4.05** | 0.000 | 0.9215997 | 0.971973 |
| hispani0 | 1.031463 | 0.1083414 | 0.29 | 0.768 | 0.8395439 | 1.267254 |
| black | 1.546409 | 0.1393494 | 4.84** | 0.000 | 1.296041 | 1.845142 |
| other | 1.182617 | 0.1252608 | 1.58 | 0.113 | 0.9609115 | 1.455475 |
| uninsured | 2.10233 | 0.2900061 | 5.39** | 0.000 | 1.604273 | 2.755014 |
| body_ICF | 0.9278039 | 0.0653277 | -1.06 | 0.287 | 0.8082026 | 1.065104 |
| activity | 1.08216 | 0.0849992 | 1.01 | 0.315 | 0.9277496 | 1.262269 |
| emot_ICF | 0.9645541 | 0.0728127 | -0.48 | 0.633 | 0.8318954 | 1.118367 |
| _cons | 0.2915287 | 0.0458318 | -7.84** | 0.000 | 0.2142189 | 0.3967388 |

**Indicator 10**

Number of strata = 101 Number of obs = 38426
Number of PSUs = 38426 Population size = 10691688
Design df = 38325
F( 10, 38316) = 22.29**
Prob > F = 0.0000

| Variable | O.R. | Std. Err. | t | P>t | Confidence Interval | |
|---|---|---|---|---|---|---|
| msastatr | 1.028916 | 0.0907367 | 0.32 | 0.747 | 0.8655916 | 1.223058 |
| educ_09 | 1.296817 | 0.0972269 | 3.47** | 0.001 | 1.11959 | 1.502098 |
| povleve0 | 1.084057 | 0.0247071 | 3.54** | 0.000 | 1.036696 | 1.133581 |
| hispani0 | 1.284362 | 0.2070401 | 1.55 | 0.121 | 0.9364155 | 1.761595 |
| black | 0.6503455 | 0.0803241 | -3.48** | 0.000 | 0.5105156 | 0.8284747 |
| other | 0.7930404 | 0.0974027 | -1.89 | 0.059 | 0.62337 | 1.008892 |
| uninsured | 0.3185743 | 0.0498488 | -7.31** | 0.000 | 0.234431 | 0.4329186 |
| body_ICF | 1.320649 | 0.1105333 | 3.32** | 0.001 | 1.120838 | 1.55608 |
| activity | 0.9977208 | 0.0889876 | -0.03 | 0.980 | 0.8376975 | 1.188313 |
| emot_ICF | 0.8525604 | 0.0745104 | -1.83 | 0.068 | 0.7183419 | 1.011857 |
| _cons | 4.741126 | 0.8731798 | 8.45** | 0.000 | 3.304529 | 6.802263 |

**Indicator 11**

Number of strata = 101 Number of obs = 37935
Number of PSUs = 37935 Population size = 10555619
Design df = 37834
F( 10, 37825) = 81.19**
Prob > F = 0.0000

| Variable | O.R. | Std. Err. | t | P>t | Confidence Interval | |
|---|---|---|---|---|---|---|
| msastatr | 0.9108028 | 0.0456138 | -1.87 | 0.062 | 0.8256463 | 1.004742 |
| educ_09 | 1.188323 | 0.0467521 | 4.39** | 0.000 | 1.100131 | 1.283584 |
| povleve0 | 1.05702 | 0.0091594 | 6.40** | 0.000 | 1.039219 | 1.075126 |
| hispani0 | 0.8027841 | 0.0552408 | -3.19** | 0.001 | 0.7014948 | 0.9186987 |
| black | 0.5258203 | 0.0322978 | -10.46** | 0.000 | 0.466178 | 0.5930931 |
| other | 0.6929397 | 0.047184 | -5.39** | 0.000 | 0.6063637 | 0.7918769 |
| uninsured | 0.5497189 | 0.0672029 | -4.89** | 0.000 | 0.4325918 | 0.698559 |
| body_ICF | 0.7952273 | 0.0353749 | -5.15** | 0.000 | 0.7288283 | 0.8676754 |
| activity | 0.6683584 | 0.0326914 | -8.24** | 0.000 | 0.6072581 | 0.7356065 |
| emot_ICF | 0.5896338 | 0.028356 | -10.98** | 0.000 | 0.5365943 | 0.6479159 |
| _cons | 2.433098 | 0.2850638 | 7.59** | 0.000 | 1.933877 | 3.06119 |

**Indicator 12**

Number of strata = 101 Number of obs = 37931
Number of PSUs = 37931 Population size = 10548403
Design df = 37830
F( 10, 37821) = 232.72**
Prob > F = 0.0000

| Variable | O.R. | Std. Err. | t | P>t | Confidence Interval | |
|---|---|---|---|---|---|---|
| msastatr | 1.048124 | 0.0447218 | 1.10 | 0.271 | 0.9640338 | 1.13955 |
| educ_09 | 1.660789 | 0.0750646 | 11.22** | 0.000 | 1.519989 | 1.814632 |
| povleve0 | 1.319618 | 0.0114559 | 31.95** | 0.000 | 1.297354 | 1.342264 |
| hispani0 | 0.893669 | 0.0566917 | -1.77 | 0.076 | 0.7891823 | 1.01199 |
| black | 0.448925 | 0.0280094 | -12.84** | 0.000 | 0.3972499 | 0.5073222 |
| other | 0.6839765 | 0.0405913 | -6.40** | 0.000 | 0.6088694 | 0.7683484 |
| uninsured | 3.074816 | 0.3783998 | 9.13** | 0.000 | 2.415813 | 3.913586 |
| body_ICF | 1.420788 | 0.0531765 | 9.38** | 0.000 | 1.320292 | 1.528934 |
| activity | 1.174786 | 0.0470747 | 4.02** | 0.000 | 1.086049 | 1.270774 |
| emot_ICF | 1.227376 | 0.0485938 | 5.17** | 0.000 | 1.135733 | 1.326414 |

**Indicator 13**

Number of strata = 101 Number of obs = 38211
Number of PSUs = 38211 Population size = 10620874
Design df = 38110
F( 10, 38101) = 75.35**
Prob > F = 0.0000

| Variable | O.R. | Std. Err. | t | P>t | Confidence Interval | |
|---|---|---|---|---|---|---|
| msastatr | 1.145686 | 0.0634907 | 2.45* | 0.014 | 1.027763 | 1.27714 |
| educ_09 | 1.37783 | 0.069929 | 6.32** | 0.000 | 1.247364 | 1.521942 |
| povleve0 | 0.9627291 | 0.0093164 | -3.93** | 0.000 | 0.9446407 | 0.9811638 |
| hispani0 | 1.187443 | 0.0937494 | 2.18* | 0.030 | 1.017203 | 1.386174 |
| black | 0.8261999 | 0.066383 | -2.38* | 0.017 | 0.7058154 | 0.9671172 |
| other | 0.9765596 | 0.0800399 | -0.29 | 0.772 | 0.8316319 | 1.146744 |
| uninsured | 3.438761 | 0.4631948 | 9.17** | 0.000 | 2.640846 | 4.477761 |
| body_ICF | 1.977674 | 0.1058698 | 12.74** | 0.000 | 1.780681 | 2.196458 |
| activity | 1.949582 | 0.1169727 | 11.13** | 0.000 | 1.733281 | 2.192877 |
| emot_ICF | 2.234513 | 0.12875 | 13.95** | 0.000 | 1.995888 | 2.501668 |
| _cons | 0.0287112 | 0.0044549 | -22.88** | 0.000 | 0.0211824 | 0.0389161 |

**Indicator 14**

Number of strata = 101 Number of obs = 37053
Number of PSUs = 37053 Population size = 10222170
Design df = 36952
F( 10, 36943) = 150.51**
Prob > F = 0.0000

| Variable | O.R. | Std. Err. | t | P>t | Confidence Interval | |
|---|---|---|---|---|---|---|
| msastatr | 0.9346995 | 0.0398555 | -1.58 | 0.113 | 0.8597569 | 1.016175 |
| educ_09 | 0.9235172 | 0.0380879 | -1.93 | 0.054 | 0.8518015 | 1.001271 |
| povleve0 | 0.8875585 | 0.0077715 | -13.62** | 0.000 | 0.872456 | 0.9029224 |
| hispani0 | 1.293485 | 0.0858706 | 3.88** | 0.000 | 1.135666 | 1.473234 |
| black | 1.261655 | 0.0752693 | 3.90** | 0.000 | 1.122424 | 1.418157 |
| other | 1.224522 | 0.0774491 | 3.20** | 0.001 | 1.081752 | 1.386135 |
| uninsured | 0.9886513 | 0.0985485 | -0.11 | 0.909 | 0.8131915 | 1.20197 |
| body_ICF | 1.792288 | 0.0720037 | 14.52** | 0.000 | 1.656572 | 1.939122 |
| activity | 2.128581 | 0.0907941 | 17.71** | 0.000 | 1.957858 | 2.314191 |
| emot_ICF | 1.359947 | 0.0567196 | 7.37** | 0.000 | 1.253198 | 1.475789 |

**Indicator 15**

Number of strata = 101 Number of obs = 38229
Number of PSUs = 38229 Population size = 10630494
Design df = 38128
F( 10, 38119) = 91.02**
Prob > F = 0.0000

| Variable | O.R. | Std. Err. | t | P>t | Confidence Interval | |
|---|---|---|---|---|---|---|
| msastatr | 1.160306 | 0.0639588 | 2.70** | 0.007 | 1.04148 | 1.29269 |
| educ_09 | 1.159051 | 0.0537054 | 3.19** | 0.001 | 1.058426 | 1.269243 |
| povleve0 | 0.942345 | 0.0092341 | -6.06** | 0.000 | 0.9244185 | 0.960619 |
| hispani0 | 1.501581 | 0.1135393 | 5.38** | 0.000 | 1.294746 | 1.741458 |
| black | 0.9945245 | 0.0740082 | -0.07 | 0.941 | 0.8595493 | 1.150695 |
| other | 1.250413 | 0.0930495 | 3.00** | 0.003 | 1.08071 | 1.446763 |
| uninsured | 1.40643 | 0.1899332 | 2.53* | 0.012 | 1.079351 | 1.832624 |
| body_ICF | 1.79332 | 0.0947234 | 11.06** | 0.000 | 1.616947 | 1.988932 |
| activity | 3.04754 | 0.1823862 | 18.62** | 0.000 | 2.710229 | 3.426833 |
| emot_ICF | 1.785316 | 0.1009267 | 10.25** | 0.000 | 1.598063 | 1.994511 |
| _cons | 0.0508638 | 0.0072852 | -20.80** | 0.000 | 0.0384139 | 0.0673488 |

* = significant at the 95-percent level;
** = significant at the 99-percent level.

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