2019

Effect of Rural Residence on Primary Care Access for Adolescents with Chronic Conditions

Jessica Michelle Winkler
Medical University of South Carolina

EFFECT OF RURAL RESIDENCE ON PRIMARY CARE ACCESS FOR ADOLESCENTS WITH CHRONIC CONDITIONS

BY

Jessica Michelle Winkler

A doctoral project submitted to the faculty of the Medical University of South Carolina in partial fulfillment of the requirement for the degree

Doctor of Health Administration in the College of Health Professions

ACKNOWLEDGEMENTS

I would like to thank each and every member of my committee, Dr. Elizabeth A. Brown, PhD, MPA, Dr. Kit N. Simpson, DrPH, and Dr. Brandi M. White, PhD, MPH. Dr. Brown I would like to thank you for taking this journey with me, giving me tissues to wipe my tears, and a many pushes to continue on this journey. Dr. Simpson thank you for always having a smile on your face and stopping whatever you were doing to speak with me when I came by your office. Your words of encouragement meant a lot to me during this process. Dr. White thank you for being there and lending a supportive hand, resources and your words of encouragement. I could not made it through this process without you all on my team.

Table of Contents

List of Tables

Abstract of Doctoral Project Report Presented to the Interprofessional Doctoral Program in Health Administration & Leadership
Medical University of South Carolina
In Partial Fulfillment of the Requirements for the
Degree of Doctor of Health Administration

EFFECT OF RURAL RESIDENCE ON PRIMARY CARE ACCESS FOR ADOLESCENTS WITH CHRONIC CONDITIONS

BY

Jessica Michelle Winkler

Chairperson: Dr. Elizabeth A. Brown, PhD, MPA, Assistant Professor, Medical University of South Carolina

Committee: Dr. Kit N. Simpson, DrPH, Professor, Medical University of South Carolina

Dr. Brandi M. White, PhD, MPH, Assistant Professor, University of Kentucky

It is essential for adolescents with chronic conditions to have appropriate access to primary care. If the adolescents with chronic conditions do not have adequate primary care access, they will likely have a poorer quality of life and more preventable hospitalizations. This can make an already difficult situation on the family even more burdensome. Additionally, this will also become burdensome to the healthcare community. This study is important because the medical community can begin to look at the disparities in health care services. This retrospective cohort study used 2014 state hospitalization data from Georgia (GA), Kentucky (KY), and South Carolina (SC) to examine access to primary care for adolescents from both urban and rural areas. The sample population was adolescents, between 10 years old and 19 years old, with ACS conditions (Carbone et al. 2015) were considered for this study. The study examined the likelihood of adolescent living with chronic illnesses and living in rural areas experiencing

higher preventable hospitalization (PH). The most noteworthy findings were that younger, minority, males who have a MHI lower than $40,000, and live in a rural areas were most likely to have PH compared to their counterparts.

Keywords: preventable hospitalizations, adolescents, ambulatory care sensitive conditions, primary care

Chapter 1: Introduction

Background and Need

Access to primary care requires individuals and families having the ability to see a health care provider to respond to their specific health care needs. The idea of having quality access to primary care is especially important for individuals living with chronic conditions, especially adolescents who are dependent on their caregiver's ability to get them to proper care. If adolescents get the appropriate primary care services, their chronic illnesses will be appropriately managed, and their quality of life will improve. Appropriate and timely primary care services may also decrease ambulatory care sensitive (ACS) conditions which generally lead to preventable hospitalizations (PH). For example, a child living with a chronic condition like asthma, diabetes, or sickle cell should not be hospitalized for a preventable condition like dehydration, urinary tract infection (UTI), or severe ear, nose, and throat (ENT) infections, which are commonly referred to as ACS conditions. With the appropriate maintenance care the cost to hospitals and individuals will decrease and emergency rooms will not be overloaded with cases that could be handle by a primary care physician if the patient has access to the appropriate services and resources.

This study is importance because the medical community can begin to look at the disparities in health care services. This study will bring to the forefront individuals that live in rural areas that have less access to care, therefore, have a poorer quality of life, less resources, higher health care cost, and potentially more PH. Within the rural areas, the study will also show that there is health care and economic disparities between white and non-white individuals. The lack of primary care access leads to poor disease management (Douthit, Kiv, Dwolatzky, & Biswas 2015). The poor disease management leads to a poorer quality of life and much higher

medical cost due the inappropriate use of emergency rooms. These individuals health care cost are usually much higher because they do not go in for routine check-ups or management. They tend to go to the hospital in a medical crisis which then leads to PH.

Currently, there is limited research regarding adolescents with chronic illnesses and their access to care. Per the literature, it is difficult to access the information due to adolescents being dependent on their parents or caregivers to bring them in to seek care. There are also other social and socioeconomic conditions (e.g. employment, income, etc.) that adolescents cannot be held accountable for because they are under the care of their parent or legal guardian. Essentially, adolescents cannot manage their own medical needs.

This study can have the healthcare community begin to look at ways to filter more resources into rural communities and help them understand the importance of getting access to the appropriate primary care. This will require more education provided to those that live in the rural communities.

Problem Statement

Since adolescents are considered a vulnerable population, it is important to examine whether adolescents, especially those living with a chronic illnesses and living in a rural area, experience a higher likelihood of having a PH.

Research Question and Research Hypothesis

The research question for this particular study will attempt to determine the difference in access to primary care for adolescents living chronic illnesses and living in rural areas compared to adolescents living with chronic illnesses in urban areas.

Research Question: Do adolescents living with chronic illnesses and living in rural areas have less access to primary care than adolescents living with chronic illnesses in urban areas?

Hypothesis: Adolescents living with chronic conditions in rural areas will experience a higher number of PH compared to adolescents living with chronic conditions in urban areas.

Rationale: Adolescents living with chronic conditions in rural areas face more adverse social determinants of health (SDOH) than adolescents living with chronic conditions who live in urban areas. For example, people in rural areas may have barriers to care like finding transportation while people in urban areas have better accessibility with public transportation. Another example is people in rural areas may face more barriers in terms of socioeconomic factors like less employment opportunities which can negatively impact ability to get or maintain health insurance or have enough money to pay for primary care. In comparison, people in urban areas may have less barriers in terms of socioeconomic factors like increased employment opportunities which may provide them with employer-based health insurance and/or more money to pay towards primary care costs.

Population

The population being studied are adolescents with chronic condition between 10 years old and 19 years old who were hospitalized in South Carolina, Georgia, and Kentucky from January 2014 to December 2014. Adolescents who were hospitalized with potential pediatric ACS conditions (Carbone, Young, Stoddard, Wilkes, & Trasande 2015) were considered for this study,

Chapter 2: Scoping Literature Review

There is a common theme regarding access to primary care regarding adults that live in rural areas versus adults that live in urban areas with ACS conditions. According to Schreiber and Zielinski (1997), ACS conditions are hospital admissions that can be largely avoided if sufficient and timely outpatient care is received. The growing awareness of the importance of primary care as the foundation of a cost-effective health care system has led to an increased interest in how researchers measure the adequacy of primary care services in a given geographical area (Schreiber & Zielinski, 1997). The data shows that adults who live in urban areas have better access to primary care and less hospitalizations for what are considered PH (measured by the number or type of ACS conditions). Different articles discuss SDOH (e.g.. socioeconomic conditions, race, gender, ethnicity, payer status, etc.) that contribute to adults living in rural areas having less access to primary care and more hospitalizations for ACS conditions. Some of the contributing factors for decrease access to primary care were transportation, income, access to qualified doctors, geographical segregation, and insurance status (Caldwell et al. 2016).

Geographical segregation

In rural areas, segregation contributed to worse access to primary care and to usual source of health care but higher reports of health care needs being met among African Americans and Hispanics (Caldwell et al. 2016). According to Forman and Koch (2012), the clustering of rich and poor into separate neighborhoods may have been a largely unavoidable symptom of the growing income gulf between rich and poor. New research is providing a better indication of how the stat's changing income distribution may contribute to neighborhood changes (Forman & Koch, 2012). Forman and Koch's (2012) research showed a connection between rising

inequality and increasing income segregation is largely driven by the fact that families at the top of the income distribution are geographically separating themselves as they become more affluent.

According to Parchman and Culler (1994), there is a significant relationship between the number of family practitioners (FP)/general practitioners (GP), and the avoidable health care (AHC) rate based on income. This relationship is inverse: the higher the income level in health service areas the lower the AHC. This correlation is for both pediatric and adult individuals the AHCs (Parchman and Culler 1994). Parchman and Culler (1994) study also stated that the more FPs/GPs in an area, the less PH. Patients living in low income zip codes are three to seven times more likely to have a PH. These to correlations explains that there appears to be more FP/GSs in more affluent areas which leads to those living in those areas having less PH. This could be related to more resources being available to those in less affluent or poorer areas.

According to Douthit, et al. (2015), minorities tend to have less access to primary care and resources in their neighborhood/community due to physicians not wanting to be in the area, and the physicians' primary payer sources would be Medicaid, Medicare, and/or self-pay. The rural and lower socioeconomic areas are considered to be undesirable, and this population is also considered undesirable. The individuals that live in the areas listed above are considered undesirable because it is believed they are not an asset to society, and they only take. When health care is more segregated, minorities received less health care when compared to whites (Caldwell et al. 2016).

Rural adult populations generally have higher morbidity and mortality rates compared to urban populations; individuals living in rural areas have fewer visits for preventive screenings, less access to specialist, and more PH when compared to urban populations (Caldwell et al. 2016).

Transportation

Transportation is a major factor because many of those who live in rural areas do not have transportation and/or they live a considerable distance away from the primary care providers. According to previous literature, many time adults will forgo regular primary care visits and just go when they have a "major" appointment and have their primary care needs taken care of at this time (Douthit. 2015). Many individuals who live in rural areas do not have reliable transportation. If these low income individuals do not have Medicaid, which provides transportation, they have to provide their own transportation. Many times this includes paying someone to take them to an appointment that could be one to two hours away. Many of these individuals live below the poverty rate and cannot afford this extra cost.

Income

Income is another factor in rural patients having higher ACS condition hospitalizations. Many rural families are low-income, and they have a significantly lower income ratio that those that live in urban areas (Caldwell et al. 2016).

Many times low income individuals and families cannot afford their medications which can hinder managing or treating a diagnosis which can lead to an ACS condition or PH. Low income individuals do not have the monies to pay for transportation to their primary care visits. The major issue, per the literature, is that they do not have the money to pay for the appointment

even if they have insurance. This lack of income also impacts the patient's ability to purchase medications, get transportation to appointments, and ability to see a provider.

Health Insurance Type

The type of health care insurance a person has is another SDOH that factors into rural residents having less primary care visits and higher ACS condition hospitalizations. The majority of rural residents have Medicaid or Medicare (Schreiber & Zielinski 1997). These insurances limit the providers that an individual may see because not all medical provider are in network with Medicaid or Medicare (Douthit et al. 2016). Medicaid and Medicare, depending on the HMO, also limit the number of visits a patient can have to a primary care physician (Douthit et al 2016). These government insurances also limit the number of prescriptions they will pay for per month (Douthit et al. 2016). With Medicare, the elderly have the option of buying into prescription program, but this may not be an option for some because they cannot afford the monthly premiums. Most individuals 65 years old and older already pay a premium for Medicaid part B. Many private companies, for example AARP, offer prescription and supplement programs for seniors, but these program can cost a significant amount of money. It may be down to seniors choosing $100.00 for the monthly premium of buying food for the month. It is not fair for those who have worked and paid into the system the majority of their life to have to choose healthcare or food because both are need for survival and a good quality of life.

Health Insurance Status

Another insurance status issue is being uninsured or being underinsured. Per the literature, being uninsured or underinsured are leading factors in patients not seeking primary care treatment or follow up care (Douthit et al, 2015). A prominent theme was that rural residents

with insurance were under insured due to the type of jobs they had which were low paying and offered minimal or no benefits (Caldwell et al, 2016). Also, many physicians do not see patients if they do not have insurance of if they are under insured. According to Shi, Samuel, Pease, Bailey & Corley (1999), nonwhite patients with Medicare and/or Medicaid insurance were more likely to be discharged with an ACS condition than whites. Race as well as type of health insurance may impact quality of care. This may lead to minority and low-income patients using the hospital emergency room as their source of primary care and can lead to increased PH. Also, most individuals do not go to the emergency room until a situation or circumstance is at its worst. This may be due to various factors, including no health insurance, lack of transportation, distance to a provider, inability to pay for a doctor visit, and so forth.

Race/Ethnicity

A major theme that was shown in the data is that non-Whites have higher rates of PH than Whites. Nonwhites are almost twice as likely as whites to have a PH (Shi et al. 1999). This is attributed to Whites being of a higher economic status that non-Whites. Whites having better access to care than non-Whites. The literature stated that there will be more primary care clinics and newer hospitals in majority White areas as oppose to those areas with a higher concentration of non-White residents (Caldwell et al, 2016). It is believed this is due to the White area are usually of a higher economic status. This could mean these individuals have “good” insurance and are capable of paying for the services that are provided to them. Lower socioeconomic areas usually have residents that are uninsured, under insured, or received Medicaid or Medicare. Physicians are less likely to set up practices in these areas due to not receiving paying or receiving payments that are a fraction of what they would receive from private insurance payers.

Provider Shortages

There is also a lack of physicians in rural area. According to Caldwell et al. (2016), there are not many incentives for practicing in rural areas. The physicians income would be limited due to the majority of rural residents being uninsured, under insured, or having Medicaid/Medicare. There is concern for follow up care because the residents cannot afford the medication and/or the continued care. Also many rural physicians lack the necessary resources they need to treat their patients because much of the monies are being funneled into urban areas where state government officials may feel the needed is more warranted.

Rural residents not receiving appropriate primary care follow up leads to them having higher PH, and their overall care cost is much more expensive. With the appropriate monitoring by a primary care physician, small health issues can be taken care of appropriately and in an appropriate amount of time. Access to primary care can potentially limit the emergency room visits and PH, which will lower the cost of an individual's lifetime care cost and improve their quality of life. According to Laditka, Laditka, and Probst (2008), the most rural counties over 90% greater than the rate in the most urban counties, and there is evidence of increasing rates of PH with increasing leaves of rurality.

Poverty

According to Schreiber and Zielinski (1997), poverty was the strong predictor of ACS condition admissions. This finding is consistent with previous studies. This is likely due to individuals who are of a lower socioeconomic status have less resources and access to primary care physicians. Also, these individuals may be unable to pay for the services provided, continued treatment, and cost of medication. For many individuals, getting medical treatment

and medications is a very hard and difficult decision. Many times, individuals living in poverty have to choose between feeding their adolescents and paying for medical care for themselves.

Gap in the Literature

Through this literature review, there is very limited information regarding adolescents living in rural areas and their access to primary care as measured by ACS conditions for PH. According to Hale, Probst, & Robertson 2015, important factors associated with child health, such as parental education and socioeconomic status are not available in discharge data. This limitation may be why there is little research in the area measuring adolescents' access to care in hospitalization data.

Chapter 3: Methodology

Research Design

The research design will be a cohort study where quantitative data will be used to measure access to primary care for adolescents from both and urban and rural areas. There will be a retrospective analysis of Medicaid data for the year 2014 using ICD-9 diagnosis codes. This data will be analyzed in an attempt to determine if adolescents with chronic illnesses living in rural areas have less access to care which may lead to more preventable hospitalizations.

Sample Selection

The sample population will be adolescents, between 10 years old and 19 years old, with chronic illness that have Medicaid as their primary payer source. Adolescents ages 10-19 years old living in South Carolina, Georgia, Kentucky who were hospitalized with potential pediatric ACS conditions (Carbone et al. 2015) were considered for this study.

Data Set Description

The Healthcare Cost and Utilization (HCUP) the State Inpatient Database (SID) captures inpatient hospital stays from community hospitals in each state; it includes patient demographic information, including age, type of health insurance, and race/ethnicity (HCUP, 2018). The Health Resources Services Administration's (HRSA) Area Health Resources Files (AHRF) provide county-level health care data on health professionals, health status, and socioeconomic status to measure the health status of various geographical areas (Health Resources and Services Administration, n.d.). AHRF data can be linked to HCUP SID data for analysis.

Data Collection/Procedure

Adolescents with a secondary discharge diagnosis for asthma, diabetes, or sickle cell will be defined as adolescents with a chronic condition (Table 1).

Table 1: List of chronic conditions and ICD-9 codes

Chronic Conditions	Reference	Comments
Asthma	Brown, E. A., White, B.M., Jones, W., Simpson, K.N. (2018). Medicaid Expansion and Access to Care: Use of Ambulatory Care Sensitive Conditions and Interrupted Time Series to Evaluate United States Healthcare Policies. Retrieved from http://digital.library.musc.edu/cdm/singleitem/collection/medica/id/1388/rec/1	- Asthma (493) - Extrinsic asthma (493.0) - Asthma unspecified (493.9)
Diabetes "A"	Brown, E. A., White, B.M., Jones, W., Simpson, K.N. (2018). Medicaid Expansion and Access to Care: Use of Ambulatory Care Sensitive Conditions and Interrupted Time Series to Evaluate United States Healthcare Policies. Retrieved from http://digital.library.musc.edu/cdm/singleitem/collection/medica/id/1388/rec/1	- Diabetes with ketoacidosis (250.1) - Diabetes with hyperosmolarity (250.2) Diabetes with other coma (250.3)
Diabetes "B"	Brown, E. A., White, B.M., Jones, W., Simpson, K.N. (2018). Medicaid Expansion and Access to Care: Use of Ambulatory Care Sensitive Conditions and Interrupted Time Series to Evaluate United States Healthcare Policies. Retrieved from http://digital.library.musc.edu/cdm/singleitem/collection/medica/id/1388/rec/1	- Diabetes with other specified manifestations (250.8) - Diabetes with unspecified complication (250.9) -Diabetes with renal manifestations (250.4)
Diabetes "C"	Brown, E. A., White, B.M., Jones, W., Simpson, K.N. (2018). Medicaid Expansion and Access to Care: Use of Ambulatory Care Sensitive Conditions and Interrupted Time Series to Evaluate United States Healthcare Policies. Retrieved from http://digital.library.musc.edu/cdm/singleitem/collection/medica/id/1388/rec/1	- Diabetes mellitus without mention of complication (250.0)
Sickle Cell	Practice Management Information Corporation. (2003). *ICD-9-CM 2004* (Vol. 1). Practice Management Information Corporation.	-Hb-SS disease with crisis (282.62 -Sickle-cell/HB-C disease with crisis (282.64)

		-Other sickle-cell disease with crisis (282.69)

Adolescents with a chronic condition (e.g. diabetes, asthma, or sickle cell) will be categorized into two groups: those with poor access to primary care and those with appropriate access to primary care. Poor access to primary care will be defined as having a primary discharge diagnosis of certain ACS conditions, such as angina pectoris, bacterial pneumonia, and cellulitis (see Appendix for full list). This particular methodology determining primary versus secondary diagnoses comes from researchers who studied access to primary care for children with Autism Spectrum Disorder (ASD) (Carbone et al, 2015).

Independent and Dependent Variables

The independent variable is rural/urban residence and its impact on the dependent variable, which the number of preventable hospitalizations. The study is essentially trying to determine if living in a rural area is limiting their access to the appropriate primary care.

Data Analysis

Researchers will SAS 9.4 to complete all data analysis. Descriptive statistics will include mean and percentages to describe sample population. A regression model will be used to determine the relationship between rural/urban status and poor access to primary care. Several covariates, including race/ethnicity and sex will be controlled for in adjusted models.

Limitations

There are some limitations to this study due to it mainly focusing on adolescents in South Carolina, Georgia, and Kentucky and not generalizable to other populations or demographic areas. There is limited research in the area measuring adolescents' access to care in hospital data. Parents' education, employment, transportation and other parental factors may impact minor adolescents' access to primary care. Due to this, it was hard to encapsulate the true cause of their lack of primary care access. This study depends on the accuracy of the ICD-9 codes and coding. Finally, we were unable to determine the severity of the patients' illness.

Protection of Human Subjects

Researchers will use archival administrative hospital data to conduct data analysis. The Institutional Review Board (IRB) at the Medical University of South Carolina (MUSC) deemed this research to not be human subject research (ID: Pro00037013) since the data will use de-identified public use data. This study will be using archival data from HCUP. Permission was granted by the Medical University of South Carolina for this data to be used in this study.

Abstract of Doctoral Project Report Presented to the Interprofessional Doctoral Program in Health Administration & Leadership
Medical University of South Carolina

In Partial Fulfillment of the Requirements for the

Degree of Doctor of Health Administration

EFFECT OF RURAL RESIDENCE ON PRIMARY CARE ACCESS FOR ADOLESCENTS WITH CHRONIC CONDITIONS

BY

Jessica Michelle Winkler

Chairperson: Dr. Elizabeth A. Brown, PhD, MPA, Assistant Professor, Medical University of South Carolina

Committee: Dr. Kit N. Simpson, DrPH, Professor, Medical University of South Carolina

Dr. Brandi M. White, PhD, MPH, Assistant Professor, University of Kentucky

It is essential for adolescents with chronic conditions to have appropriate access to primary care. If the adolescents with chronic conditions do not have adequate primary care access, they will likely have a poorer quality of life and more preventable hospitalizations. This can make an already difficult situation on the family even more burdensome. Additionally, this will also become burdensome to the healthcare community. This study is important because the medical community can begin to look at the disparities in health care services. This retrospective cohort study used 2014 state hospitalization data from Georgia (GA), Kentucky (KY), and South Carolina (SC) to examine access to primary care for adolescents from both urban and rural areas. The sample population was adolescents, between 10 years old and 19 years old, with ACS conditions (Carbone et al. 2015) were considered for this study. The study examined the

likelihood of adolescent living with chronic illnesses and living in rural areas experiencing higher preventable hospitalization (PH). The most noteworthy findings were that younger, minority, males who have a MHI lower than $40,000, and live in a rural areas were most likely to have PH compared to their counterparts.

Keywords: preventable hospitalizations, adolescents, ambulatory care sensitive conditions, primary care

Introduction

Access to primary care requires individuals and families having the ability to see a health care provider to respond to their specific health care needs. The idea of having quality access to primary care is especially important for individuals living with chronic conditions, especially adolescents who are dependent on their caregiver's ability to get them to proper care. If adolescents get the appropriate primary care services, their chronic illnesses will be appropriately managed, and their quality of life will improve. Appropriate and timely primary care services may also decrease ambulatory care sensitive (ACS) conditions which generally lead to preventable hospitalizations (PH). ACS conditions are those conditions for which hospital admission could be prevented by interventions in primary care. Sets of ACS conditions often include conditions for which acute management and control should prevent admissions Moy, E., Chang, E., & Barrett, M. 2013). Preventable hospitalizations are Admissions to a hospital for certain acute illnesses (e.g. dehydration) or worsening chronic conditions (e.g. diabetes) that might not have required hospitalization had these conditions been managed successfully by primary care providers in outpatient settings (Purdy, S., Griffin, T., Salisbury, C., & Sharp, D. 2009). For example, a child living with a chronic condition like asthma, diabetes, or sickle cell should not be hospitalized for a preventable condition like dehydration, nutritional deficiencies, dental conditions, constipation or severe Ear, Nose, and Throat (ENT) infections which are commonly referred to as ACS conditions. With the appropriate maintenance care the cost to hospitals and individuals will decrease and emergency rooms will not be overloaded with cases that could be handle by a primary care physician if the patient is given the appropriate access and resources.

There is a common theme regarding access to primary care regarding adults that live in rural areas versus adults that live in urban areas with ACS conditions. According to Schreiber and Zielinski (1997), ACS conditions are hospital admissions that can be largely avoided if sufficient and timely outpatient care is received. The growing awareness of the importance of primary care as the foundation of a cost-effective health care system has led to an increased interest in how researchers measure the adequacy of primary care services in a given geographical area (Schreiber & Zielinski, 1997). Also according to Parchman and Culler (1994), the availability of family practitioners/general practitioners are related to lower PH. The data shows that adults who live in urban areas have better access to primary care and less hospitalizations for what are considered PH (measured by the number of ACS conditions). Different articles discuss SDOH (e.g.. socioeconomic conditions, race, gender, ethnicity, payer status, etc.) that contribute to adults living in rural areas having less access to primary care and more hospitalizations for ACS conditions. Some of the contributing factors for decrease access to primary care were transportation, income, access to qualified doctors, geographical segregation, and insurance status (Caldwell et al. 2016).

According to Schreiber and Zielinski (1997), poverty was the strongest predictor of ACS condition admissions. This is likely due to individuals who are of a lower socioeconomic status have less resources and access to primary care physicians. Also, these individuals may be unable to pay for the services provided (e.g. copays, deductibles, etc.), continued treatment, and cost of medication. For many individuals, getting medical treatment and medications is a very hard and difficult decision. Many times, individuals living in poverty must choose between feeding their families and paying for medical care for themselves.

Through this literature review, there is very limited information regarding adolescents living in rural areas and their access to primary care as measured by ACS conditions for PH. According to Hale, Probst, & Robertson 2015, important factors associated with child health, such as parental education and socioeconomic status are not available in discharge data. This limitation may be why there is little research in the area measuring adolescents' access to care in hospitalization data.

Methods

The study used 2014 state hospitalization data from Georgia (GA), Kentucky (KY), and South Carolina (SC) to examine access to primary care for adolescents from both urban and rural areas. The sample population was adolescents, between 10 years old and 19 years old, with ACS conditions (Carbone et al. 2015) were considered for this study.

The Healthcare Cost and Utilization (HCUP) the State Inpatient Database (SID) captures inpatient hospital stays from community hospitals in each state; it includes patient demographic information, including age, type of health insurance, and race/ethnicity (HCUP, 2018). Hospitalizations were categorized into two separate groups based on the National Center for Health Statistics (NCHS) urban-rural classification (HCUP, 2018).

Adolescents with a primary discharge diagnosis for asthma, diabetes, sickle cell as well as pediatric ACS conditions, except immunizable conditions (e.g. diphtheria, pertussis, etc.), were included in the final analysis (see Appendix for conditions and corresponding ICD-9 codes). Appropriate discharge diagnoses for ACS conditions were identified with ICD-9 codes (*International Classification of Diseases, 9th Revision, Clinical Modification* codes).

Race, expected primary payer, and age were recoded from the original HCUP dataset. Race was categorized as white or nonwhite. Expected primary payer was recoded to include Medicare and Medicaid in one category defined as public health insurance (Carbone et al. 2015). Age was a continuous variable in both GA and KY; however, the variable was turned into a categorical variable to better align with SC's categorical age variable. Thus, researchers focused on the following two age groups: 10-14 years old and 15-19 years old based on SC's data construction.

Statistical Analyses. Descriptive statistics compared differences in demographic variables between patients from urban and rural residences. First, associations were tested between residence type (rural or urban), patient demographics, and hospitalization type (preventable vs. non preventable) in bivariate analyses. Chi-square tests were used to determine associations between categorical variables. For continuous variables, two-sample t-tests were conducted to test the difference in means between the urban vs. rural group. Wilcoxon tests results reported for non-normal data.

Secondly, unadjusted and adjusted models were performed on the main dependent variable (access to primary care measured by preventable hospitalizations) and the secondary dependent variable (length of stay). Binary logistic regression model was used to analyze the odds of having a preventable hospitalization. A negative binomial (NB) regression model was used to analyze data for LOS. Adjusted multivariable models controlled for several covariates, including race, age, sex, and income.

Researchers used SAS 9.4 to analyze archival administrative hospital data. The Institutional Review Board (IRB) at the Medical University of South Carolina (MUSC) deemed this research to not be human subject research (ID: Pro00037013) since the data will use de-

identified public use data. This study will be using archival data from HCUP. Permission was granted by the Medical University of South Carolina for this data to be used in this study.

Results

In 2014, for adolescents aged 10-19 years old, there were a total of 72,944 total hospitalizations in GA (48.32%), KY (30.19%), and SC (21.49%). Of the total hospitalizations, 9,074 (12.44%) reported a rural residence. Approximately, 1,089 (12%) of patients with a rural residence had a preventable hospitalization.

Descriptive statistics for patient-level characteristics are shown in Table 1. Chi-square analysis illustrated that adolescents in both the rural and urban cohort had a higher proportion who were older (15-19 years old), white, and female. A majority in both the urban (53.96%) and rural (69.13%) cohorts listed public insurance as the primary payer. Rural adolescents were more likely to have an MHI less than $40,000 ($p<.0001$). The proportion of discharges with a primary diagnosis of an ACS condition (preventable hospitalization) was not significant between urban and rural residence (11.89% vs. 12.00%, $p=0.7522$). The average length of stay (4.88) for rural residents was significantly higher than those from urban areas (4.78) ($p<0.001$).

Table 1. Demographics variables for adolescents aged 10-19 years old by residence type

Characteristic[1,2]	Urban Residence n(%) n=63,870 (87.56)	Rural Residence n(%) n=9,074 (12.44)	p-value
Race			<.0001
Minority	31082 (48.66)	2280 (25.13)	
White	32788 (51.34)	6794 (74.87)	
Sex			<.0001
Female	41530 (65.03)	6106 (67.31)	
Male	22329 (34.97)	2966 (32.69)	
Age			<.0001
10-14 years old	4180 (6.54)	334 (3.68)	
15-19 years old	59690 (93.46)	8740 (96.32)	
Median Household Income (MHI)			<.0001
$1 - $39,999	24806 (39.27)	7567 (84.82)	
$40,000 - $50,999	18977 (30.44)	1266 (14.19)	
$51,000 - $65,999	13549 (21.45)	88 (0.99)	
$66,000+	5837 (9.24)	0 (0.00)	
Primary payer			<.0001
Public[3]	34464 (53.96)	6273 (69.13)	
Private	23749 (37.18)	2298 (25.33)	
Uninsured	2273 (3.56)	278 (3.06)	
Other	3384 (5.30)	225 (2.48)	
Hospitalizations			0.7522
Nonpreventable	56278 (88.11)	7985 (88.00)	
Preventable	7592 (11.89)	1089 (12.00)	
Length of Stay (LOS), Mean (SD)[4]	4.78 (9.27)	4.88 (11.46)	<.0001
Total Charges, Mean (SD)	$27,005 ±$66,153	$25,044 ±$67,108	<.0001

State characteristics are listed in Table 2. KY had the most hospitalizations with a rural residence listed (54.64%). GA had the most hospitalizations with an urban residence listed (50.63%). GA also had a majority of preventable hospitalizations (51.89%) compared to KY (23.12%) and SC (24.99%).

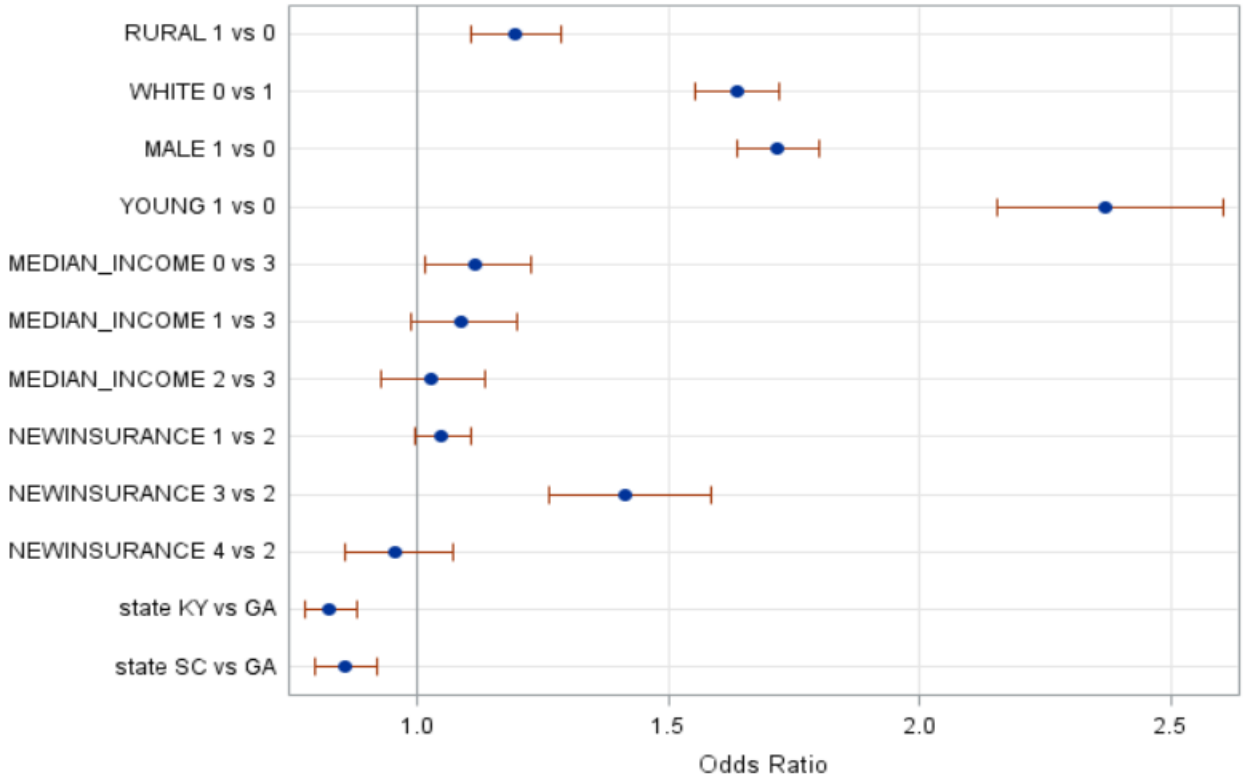
[1] Chi-square tests conducted for categorical variables and t-tests conducted for continuous variables. Wilcoxon used for all non-normal data.
[2] All data reported accounts for non-missing data
[3] Includes Medicaid and Medicare
[4] SD: Standard deviation

Table 2. State-level characteristics, 2014

Characteristics	Georgia n(%) n=35,244 (48.32)	Kentucky n(%) n=22023 (30.19)	South Carolina n(%) n=15,677 (21.49)	p-value
Residence type				<.0001
Urban	32336 (50.63)	17065 (26.72)	14469 (22.65)	
Rural	2908 (32.05)	4958 (54.64)	1208 (13.31)	
Hospitalizations				<.0001
Nonpreventable	30739 (47.83)	20016 (31.15)	13508 (21.02)	
Preventable	4505 (51.89)	2007 (23.12)	2169 (24.99)	

Preventable Hospitalizations. In an unadjusted model, rural residence was not significantly associated with a higher odd of having a preventable hospitalization (OR:1.011, 95% CI 0.945-1.082). After adjusting for several covariates, rural residents (OR:1.193, 95% CI 1.107-1.285), minorities (OR:1.635, 95% CI 1.553-1.722), males (OR:1.717, 95% CI 1.638-1.799), and younger adolescents (10-14 years old) (OR:2.369, 95% CI 2.154-2.605) had a significantly increased odds of a preventable hospitalization (Figure 1). Those with a median income less than $40,000 had higher odds of having a preventable hospitalization compared to those with an MHI of $66,000 or higher (OR 1.116, 95% CI 1.016-1.226). When looking at states, those in KY and SC had lower odds of having a preventable hospitalization compared to GA.

Figure 1. Adjusted logistic regression of preventable hospitalizations[5]



Length of Stay. In unadjusted model examining the difference length of stay (LOS), having a rural residence was significantly associated with a slightly longer LOS (1.58 vs. 1.56, p=0.0456). After adjusting the model for several covariates, rural residence had a shorter LOS (1.44 vs. 1.47, p=0.0044) (Figure 2). Those who were minority, younger, male, and publicly insured tended to trend towards a longer LOS (Table 3). A shorter LOS was significantly associated with the following characteristics: urban residence, preventable hospitalization, the uninsured, and those with lower incomes.

[5] Odds Ratios with 95% Confidence Limits

Figure 2. Mean length of stay by residence type, adjusted model

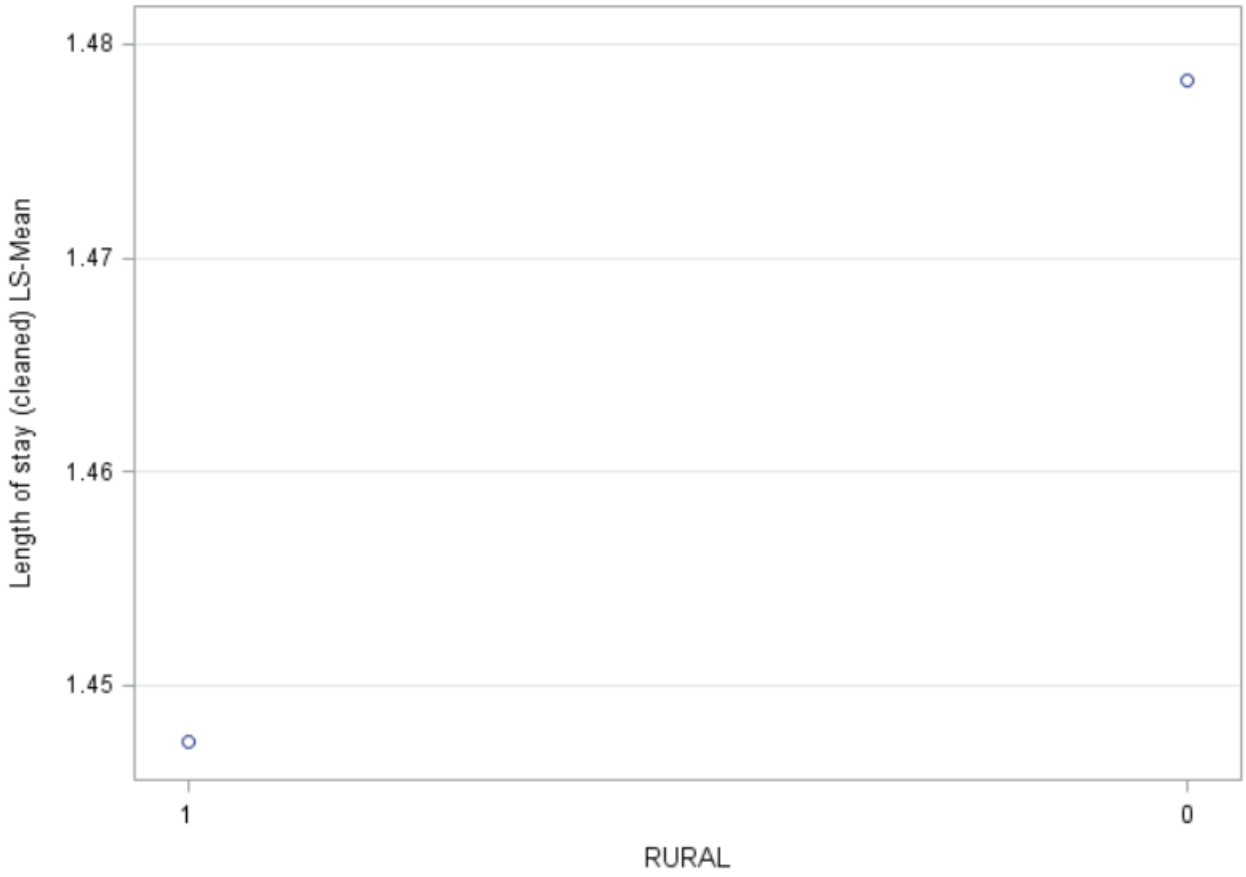


Table 3. Adjusted linear regression for length of stay

Characteristic	Estimate	p-value
Residence		
Urban (ref)		
Rural	-0.0310	0.0044
Race		
White (ref)		
Minority	0.0418	<.0001
Sex		
Female (ref)		
Male	0.3207	<.0001
Age		
15-19 years old (ref)		
10-14 years old	0.1835	<.0001
Median Household Income (MHI)		
$1 - $39,999	-0.1039	<0.0001
$40,000 - $50,999	-0.0465	0.0006
$51,000 - $65,999	-0.0048	0.7327
$66,000+ (ref)		
Primary payer		
Private (ref)		
Public[6]	0.0519	<.0001
Uninsured	-0.1050	<.0001
Other	0.1536	<.0001
State		
Georgia (ref)		<.0001
Kentucky	0.3695	<.0001
South Carolina	-0.0921	
Hospitalizations		
Nonpreventable (ref)		
Preventable	-0.5050	<.0001

Discussion

This study examines the likelihood of adolescents living with chronic illnesses and living in rural areas experiencing higher PH. The most noteworthy findings were that younger, minority, males who have a MHI of lower than $40,000, and live in a rural area were more likely

[6] Includes Medicaid and Medicare

to have PH compared to their counterparts. There are many factors that may contribute to this finding. First, adolescents who live with a family/caregiver that has a MHI of less than $40,000 are likely on Medicaid or uninsured. According to Evans, Smith, Kobayashi, and Chang (2015), African Americans who are uninsured or covered by Medicaid and uninsured Latinos are more likely than Whites to be admitted for PH. African Americans were more likely to have a PH 1.582 (Medicaid) and 1.714 (uninsured) than Whites (Evans, et al. 2015). Uninsured Latinos have a 1.714 higher chance of a PH than Whites (Evans, et al. 2015). Minorities tend to have less access to primary care and resources in their neighborhoods and/or communities due to physicians not being located in lower income areas and those residents primary payer sources would be Medicaid, Medicare, and/or self-pay. (Douthit, et al. 2015).

According to Garg, Probst, Sease, and Samuels (2003), higher rates of ACSCs among with Medicaid suggest that insurance alone does not guarantee access to ambulatory care. Medicaid children may have increased morbidity due to poor environmental and social conditions (Garg, et al. 2003). The younger group of adolescents may be more likely to have PH because they are dependent on their parents to ensure primary care is provide for them. The ability of their parents to seek appropriate care depends on the parent's education, socio economic condition, transportation, and available resources. Another factor that could impact access to care is the number of community health centers (CHC) in a geographic area. CHC are health centers that received grants under the Health Center Program under section 30 of the Public Health Act (Evans et al. 2015). Federally Qualified Heath Centers (FQHC) are organizations that meet all the Health Center Program requirements but do not receive Health Center Program Grants (Evans et al. 2015). According to Evans, et al (2015) study that was done in California, as the number of community health centers increased the number of PH

decreased for Medicaid and uninsured patients. Evans et al. (2015) states, in Medicaid patients, as the CHS density increased around hospitals, there was a decreasing odds ratio trend for admission to hospitals with chronic PQI (OR 0.84, 0.83, 0.81, respectively, $p<.001$, .001, .004). CHCs and other FQHCs are expected to play a significant role in providing for increased demand in primary care services, particularly among low-income patient populations (Evans et al 2015).

The findings were interesting for length of stay (LOS). The adjusted model showed that individuals who lived in rural areas had a slightly shorter LOS than individuals that lived in urban areas. This could be due to several factors. A significant factor is due to most public insurances having limited number of days for a hospitalization depending on the diagnosis or lack of insurance; therefore, type of insurance could be impact LOS. Additional research needs to be done to determine why adolescents who live in rural areas have low LOS than their counterparts in urban areas.

There needs to be additional research on how to decrease the number of PH for adolescents in rural areas. Future research studies should identify what type of resources the community needs, what incentives are available for doctors who go in rural medicine, and if telehealth is a viable option for those within the rural communities.

Limitations

There are some limitations to this study due to it mainly focusing on adolescents in South Carolina, Georgia, and Kentucky and not generalizable to other populations or demographic areas. Parents' education, employment, transportation and other parental factors may impact

minor adolescents' access to primary care. Due to this, it was hard to encapsulate the true cause of adolescents' lack of primary care access. This study was unable to measure the parent's employment status or educational background because this information was not available in HCUP. Due to this, we were unable to determine the child's household make up, parent's level of education, parent's insurance status, and/or employment status. The study depends on the accuracy of ICD-9 codes, which could have errors.

Conclusion

According to Garg et al. (2003), 1998 hospitalization data showed young, male, nonwhite children with Medicaid and living in rural areas are more likely to have a PH. Our study showed the same results as Garg et al. (2003) using 2014 hospitalization data. In a span of 16 years, younger, minority, male adolescents from rural areas still have issues accessing primary care. There are so many factors that need to be considered when trying to off appropriate healthcare especially to children. Many individuals think that if health insurance is provided, then everyone would have access to appropriate healthcare. This is not the case. There are various social determinants of health (e.g. density of health care providers and facilities, transportation, socioeconomic status) that need to be considered when serving vulnerable populations.

References

Brown, E.A., White, B.M., Jones, W., Simpson, K.N. (2018). Medicaid expansion and Access to Care: Use of Ambulatory Care Sensitive Conditions and Interrupted Time Series to Evaluate United States Healthcare Policies. Retrieved from http://digital.library.musc.edu/cdm/singleitem/collection/medica/id/1388/rec/1

Caldwell, J. T., Ford, C. L., Wallace, S. P., Wang, M. C., & Takahashi, L. M. (2017). Racial and ethnic residential segregation and access to health care in rural areas. *Health & place*, *43*, 104-112.

Carbone, P. S., Young, P. C., Stoddard, G. J., Wilkes, J., & Trasande, L. (2015). A comparison of ambulatory care sensitive hospitalizations among children with and without autism spectrum disorder. *Academic pediatrics*, *15*(6), 626-635.

Douthit, N., Kiv, S., Dwolatzky, T., & Biswas, S. (2015). Exposing some important barriers to health care access in the rural USA. *Public health*, *129*(6), 611-620.

Evans, C. S., Smith, S., Kobayashi, L., & Chang, D. C. (2015). The effect of community health center (CHC) density on preventable hospital admissions in Medicaid and uninsured patients. *Journal of health care for the poor and underserved*, *26*(3), 839-851.

Forman, B., & Koch, C. (2012). Geographic Segregation: The Role of Income Inequality. *Communities and Banking*.

Garg, A., Probst, J. C., Sease, T., & Samuels, M. E. (2003). Potentially preventable care: ambulatory care-sensitive pediatric hospitalizations in South Carolina in 1998. *Southern medical journal*, *96*(9), 850-859.

Hale, N., Probst, J., & Robertson, A. (2016). Rural area deprivation and hospitalizations among children for ambulatory care sensitive conditions. *Journal of community health*, *41*(3), 451-460.

Healthcare Cost and Utilization Project. (2018). Overview of the state inpatient databases (SID). Retrieved from: https://www.hcup-us.ahrq.gov/sidoverview.jsp

Healthcare Cost and Utilization Project (2018). National center for health statistics urban-rural code (NCHS). Retrieved from: https://www.hcupus.ahrq.gov/db/vars/pl_nchs/nisnote.jsp.

ICD9data.com. (n.d.). Sickle-cell disease, unspecified. Retrieved from http://www.icd9data.com/2012/Volume1/280-289/282/282.60.htm

Laditka, J. N., Laditka, S. B., & Probst, J. C. (2009). Health care access in rural areas: evidence that hospitalization for ambulatory care-sensitive conditions in the United States may increase with the level of rurality. *Health & place*, *15*(3), 761-770.

Moy, E., Chang, E., Barrett, M., & Centers for Disease Control and Prevention (CDC). (2013). Potentially preventable hospitalizations—United States, 2001–2009. *MMWR Surveill Summ*, *62*(Suppl 3), 139-143.

Parchman, M. L., & Culler, S. (1994). Primary care physicians and avoidable hospitalizations. *Journal of Family Practice*, *39*(2), 123-129.

Purdy, S., Griffin, T., Salisbury, C., & Sharp, D. (2009). Ambulatory care sensitive conditions: terminology and disease coding need to be more specific to aid policy makers and clinicians. *Public health*, *123*(2), 169-173.

Schreiber, S., & Zielinski, T. (1997). The meaning of ambulatory care sensitive admissions: urban and rural perspectives. *The Journal of Rural Health*, *13*(4), 276-276.

Shi, L., Samuels, M. E., Pease, M., Bailey, W. P., & Corley, E. H. (1999). Patient characteristics associated with hospitalizations for ambulatory care sensitive conditions in South Carolina. *Southern medical journal*, *92*(10), 989-998.

Appendix

Ambulatory Care Sensitive (ACS) Conditions	References [ICD-9 Codes]	Comments
1. Angina pectoris	Brown, E. A., White, B.M., Jones, W., Simpson, K.N. (2018). Medicaid Expansion and Access to Care: Use of Ambulatory Care Sensitive Conditions and Interrupted Time Series to Evaluate United States Healthcare Policies. Retrieved from http://digital.library.musc.edu/cdm/singleitem/collection/medica/id/1388/rec/1	- Exclude cases with a surgical procedure [01-86.99] (Millman, 1993) - Intermediate coronary syndrome (411.1) - Other acute and subacute forms of ischemic heart disease (411.8) - Angina pectoris (413)
2. Asthma	Brown, E. A., White, B.M., Jones, W., Simpson, K.N. (2018). Medicaid Expansion and Access to Care: Use of Ambulatory Care Sensitive Conditions and Interrupted Time Series to Evaluate United States Healthcare Policies. Retrieved from http://digital.library.musc.edu/cdm/singleitem/collection/medica/id/1388/rec/1	- Asthma (493) - Extrinsic asthma (493.0) - Asthma unspecified (493.9)
3. Bacterial Pneumonia	Brown, E. A., White, B.M., Jones, W., Simpson, K.N. (2018). Medicaid Expansion and Access to Care: Use of Ambulatory Care Sensitive Conditions and	- Exclude cases with secondary diagnosis of sickle cell [282.6] and patients < 2 months (Millman, 1993) - Pneumococcal pneumonia (481) - Pneumonia due to Hemophilus influenza (482.2)

	Interrupted Time Series to Evaluate United States Healthcare Policies. Retrieved from http://digital.library.musc.edu/cdm/singleitem/collection/medica/id/1388/rec/1	- Pneumonia due to streptococcus (482.3) - Bacterial pneumonia, unspecified (482.9) - Pneumonia due to other specified organism (483) - Bronchopneumonia, organism unspecified (485) - Pneumonia, organism unspecified (486)
4. Cellulitis	Brown, E. A., White, B.M., Jones, W., Simpson, K.N. (2018). Medicaid Expansion and Access to Care: Use of Ambulatory Care Sensitive Conditions and Interrupted Time Series to Evaluate United States Healthcare Policies. Retrieved from http://digital.library.musc.edu/cdm/singleitem/collection/medica/id/1388/rec/1	- Exclude cases with surgical procedure [01-86.99], except skin incision and subcutaneous tissue [86.0] where it is just listed as surgical procedure (Millman, 1993) - Cellulitis and abscess of finger and toe (681) - Other cellulitis and abscess (682) - Cellulitis and abscess of face (682.0) - Acute lymphadenitis (683) - Other local infections of skin and subcutaneous tissue (686)
5. Chronic Obstructive Pulmonary Disease (COPD)	Brown, E. A., White, B.M., Jones, W., Simpson, K.N. (2018). Medicaid Expansion and Access to Care: Use of Ambulatory Care Sensitive Conditions and Interrupted Time Series to Evaluate United States Healthcare Policies. Retrieved from http://digital.library.musc.edu/cdm/singleitem/collection/medica/id/1388/rec/1	- Acute bronchitis [466.0] only with secondary diagnosis of 491, 492, 494, 496 (Millman, 1993) - Chronic bronchitis (491) - Emphysema (492) - Bronchiectasis (494) - Chronic airway obstruction (496) - Acute bronchitis (466.0) - Acute bronchiolitis (466.1)
6. Congestive Heart Failure (CHF)	Brown, E. A., White, B.M., Jones, W.,	- Exclude cases with surgical procedures [36.01, 36.02, 36.05,

	Simpson, K.N. (2018). Medicaid Expansion and Access to Care: Use of Ambulatory Care Sensitive Conditions and Interrupted Time Series to Evaluate United States Healthcare Policies. Retrieved from http://digital.library.musc.edu/cdm/singleitem/collection/medica/id/1388/rec/1	36.1, 37.5, or 37.7] (Millman, 1993) - Congestive Heart Failure (428) - Malignant Hypertensive Heart Disease with Heart Failure (402.01) - Benign Hypertensive Heart Disease with Heart Failure (402.11) - Unspecified Hypertensive Heart Disease with Heart Failure (402.91) - Congestive Heart Failure, unspecified (428.0) - Left heart failure (428.1) - Acute edema of lung, unspecified (518.4)
7. Convulsions "B"	Brown, E. A., White, B.M., Jones, W., Simpson, K.N. (2018). Medicaid Expansion and Access to Care: Use of Ambulatory Care Sensitive Conditions and Interrupted Time Series to Evaluate United States Healthcare Policies. Retrieved from http://digital.library.musc.edu/cdm/singleitem/collection/medica/id/1388/rec/1	- Use for those age > 5 (Millman, 1993) - Convulsions (780.3)
8. Dehydration - volume depletion	Brown, E. A., White, B.M., Jones, W., Simpson, K.N. (2018). Medicaid Expansion and Access to Care: Use of Ambulatory Care Sensitive Conditions and Interrupted Time Series to Evaluate United States Healthcare Policies. Retrieved	- Examine principal and secondary diagnoses separately (Millman, 1993) - Volume depletion disorder (276.5)

	from http://digital.library.musc.edu/cdm/singleitem/collection/medica/id/1388/rec/1	
9. Diabetes "A"	Brown, E. A., White, B.M., Jones, W., Simpson, K.N. (2018). Medicaid Expansion and Access to Care: Use of Ambulatory Care Sensitive Conditions and Interrupted Time Series to Evaluate United States Healthcare Policies. Retrieved from http://digital.library.musc.edu/cdm/singleitem/collection/medica/id/1388/rec/1	- Diabetes with ketoacidosis (250.1) - Diabetes with hyperosmolarity (250.2) - Diabetes with other coma (250.3)
10. Diabetes "B"	Brown, E. A., White, B.M., Jones, W., Simpson, K.N. (2018). Medicaid Expansion and Access to Care: Use of Ambulatory Care Sensitive Conditions and Interrupted Time Series to Evaluate United States Healthcare Policies. Retrieved from http://digital.library.musc.edu/cdm/singleitem/collection/medica/id/1388/rec/1	- Diabetes with other specified manifestations (250.8) - Diabetes with unspecified complication (250.9) - Diabetes with renal manifestations (250.4)
11. Diabetes "C"	Brown, E. A., White, B.M., Jones, W., Simpson, K.N. (2018). Medicaid Expansion and Access to Care: Use of Ambulatory Care Sensitive	- Diabetes mellitus without mention of complication (250.0)

	Conditions and Interrupted Time Series to Evaluate United States Healthcare Policies. Retrieved from http://digital.library.musc.edu/cdm/singleitem/collection/medica/id/1388/rec/1	
12. Gastroenteritis	Brown, E. A., White, B.M., Jones, W., Simpson, K.N. (2018). Medicaid Expansion and Access to Care: Use of Ambulatory Care Sensitive Conditions and Interrupted Time Series to Evaluate United States Healthcare Policies. Retrieved from http://digital.library.musc.edu/cdm/singleitem/collection/medica/id/1388/rec/1	- Other and unspecified noninfectious gastroenteritis and colitis (558.9) (558)
13. Gastrointestinal ulcer	Brown, E. A., White, B.M., Jones, W., Simpson, K.N. (2018). Medicaid Expansion and Access to Care: Use of Ambulatory Care Sensitive Conditions and Interrupted Time Series to Evaluate United States Healthcare Policies. Retrieved from http://digital.library.musc.edu/cdm/singleitem/collection/medica/id/1388/rec/1	- Gastric ulcer (531) - Gastric ulcer, unspecified (531.9) - Duodenal ulcer (532) - Chronic duodenal ulcer (532.7) - Duodenal ulcer, unspecified (532.9) - Peptic ulcer (533) - Gastrojejunal ulcer (534)

14. Grand mal status and other epileptic convulsions	Brown, E. A., White, B.M., Jones, W., Simpson, K.N. (2018). Medicaid Expansion and Access to Care: Use of Ambulatory Care Sensitive Conditions and Interrupted Time Series to Evaluate United States Healthcare Policies. Retrieved from http://digital.library.musc.edu/cdm/singleitem/collection/medica/id/1388/rec/1	- Epilepsy and recurrent seizures (345) - Generalized convulsive epilepsy (345.1) - Epilepsy, unspecified (345.9)
15. Hypertension / Malignant Hypertension	Brown, E. A., White, B.M., Jones, W., Simpson, K.N. (2018). Medicaid Expansion and Access to Care: Use of Ambulatory Care Sensitive Conditions and Interrupted Time Series to Evaluate United States Healthcare Policies. Retrieved from http://digital.library.musc.edu/cdm/singleitem/collection/medica/id/1388/rec/1	- Exclude cases with procedures [36.01, 36.02, 36.05, 36.1, 37.5, 37.7] (Millman, 1993) - Malignant hypertension (401.0) - Unspecified hypertension (401.9) - Malignant hypertensive heart disease (402.0) - Malignant hypertensive heart disease without heart failure (402.00) - Benign hypertensive heart disease without heart failure (402.10) - Unspecified hypertensive heart disease without heart failure (402.90) - Malignant hypertensive renal disease (403.0) - Hypertensive heart and chronic kidney disease (404.0)
16. Hypoglycemia	Brown, E. A., White, B.M., Jones, W., Simpson, K.N. (2018). Medicaid Expansion and Access to Care: Use of Ambulatory Care Sensitive Conditions and Interrupted Time Series	- Hypoglycemia (251.2)

	to Evaluate United States Healthcare Policies. Retrieved from http://digital.library.musc.edu/cdm/singleitem/collection/medica/id/1388/rec/1	
17. Kidney/Urinary Tract Infection	Brown, E. A., White, B.M., Jones, W., Simpson, K.N. (2018). Medicaid Expansion and Access to Care: Use of Ambulatory Care Sensitive Conditions and Interrupted Time Series to Evaluate United States Healthcare Policies. Retrieved from http://digital.library.musc.edu/cdm/singleitem/collection/medica/id/1388/rec/1	- Infections of kidney (590) - Urinary tract infection, site not specified (599.0) - Unspecified disorder of urethra and urinary tract (599.9)
18. Severe ENT (ears, nose, and/or throat) infections	Brown, E. A., White, B.M., Jones, W., Simpson, K.N. (2018). Medicaid Expansion and Access to Care: Use of Ambulatory Care Sensitive Conditions and Interrupted Time Series to Evaluate United States Healthcare Policies. Retrieved from http://digital.library.musc.edu/cdm/singleitem/collection/medica/id/1388/rec/1	- Exclude cases with otitis media [382] and myringotomy with insertion tube [20.01] (Millman, 1993) - Otitis media (382) - Acute pharyngitis (462) - Acute tonsillitis (463) - Acute upper respiratory infections (465) - Acute upper respiratory infections, unspecified (465.9) - Chronic pharyngitis (472.1)
19. Constipation	Carbone, P. S., Young, P. C., Stoddard, G. J., Wilkes, J., & Trasande, L. (2015). A	- Constipation (564.0x) - Encropresis (307.7)

	comparison of ambulatory care sensitive hospitalizations among children with and without autism spectrum disorder. *Academic pediatrics*, *15*(6), 626-635.	
20. Dental Conditions	Carbone, P. S., Young, P. C., Stoddard, G. J., Wilkes, J., & Trasande, L. (2015). A comparison of ambulatory care sensitive hospitalizations among children with and without autism spectrum disorder. *Academic pediatrics*, *15*(6), 626-635.	- Diseases of hard tissue of teeth (521.xx) - Diseases of pulp and periapical tissues (522.xx) - Gingival and periodontal diseases (523.xx) - Other diseases/conditions of teeth and supporting structures (525.xx) - Diseases of the oral soft tissues, excluding lesions specific for gingiva and tongue (528.xx)
21. Other skin/tissue infections	Carbone, P. S., Young, P. C., Stoddard, G. J., Wilkes, J., & Trasande, L. (2015). A comparison of ambulatory care sensitive hospitalizations among children with and without autism spectrum disorder. *Academic pediatrics*, *15*(6), 626-635.	- Carbuncle and furuncle/boils (680.xx) - Impetigo (684.xx) - Lymphadenitis (289.3)
22. Underweight	Carbone, P. S., Young, P. C., Stoddard, G. J., Wilkes, J., & Trasande, L. (2015). A comparison of ambulatory care sensitive hospitalizations among	- Lack of expected normal physiological development in childhood (783.4x) - Abnormal loss of weight and underweight (783.2x)

	children with and without autism spectrum disorder. *Academic pediatrics*, *15*(6), 626-635.	
23. Nutritional Deficiencies	Carbone, P. S., Young, P. C., Stoddard, G. J., Wilkes, J., & Trasande, L. (2015). A comparison of ambulatory care sensitive hospitalizations among children with and without autism spectrum disorder. *Academic pediatrics*, *15*(6), 626-635.	- Kwashiorkor, form of childhood malnutrition (260.xx) - Nutritional marasmus, severe calorie deficiency (261.xx) - Other severe protein-calorie malnutrition (262.xx) - Vitamin D deficiency/Rickets (268.0x) - Rickets, late effect (268.1x) - Ascorbic acid deficiency (267.xx) - Iron deficiency anemias (280.xx) - Vitamin A deficiency (264.xx)