Critical Access Hospital Closures in Medicaid Expansion and Non-Expansion States: Exploring County-Level Variables Associated with Closures

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Abstract

As part of the Affordable Care Act, states were provided the option to expand access to health care coverage by adopting to expand Medicaid resulting in increased access to health care coverage. Even with this policy change, critical access and rural hospitals continue to close with 210 hospitals being deemed at extreme risk of closure (NRHA, 2016). Hospital closures are devastating to rural communities and impact access to care, health disparities, health outcomes, and economic stability in the communities (Corcoran & Waddell, 2019; Holmes, 2015; Lindrooth et al., 2018; Mason, 2017; Reiter et al., 2015; Thomas et al., 2015). Critical Access Hospitals (CAH) serve as a safety net for care delivery in rural communities. From 2010-2020 there were 25 CAHs that completely closed (UNC Cecil G. Sheps Center, n.d.). This mixed methods study explored the impact of state's decision to expand or not expand Medicaid on CAH closures. The study also analyzed facility and county-level variables that may correlate with closed CAHs in expansion versus non-expansion states. Furthermore, qualitative data was used to clarify the secondary data findings. The variables included annual average daily census, population shift from 2010-2020, population of 65 plus, population of uninsured, population of non-White, population of Hispanic/Latino, and population living at the federal poverty level. Using independent t-tests and independent Mann-Whitney U-tests, the results of the study found one statistically significant variable. The percent of population uninsured was statistically significant, $t = 2.31$, $p = 0.030$, for the percent of population that was uninsured in expansion ($M = 11.56$, $SD = 4.18$) and non-expansion ($M = 15.69$, $SD = 3.43$) states. Although percent of population age 65 plus and percent of population shift were not statistically significant, there were medium and large effect sizes ($d = 0.572$ and $d = 0.880$), which indicate a potential for correlation. Other findings include that 20 of the CAH closures were in non-expansion versus

five in expansion states and 88% of the closures were in Southern states. Qualitative data demonstrated themes to include the need to close the revenue gap, the impact of internal and external relationships on closures, lack of resources to grow services, and the need to engage in collaborative service expansion. This study supports that policies, county-level variables, and organizational practices can impact the stability of a CAH.

Keywords: Medicaid expansion, critical access hospitals, rural health care challenges, closed hospitals

Dedications

This journey has shown me that I am sincerely blessed with some of the best, most supportive people in my life. I could not have been successful without all of their help to keep me moving forward even when I wanted to hit pause. My friends went above and beyond for me and I hope one day I can do the same them if they need me. Jennifer and Jack, thank you for all of the amazing meals and for helping me to stay grounded in my studies. Sallie Beth, you encouraged me to go on this journey and have supported and guided me. Fabiana, you have provided support at some of the most important times. Kameron, while I was writing papers, you were mowing my lawn. I have the best circle of friends. Thank you just does not seem like enough.

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Critical Access Hospitals (CAHs) serve as a care delivery system for rural communities. Even with the enactment of the Affordable Care Act (ACA) and the option for states to expand Medicaid, both increasing access to health care coverage, CAH closures continue to rise. From 2010 to 2020, 25 CAHs have completely closed, leaving many residents with no access to care. The majority of the research is focused on rural hospital closures, which is inclusive of CAH but not exclusive. Additionally, the research also focuses on financial variables that have contributed to the closures versus seeking to understand if there are common facility and county-level variables that may have an influence. Having a better understanding of commonalities among the CAH closures will help inform hospital leaders of vulnerabilities, allow for consideration of alternate care delivery models, and help inform federal and state level policies to ensure the viability of CAHs.

Purpose of the Research

The purpose of this mixed methods study is to determine the impact of the state's decision to expand or not expand Medicaid from 2010-2020 specifically on CAH closures and to explore if there are common facility and county-level predictor variables among the closed CAHs. The secondary data analysis will analyze facility and county-level variables to include the average annual daily census (AADC) of the CAH, percent population decline from 2010-2020, percent of population age 65 or older, percent of uninsured, percent of population non-White (race), percent Hispanic population (ethnicity), and percent of individuals living at or below the federal poverty level (FPL) in counties with CAH closures. The dependent variable is CAH closures. The independent variable is hospitals in Medicaid expansion versus non-expansion states. Confounding variables include AADC, percent population decline, percent of population age 65 or older, percent uninsured, race, ethnicity, and percent living at or below the FPL in

counties with CAH closures. After the secondary data analysis was completed, key informant interviews were conducted with former leaders of the closed CAHs to better understand the data results and further explore any additional potential county and/or facility level variables that may have impacted the closures.

Background

There is a concerning trend with rural hospital closures. Since 2005, data indicate 170 rural hospitals closed with 36% of the closures being CAHs (Thomas et al., 2020). CAH designation is a preferred payment designation term for rural hospitals that meet the following criteria to include the hospital is at least 35 miles from another hospital, there is 24/7 emergency care, the facility 25 or less beds, and the annual average length of stay is less than 4 days (Corcoran & Waddell, 2019; Reiter et al., 2015; Thomas et al., 2020). CAHs have a cost-based reimbursement payment model with Medicare, which reimburses 99% of costs for inpatient and outpatient services (Reiter et al., 2015; Lindrooth et al., 2018). These hospitals often serve as the center of health care for underserved, rural communities, which often have high rates of uninsured residents (Reiter et al., 2015).

As part of the ACA implemented in 2014, states were given the ability to expand Medicaid coverage to cover the uninsured who did not qualify for marketplace coverage (individuals living at or below 138% of the Federal Poverty Level) (Reiter et al., 2015). As of 2020, there were 12 states that did not expanded Medicaid. Although there are more people with health insurance coverage due to the ACA and Medicaid expansion, hospitals are still closing at record rates. Lindrooth et al. (2018) noted a trend in closures beginning in 2012 when the Supreme Court made the decision that Medicaid expansion was optional for states, noting that hospitals in expansion states were less likely to close than in non-expansion states. Of all hospital

closures in the United States, rural hospital closures in southern states represented 77% of the closures from 2013-2017 (Corcoran & Waddell, 2019). Reiter et al. (2015) indicated from January 2010 and August 2015, 57 rural hospitals closed or converted to other types of health care facilities, and that the closures began prior to ACA implementation. There is evidence indicating rural hospital closures are higher in non-Medicaid expansion states (non-expansion states); however, the literature has not correlated closures with expansion (Holmes, 2015; Reiter et al., 2015). The literature states it is a perplexing challenge to determine what other factors may influence hospital closures (Frakt, 2019; Holmes, 2015).

Reiter et al. (2015) studied uncompensated care related to rural hospital financial vulnerability. The study concluded that CAHs in expansion and non-expansion states had similar charity care costs; however, CAHs in non-expansion states had lower operating margins than expansion states indicating financial vulnerability (Reiter et al., 2015). CAHs in non-expansion states rely more on Medicare reimbursement for inpatient and outpatient versus profitable services such as surgical services (Reiter et al., 2015). Therefore, population of counties age 65 and over may impact the financial viability of a CAH. Frakt (2019) discussed shrinking populations as a potential threat to hospitals resulting in lower occupancy rates for inpatient beds. Sharfstein (2016) stated rural hospitals are experiencing financial distress due to declining patient admissions, declining populations, and trends to outpatient services. Corcoran and Waddell (2019) argued that hospital closures are related to economics in rural communities. Rural areas have increasing older populations that creates high demand for inpatient services; however, the declining population due to job losses such as mining and farming presents challenges for rural hospitals (Corcoran & Waddell, 2019).

There are several gaps in the initial review of literature to include the studies focus on the financial analysis of hospital closures with regards to payment methodologies, operating margins, and market share versus other potential non-financial variables for CAHs. Furthermore, most of the studies focus on rural hospitals, which includes CAHs, but is not exclusive to CAHs. There was also a gap in multiple year studies. Studies reviewed data in smaller time periods ranging from 1 to 5 years.

This project explored if there were any statistically significant differences between CAH closures from 2010-2020 in Medicaid expansion versus non-expansion states and explored facility and county-level variables that may be associated with closures to include the AADC of the hospital, percent population decline, percent of population over age 65 and older, percent of population uninsured, race, ethnicity, and percent living at or below the FPL. There were 11 states that opted not to expand Medicaid that have CAH closures and four states that opted to expand Medicaid that have CAH closures. According to the Cecil G. UNC Sheps Center for Health Services Research (n.d.), during this timeframe there were 42 CAH closures; 25 completely closed while 17 converted to outpatient services, rehabilitation centers, and/or urgent care/emergency department services. This study focused on comparing the 25 complete closures that span Medicaid expansion and non-expansion states.

Implications of the Research

This study can help inform leaders of CAHs and policymakers of factors that may potentially impact the ability of a hospital to remain open. If leaders of a CAH are aware of trends associated with county and facility level factors correlated with CAH closures, then strategies can be developed to increase the financial viability of the CAH. Additionally, there may be indications for further research focused on additional county and facility level variables

that may impact closures. It is essential to keep CAHs vital in their communities to ensure access to care for preventive and emergent health needs.

Research Questions and Hypotheses

Research Question 1a: Is there a difference in the number of CAH closures in Medicaid expansion states versus non-Medicaid expansion states from 2010-2020?

Research Question 1b: Is there a statistical correlation for CAH closures from 2010-2020 in Medicaid expansion versus non-expansion states with regards to AADC?

> **Hypothesis 1.1 b:** CAHs with an AADC of 10 or less patients are more likely to close in non-Medicaid expansion states than expansion states.

Research Question 2: Are there statistical correlations of county-level predictors for CAH closures from 2010-2020 in Medicaid expansion versus non-expansion states with regards to population decline, percent of population 65 plus, percent uninsured, percent non-White, percent Hispanic, and percent of population living at or below FPL?

> **Hypothesis 2.1:** CAHs located in non-Medicaid expansion states in counties with declining populations will have higher closures than CAHs in expansion states.
>
> **Hypothesis 2.2:** CAHs located in non-Medicaid expansion states with counties that have high rates of 65 plus population will have lower closures compared to CAHs in Medicaid expansion states.
>
> **Hypothesis 2.3:** CAHs located in non-Medicaid expansion states in counties with high rates of uninsured based on the U.S. average will have higher closures than CAHs in expansion states.

Hypothesis 2.4: CAHs located in non-Medicaid expansion states in counties with a higher percentage of non-White (minority) population based on the U.S. average will have higher closures.

Hypothesis 2.5: CAHs located in non-Medicaid expansion states in counties with higher than the U.S. average for Hispanic population will have higher closures.

Hypothesis 2.6: CAHs located in non-Medicaid expansion states in counties that have higher than the U.S. average of individuals living at or below the FPL will have higher closures.

Target Population

The primary target population for this mixed methods study is CAH closures. This study focused on data reflective of 25 CAHs nationwide that completely closed between 2010-2020. Additionally, the study also targeted to interview a minimum of five to a maximum of eight former CAH leaders to include former Presidents/Chief Executive Officers, Chief Nursing Officers, and Directors of Quality as key informants for the qualitative portion of the study.

Methodology

This mixed methods, nationwide study included an ecological, secondary data study and qualitative interviews with a selection of former leaders of the 25 closed CAHs. The secondary data portion utilized three data sets of which two are publicly available and one was available upon request to the UNC Cecil G. Sheps Center. The rural hospital closure data is from the UNC Cecil G. Sheps Center for Health Services Research (UNC Sheps Center, n.d.). The rural hospital closure data set includes data on all rural hospitals that closed from 2005 to 2022 and is free to download at the following URL address: https://www.shepscenter.unc.edu/programs-projects/rural-health/rural-hospital-closures/ (UNC Cecil G. Sheps Center for Health Services

Research, n.d.). This data included the hospital name, address, city, state, zip code, confirmation of CAH status, year of hospital closure, Medicare payment status, and number of beds. Data is available to download in a Microsoft excel spreadsheet .XLS file.

The U.S. Census Bureau Quick Facts (n.d.) data was the resource for county-level confounding variables. This data is publicly available for download at www. https://www.census.gov/quickfacts/fact/table/US/PST045221 (U.S. Census Bureau Quick Facts, n.d.). U.S. Census Bureau Quick Facts data include percent of population change, percent of population age 65 and older, percent of the population uninsured, percent of population by race, percent of population by ethnicity, and percent of population living in poverty.

AADC data for CAH is available through accessing the database entitled CAHPAS. This data was accessed through a direct request to the UNC Cecil G. Sheps Center. The data is hosted at https://cahmpas.sirs.unce.edu/login. To ensure data accuracy, the data report was queried by the UNC Sheps Center and sent to the researcher in a Microsoft excel spreadsheet.

All data was combined in Microsoft excel, using a unique identifier for each CAH. Data was coded. The excel spreadsheet was uploaded to SPSS v29 for statistical analysis purposes. The data analysis informed the qualitative portion of the study.

Data trends were used to develop an interview guide that included nine key questions to further explore county and facility level factors that may contribute to CAH closures. The researcher sought to interview five to eight former leaders from the 25 closed CAH. Key informants were identified through resources such as media searches, state level Offices of Rural Health, other CAH leaders, and the Federal Office of Rural Health Policy. The researcher reached out via email and phone contact to recruit key informants for the interviews. Key informant interviews lasted for 30-45 minutes. All interviews were recorded and transcribed via

the Zoom meeting platform. Transcripts were reviewed using the *Sort and Sift, Think and Shift* analysis approach to identify interview themes (Maietta et al., 2021). Interview themes were compared and contrasted with the secondary data analysis results to further inform the study conclusions regarding confounding variables that impact CAH closures.

Review of Literature

There is a concerning trend with rural hospital and CAH closures. From 2005 to 2020, data indicate 170 rural hospitals closed with 61 (36%) of the closures being CAHs (Thomas et al., 2020). Furthermore, since 2010, 78 out of more than 2,150 rural hospitals closed and rural hospitals continue to struggle with financial stability (Mason, 2017). Isaacs (2019) estimated there are 700 rural hospitals in danger of closing. Hospital closures directly impact access to care. It is essential to understand the contributing factors to the closures in order to ensure the success of the at-risk hospitals.

One of the major factors studied in the literature includes the impact of states' rights to expand or not expand Medicaid as part of the ACA in order to increase access to health coverage. State expansions of Medicaid began in 2014 (Young et al., 2019) with more urban populated states opting to expand versus rural (Holmes, 2015). Some states were early adopters, some adopted expansion later, and some selected not to expand. As of 2021, 12 states are considered Medicaid non-expansion (non-expansion) states to include North Carolina, South Carolina, Tennessee, Alabama, Florida, Georgia, Kansas, Mississippi, Texas, South Dakota, Wisconsin, and Wyoming. All other states are considered expansion states. Data indicate there are higher rates of rural and CAHs in non-expansion states (Frakt, 2019; Lindrooth et al., 2019).

Other factors for closures included the financial fragility of rural hospitals and the disproportionate share of closures in the south (Corcoran & Waddell, 2019; Holmes, 2015). There is limited research that focuses on the impact of community variables, such as population size, percent insured, percent of elderly population, unemployment rates, and market share (Corcoran & Waddell, 2019; Kaufman, et al., 2015; Thomas, et al., 2016). Scientists strive to

correlate contributing factors to closures in order to inform policy and determine future implications for saving future hospital closures (Balasubramanian & Jones, 2016).

This literature review will provide an overview of the rural and CAH closures, discuss the impact of the closures, provide a summary of potential contributing variables highlighted in the current research, and identify the gaps in the literature related to CAH closures. The majority of literature is focused on rural hospital closures, which is inclusive of CAHs but not exclusive to CAH. The literature seeks to understand the causes and contributing factors for the rural hospital closures. A better understanding of closures can provide evidence that can help inform hospital leaders of potential corrective actions that can result in alleviating closures completely and/or mitigating the impact closures have on the communities (Pai et al., 2019). Based on this concept of learning from success and mistakes, this theory based research study will utilize the Neo-institutional theory framework, which emphasizes that leaders mimic best practices and can reflect on past failures to inform systems level change.

Theory

Dimaggio and Powell (1983) studied what makes organizations so similar and how these similarities contribute to organizational homogeneity in structure, culture, and output with regards to dealing with uncertainty, which resulted in the development of the Neo-institutional theory. The neo-institutional theory was initially developed to explore homogeneity not organization variation (Dimaggio & Powell, 1983). Dimaggio and Powell (1983) argued that organizations that compete for resources, customers, political power, institutional legitimacy, and social and economic status, ultimately end up operating similarly leading to homogeneity in organizational fields, which then limits innovation and ability of organizations to adapt to change. Macfarlane et al. (2013) stated neo-institutional theory can be applied at a macrolevel to

help inform how health care organizations achieve change, what helps health care organizations adapt to change, and what hinders efforts to sustain changes.

Dimaggio and Powell (1983) highlighted that hospitals offer everything that other hospitals offer and that leaders are more consumed with competition and prestige than efficient use of resources. The neo-institutional theory (Dimaggio & Powell, 1983) has implications for organizational adaptability and change that may be applied to CAHs. The theory suggests that organization resiliency is influenced by three social pillars that include regulative (laws and contracts that influence what must happen), normative (assumptions of what should happen), and cultural cognitive (taken for granted models of what generally happens) (Dimaggio & Powell, 1983; Macfarlane et al., 2013).

The neo-institutional theory has three fundamental mechanisms for institutional change (Dimaggio & Powell, 1983; Macfarlane et al., 2013). These include coercive change (altering change from top-down related to regulative pillar), normative change (changing what is right and reasonable), and mimetic (mimicking other organizations that are successful or mimicking best practice). DiMaggio and Powell (1983) highlighted two characteristic features of coercive change related to policy shifts to include that policy makers do not experience direct consequences of their actions/decisions and that policies applied broadly to an entire category of organizations results in decisions being less adaptive and less flexible. Normative change is directly related to organizational leaders (Dimaggio & Powell, 1983; Macfarlane et al., 2013). There are two sources of normative influence to include leaders' formal education and growth of professional networks (Dimaggio & Powell, 1983). Individuals in similar professions have similar backgrounds, views on political issues, and procedures, making it more difficult to adapt to change (Dimaggio & Powell, 1983). The mimetic mechanism is a response to uncertainty and

ambiguous environments, which results in organizations modeling solutions based on other organizations successes (Dimaggio & Powell, 1983). Dimaggio and Powell (1983) referenced quality circles that were initially established in Japanese and European cultures as an example of mimicking models of innovation. In addition to three fundamental mechanisms of change, Macfarlane et al. (2013) further discussed the external forces of change to include material resource, which includes demographics such as workforce and external funding, and institutional forces such as leadership and government/policy impact based on the theory being expanded specific to health care by Scott et al. (2000).

Macfarlane et al. (2013) conducted a study using the neo-institutional theory founded by Scott et al. (2000) to study the impact and sustainability of a change-focused project conducted in the United Kingdom from 2003 to 2008 to improve patient outcomes in at-risk inner-city communities with regards to stroke, kidney, and sexual health. The study specifically involved hospitals, primary care offices, community groups, and patients (Macfarlane et al., 2013). Macfarlane et al. (2013) conducted this study in 2010 to better understand forces of change that permitted innovation as part of this project. Macfarlane et al. (2013) found health care is an ever-changing field and that leaders differed in the extent to buying-in or resisting norms and logic with regards to quality improvement strategies and culture shifts. Additionally, the study concluded that leaders uniquely influence change in a complex system that is unpredictable, and ultimately there is no winning strategy for overcoming institutional barriers to change (Macfarlane et al., 2013). Macfarlane et al. (2013) concluded that neo-institutional theory has the potential to be used to study health service transformation and that the normative and mimetic forces can be powerful influences for change.

Hospitals operate according to a norm that often conflicts with market forces for efficiency and systems change (Dimaggio & Powell, 1983). To survive an ever-changing health care environment, CAHs must have the ability to adapt to change to include national level policy change, such as the ACA, Medicaid expansion, and changes in reimbursement models. Hospital leaders response to coercive, normative, and memetic change can influence transformation (Macfarlane et al., 2013). Dimaggio and Powell (1983) argued that organizations need to encourage diversification and slow homogenization in order to be able to adapt to change. Therefore, this mixed methods study will utilize the neo-institutional theory framework to help health care leaders identify internal and external risk factors for closures and influence leaders to address systems level change efforts that result in CAH stability.

Definitions of Urban, Rural, and Critical Access Hospitals

Hospitals are categorized as urban and rural based on the location of the hospital as it relates to the definitions of urban and rural set by the U.S. Census Bureau, the Office of Management and Budget Definition (OMBD), and the Federal Office of Rural Health Policy (FORHP). According to the U.S. Census Bureau, urban has two types of classifications to include urbanized area (which is 50,000 or more people) and urban clusters (which is at least 2,500 and less than 50,000 people) (Human Resources and Services Administration, n.d.). The OMBD defines urban as an area with a population of 50,000 or greater and a micro area contains an urban area of at least 10,000 but less than 50,000 population (U.S. Department of Health and Human Services, n.d.). OMBD states that all counties that are not a part of a designated Metropolitan Statistical Area are considered rural (U.S. Department of Health and Human Services, n.d.). According to the Human Resources and Services Administration (HRSA, n.d.), the Census considers anything not urban as rural.

However, the FORHP further defines rural using a methodology known as Rural-Urban Commuting Areas (RUCA) codes that uses census tracts. There are three areas defined as rural to include (1) a county outside a metropolitan area; (2) a county in a metropolitan area with a RUCA code of four – 10; and (3) one of the 132 large area census tracts with RUCA code of two or three that have no more than three people per square mile (HRSA, n.d.). Hospitals located within urban and rural areas are designated as urban and rural hospitals. There is also a classification of rural hospitals defined as Critical Access Hospitals (CAH), which is the focus of this study.

CAH is a preferred payment designation term for rural hospitals that meet the a number of criteria to include the hospital is at least 35 miles from another hospital, there is 24/7 emergency care, the facility has 25 or less beds, and the annual average length of stay is less than 4 days (Corcoran & Waddell, 2019; Reiter et al., 2015; Thomas et al., 2020). CAHs have a cost-based reimbursement payment model with Medicare, which reimburses 99% of costs for inpatient and outpatient services (Lindrooth et al., 2018; Mason, 2017; Reiter et al., 2015). These hospitals often serve as the center of health care for underserved, rural communities, which often have high rates of uninsured residents and more chronically ill patients (Mason, 2017; Reiter et al., 2015). Medicare and Medicaid payment models are extremely important for rural and CAH hospitals. On average 60% of rural hospital revenues are from Medicare and Medicaid versus 45% for urban hospitals (Mason, 2017). Even with the federal payment model and often times local subsidies, CAHs continue to struggle due to economics and lack of workforce (Isaacs, 2019).

Population of Interest – Critical Access Hospitals

The CAH designation was created in 1997 through the Balanced Budget Act to slow the closure of rural hospitals and to protect rural populations access to health care by implementing a Medicare cost reimbursement model at 99% for inpatient and outpatient hospital services (Corcoran & Waddell, 2019; Reiter et al., 2015; Thomas et al., 2020). The role of the CAH is to serve as the safety net for access to care for geographically isolated areas (Thomas et al., 2020). Despite the higher level of cost-reimbursement payments, in the past 10 years, 33 CAHs have completely closed, leaving many residents with no access to health care services (Thomas et al., 2020).

Description of Problem: CAH Closures in Medicaid Expansion Versus Non-Expansion States

A trend in rural hospital closures was noted beginning in 2005 (Isaacs, 2019). However, when considering the impact of the ACA implementation from 2010-2020, according to the UNC Cecil G. Sheps Center for Health Services Research (2021), 134 rural hospitals closed or converted from an inpatient facility to outpatient-based services, nursing homes, rehabilitation facilities, or urgent care centers. Of those 134 closures, 42 (31%) were CAHs. Of the 42 CAHs, 17 transitioned to nursing, rehabilitation, outpatient primary care, and/or emergency care facilities, and 25 completely closed (Cecil G. Sheps Center for Health Services Research, n.d.). Twenty-one of the complete CAH closures were in non-expansion states compared to five in expansion states (reference Table 1). There are so many unknown factors that researchers struggle to understand, which makes hospital closures both a concern and perplexing challenge that deeply impacts vulnerable communities (Balasubramanian & Jones, 2016; Frakt, 2019).

Table 1

CAHs Closures in Expansion and Non-Expansion States

Expansion Status	CAH Complete Closures 2010-2020
Expansion state	5
Non-expansion state	20
Total	25

Impact of Hospital Closures

Individuals Impacted

CAHs are crucial as they often serve as the center for health care in rural areas. Individuals impacted by closures are typically elderly, racial/ethnic minorities, poor, and disabled (Holmes et al., 2017; Thomas et al., 2015; Thomas et al., 2016). Thomas et al. (2015) estimated that hospital closures from 2010 through 2014 (26 complete hospital closures) affected 800,000 people in markets with complete hospital closures. The study also highlighted that completely closed hospitals were located in areas with higher percentages of minority populations and served more chronically ill individuals in rural areas (Mason, 2017; Thomas et al., 2015).

Access to Primary Care, Emergent Care, and Health Outcomes Impacted

Hospital closings impact access to care, health disparities, and ultimately health outcomes (Corcoran & Waddell, 2019; Holmes, 2015; Lindrooth et al., 2018; Mason, 2017; Reiter et al., 2015; Thomas et al., 2015). Rural and CAH closures are linked to greater patient mortality in rural versus urban (Greenwood-Ericksen et al., 2021). Hospital closures often require individuals to travel greater distances for primary care. Many rural residents experience transportation challenges, which further contributes to the lack of access to diagnostic and preventive health tests in addition to emergent health care needs (Thomas et al., 2015).

From 2009 to 2019, rural and CAH emergency department visits increased by 50%, which Greenwood-Ericksen & Kocher (2019) related to lack of access to primary care and poor health outcomes due to unmanaged chronic conditions such as obesity and smoking in rural populations. When comparing rural and urban patient claims for Medicare beneficiaries for 30-day mortality and 30-day emergency department readmissions, data demonstrate that patients experience greater mortality rates after rural and CAH emergency department visits (Greenwood-Ericksen et al., 2021). These outcomes further underscore the need to ensure treatment is available for life-threatening conditions in rural communities, which are currently endangered by hospital closures (Greenwood-Ericksen et al., 2021). Another factor in rural areas with hospital closures is access to efficient emergency medical service (EMS) transportation.

Prior to closures, rural EMS response times were already greater than the recommended 8 minutes (Miller et al., 2020). With closures, Miller et al. (2020) found that the mean EMS transportation time increased by 2.5 minutes and the total activation time by 7.2 minutes. This increase in time is related to poor patient outcomes; for example, Wilde (2013) found that just one minute of increased EMS response time can increase the mortality outcome by 8% to 17%.

The Cost Burden Impact

A cost burden highlighted by Thomas et al. (2015) included the rise in costs for EMS due to the need to travel additional miles to the closest emergency facility. The cost burden is both fiscal as well as lives. EMS response time is already nearly double in rural areas versus urban (Mell et al., 2017). This directly impacts timely access to care, which then becomes a driver for urban-rural mortality differences in emergency situations such as myocardial infarctions and vehicle accidents (Miller et al., 2020; Thomas et al., 2015). UNC Cecil G. Sheps Center for Health Services Research (n.d.) data indicate for hospitals that closed from 2013-2017, over half

were 20 miles from the closest hospital, reinforcing that access to emergency services requires additional travel (Corcoran & Waddell, 2019). The increased need for EMS can also impact local budgets due to increased costs to meet the needs for increased EMS coverage and longer transport times (Miller et al., 2020). Miller et al. (2020) recommended that rural communities impacted by closures need to consider policy solutions that are inclusive of optimal reimbursement strategies for critical EMS services, to ensure services and address declining patient outcomes.

Additionally, hospitals are often the largest employer in the area, which has a significant impact on jobs, loan debt burden to the county, and economic growth (Frakt, 2019; Holmes, 2015; Thomas et al., 2015). Holmes (2015) stated hospital closures lead to decreases in per capita income of up to $703 and increase in unemployment rate. Frakt (2019) concurred, stating that a hospital closure can have a negative impact of up to 4% on per capita income and unemployment rates can rise 1.6 percentage points. Frakt (2019) also argued that hospital closures negatively impact the local economy because the individuals who lost their jobs are spending less, which impacts other employers.

Root Causes for Closure

Research struggles to completely identify the root causes for hospital closures. Much of the literature indicates that financial viability of hospitals is a root cause for closure (Corcoran & Waddell, 2019; Frakt, 2019; Holmes et al., 2017; Sharfstein, 2016). Holmes et al. (2017) stated hospitals that close have poorer financial outcomes compared to hospitals that remain open. Contributing factors to financial performance include utilization rates (patient admissions), lower profitability, payer mix, and market share (Corcoran & Waddell, 2019; Frakt, 2019; Holmes et al., 2017; Sharfstein, 2016). Corcoran and Waddell (2019) highlighted findings from a 2018

congressional report that states occupancy rates for urban hospitals was 66% compared to rural hospitals at 40%, and rural hospitals with less than 50 beds was 31% due to decreased length of stays and loss of rural population. Evans (2015) cited shifts to ambulatory care centers and home-based medical care as influencing decreased hospital admissions and occupancy rates.

Related to profitability, rural and CAHs had median profit margins of 2.6% to 2.0% versus urban hospitals at 5.5% in 2016 (Corcoran & Waddell, 2019). Corcoran and Waddell (2019) contributed these differences to reduced inpatient services due to increased technology that has shifted care to outpatient services. Kaufman et al. (2016) and Holmes et al. (2017) found rural and CAHs had lower levels of profitability, patient volume, and smaller market shares. Furthermore, rural hospitals are largely dependent on public insurance programs (Medicare and Medicaid) versus commercial payers due to the high levels of poverty, which ultimately impacts revenue and financial stability (Holmes, 2015). Pai et al. (2019) highlighted that operating margins were associated with Pennsylvania hospital survival rates while debt and charity care were associated with hospital closures. When comparing rural versus urban hospitals in Pennsylvania, Pai et al. (2019) found that cost per adjusted discharge (an efficiency measure for hospitals) was weakly significant for hospital survival and positively associated with rural hospitals.

A final factor in hospital financial sustainability is uncompensated care. Even with Medicaid expansion, in 2017, nationwide hospitals reported providing $38.4 billion in uncompensated care (Corcoran & Waddell, 2019). Medicaid expansion had a positive impact on uncompensated care due to increasing the number of individuals with insurance coverage; however, this benefit is dependent on states opting to expand Medicaid as part of the ACA (Corcoran & Waddell, 2019; Mason, 2017; Reiter et al., 2015; Young et al., 2019). Mason

(2017) also argued that many states only had one insurer plan option and often the ACA marketplace offered high deductible plans. Individuals in rural areas often struggle to pay the co-pays for the high deductible plans, which is correlated with increased hospital bad debt since patients in rural hospitals often cannot pay the high deductibles for their rural hospital stay (Isaacs, 2019; Mason, 2017). During the course of their treatment, patients are transferred to larger hospitals that ultimately benefit from billing the insurance, while the rural hospital is unable to bill due to the high deductible (Evans, 2014; Isaacs, 2019). Prior to the ACA, rural hospitals relied on disproportionate share (DSH) fund payments from the federal government to off-set this type of bad debt expense. However, the ACA decreased the DSH funds to hospitals, which further negatively impacts the financial viability of rural hospitals (Mason, 2017).

Trends

Higher Closures in Non-Medicaid Expansion States and the South

Although there are rural hospital closures in Medicaid expansion states, the rates are greater in non-expansion states than expansion states (Holmes, 2015). After reviewing rural hospital closure data from 2008-2016, Lindrooth et al. (2018) concluded that states that did not expand Medicaid experienced larger increases in closures from 2008-2012 and 2015-2016. Kaufman et al. (2016) found 66% of rural and CAHs closures from 2010-2014 were in non-expansion states. Corcoran and Waddell (2019) found 75% of rural hospitals closed from 2010-2019 were in non-expansion states. Sharfstein (2016) stated that rural hospitals in states that failed to expand Medicaid experience high rates of financial distress, often contributing to closures. Mason (2017) stated that rural hospital profit margins decreased in non-expansion states versus hospitals in expansion states saw profit margins stabilize or improve. According to the UNC Cecil G. Sheps Center for Health Services Research (n.d.) from 2010-2020, there were

20 CAHs that completely closed in non-expansion states versus five complete closures in expansion states. Of the 25 CAH closures, 22 were in southern states compared to three in Northern or Midwest states. Of the closures in the 22 CAH closures in southern states, 18 were in non-expansion states and four in expansion states.

Hospitals in the south have historically lower profitability (15%) compared to other regions (4%) in 2013; it has yet to be determined if not expanding Medicaid is a contributing factor (Holmes et al., 2017; Holmes, 2015). This may contribute to the fact that the South has experienced the majority of rural hospital closures (Holmes, 2015; Holmes et al., 2017). Corcoran and Waddell (2019) shared findings from a Government Accountability Office report that demonstrated rural hospitals in the South represented 38% of rural hospital closures in 2013 but represented 77% of the closures from 2013-2017. Kaufman et al. (2016) reported 64% of hospitals that closed from January 2010 – December 2014 were located in southern states versus 19% in mid-west, 8.5% in north east, and 8.5% in west.

Risk Factors for Closures

Residents in areas with rural hospital closures are older, poorer, and often in worse health compared to urban areas (Holmes et al., 2017). Corcoran and Waddell (2019) stated elderly populations increase demand for services. However, data demonstrate the percentage of elderly population was higher in expansion states versus non-expansion states (Reiter et al., 2015). CAHs receive cost-based reimbursement for Medicare, so smaller elderly populations may be a contributing factor to CAH closures; decreased elderly means less individuals covered by Medicare, which contributes to lower profit margins (Holmes et al., 2017). Pai et al. (2019) found that hospitals with larger populations of 65 plus perform better due to Medicare and Veteran's insurance reimbursement. However, Kaufman et al. (2016) contradicted this finding

and reported that hospitals with more elderly and poor residents were more likely to be at financial risk.

Reiter et al. (2015) found that hospitals in non-expansion states are located in less dense rural areas with smaller patient markets compared to hospitals in expansion states. Declining population and population density impact market share, utilization rates, and overall profitability (Corcoran & Waddell, 2019; Sharfstein, 2016; Thomas et al., 2016). Holmes (2015) reaffirmed trends in population declines have been disadvantageous for rural hospitals. Similarly, Thomas et al. (2016) concluded that population density was a risk factor associated with rural hospital closures; however, Thomas et al. (2016), found that closed rural hospitals had smaller market share but were located in areas with higher population density, indicating there may be other factors that impact closure rates.

High rates of poverty and unemployment contribute to increased rates of uninsured, which contributes to increased levels of uncompensated care. Reiter et al. (2015) summarized the higher the poverty rate in non-expansion states may mean individuals lack coverage and/or people may be less likely to afford co-pay and deductible requirements. This may lead to higher rates of uncompensated care. Hospitals with increased rates of uncompensated care are at higher risk for financial instability contributing to potential closures (Reiter et al., 2015; Thomas et al., 2016). However, Pai et al. (2019) argued that hospitals with greater number of patients living at or below the federal poverty level are likely to survive due to being kept open as a safety net for serving underserved and uninsured individuals.

Overview of Findings from Past Research Studies

Impact Medicaid Expansion Versus Non-Expansion

The ACA expanded access to health insurance coverage through the marketplace coverage options and the option for states to expand Medicaid. Therefore, the ACA was predicted to lead to increased revenue for hospitals due to decreased uncompensated care (Lindrooth et al., 2018; Young et al., 2019). Lindrooth et al. (2018) estimated the proportion of insured people in expansion states was double that of non-expansion states. With more insured individuals, Medicaid expansion contributed to substantial reductions in uncompensated care for hospitals (Lindrooth et al., 2018; Young et al., 2019). Corcoran and Waddell (2019) indicated hospitals in states that expanded Medicaid experienced a 47% decline in uncompensated care compared to an 11% decline in non-expansion states. Hospitals in Medicaid expansion states saved $6 billon in uncompensated care due to the percent of population insured (Frakt, 2018). However, when comparing the impact of uncompensated care in rural versus urban hospitals, Kaufman et al. (2016) concluded that urban hospitals had a greater decrease in the proportion of uncompensated care versus rural hospitals.

Reiter et al. (2015) included 1,111 CAHs in a study focused on comparing uncompensated care in expansion versus non-expansion states with 2013 financial data. Of the 1,111 CAHs, at the time of the study, 54% were located in states that did not expand Medicaid, indicating higher rates of uninsured (Reiter et al., 2015). The study concluded that CAHs and rural hospitals in non-expansion states had greater amounts of uncompensated care, and more financial instability versus hospitals in expansion states.

Although there are more people with health insurance coverage due to the ACA and Medicaid expansion, hospitals are still closing at record rates. Reiter et al. (2015) concluded that

the decision to not expand Medicaid may have an impact on access to coverage disparities that in turn can threaten the viability of rural hospitals. When comparing hospital closures in expansion versus non-expansion states from 2012-2013, Lindrooth et al. (2018) found that hospitals in expansion states were six times less likely to close than hospitals in non-expansion states. When holding other contributing factors constant, Lindrooth et al. (2018) also found that the increase in Medicaid eligibility to 100% of the Federal Poverty Level (FPL) made a hospital 2.5 times less likely to close than in non-expansion states. Young et al. (2019) reinforced that hospitals did experience a net positive financial effect from Medicaid expansion.

When analyzing closures from 2010-2015, Holmes (2015) concluded that there were more rural hospitals closed in non-expansion (33 hospitals) versus expansion states (nine hospitals). Corcoran and Waddell (2019) reinforced that since 2010, 75% of rural hospitals that closed were in states that did not expand Medicaid. When comparing hospital closures from 2010-2014, Kaufman et al. (2016) stated that 66% of rural hospital closures were in non-expansion states. Although literature is leaning towards a correlation between rural hospital closures (to include CAH closures) and expansion versus non-expansion decisions by states, research has yet to prove a direct link for Medicaid expansion to hospital closures (Holmes, 2015; Lindrooth et al., 2018). Researchers continue to explore if non-expansion states have other factors that lead to higher rural hospital and CAH closure rates (Holmes, 2015).

Contributing Variables to Closures

The majority of the literature is focused on financial stability or financial distress as a core variable for rural hospital closures. Other contributing variables that have been examined include for-profit status, efficiency and quality, unemployment rates, workforce shortages, uninsured rates, population, demographics, and distance to closest hospital. With regards to for-

profit versus not-for-profit status, Thomas et al. (2016) concluded closed rural hospitals were more likely to be for-profit with lower occupancy rates and lower number of beds. However, Pai et al. (2019) contradicted this stating that evidence suggests for-profit hospitals are more likely to survive than not-for-profit hospitals based on the fact that for-profit hospitals generate more revenue due to higher charges. Lindrooth et al. (2018) deemed CAHs, which are not-for-profit, are more viable due to the Medicare cost reimbursement model (Lindrooth et al., 2018).

Pai et al. (2019) examined quality measures to include readmissions, mortality index, and full-time equivalent of nurses per bed as potential variables for Pennsylvania hospital closures between 1999-2013. The study concluded that registered nurses per bed and the mortality index were quality indicators associated with hospital survival (Pai et al., 2019). The authors cited that more nurses per bed may be associated with a more complex patient population, which may be associated with higher reimbursement and profitability (Pai et al., 2019). An additional quality measure considered was average length of stay, which relates to hospital performance, and was found to be positively associated with hospital survival (Pai et al., 2019).

Average length of stay is defined as the number of days that a patient stays in a hospital setting from the day of admission until the day of discharge (Buttigieg et al., 2018). Buttigieg et al. (2018) reviewed 46 articles to determine direct and indirect variable that impact average length of stay. There were three categories that impact length of stay to include structure, process, and outcomes (Buttigieg et al., 2018). Structure components included access to services, timing of admission, availability of beds, efficiency of support services, patient characteristics such as medical history and incompliance, and social and family characteristics to include social support (Buttigieg et al., 2018). Process issues that impact length of stay include caregiver characteristics to include communication, multidisciplinary approach to care, discharge planning,

leadership, and transfer knowledge (Buttigieg et al., 2018). Outcomes that impact length of stay include hospital acquired infections and readmissions (Buttigieg et al., 2018). Buttigieg et al. (2018) concluded length of stay is complex and hospitals must be able to adapt to the challenges.

Lindrooth et al. (2018) and Reiter et al. (2015) found unemployment rates were associated with hospital closures in both rural and urban settings. Additionally, Reiter et al. (2015) also found the unemployment rate was higher for CAHs in expansion states than non-expansion states. Thomas et al. (2016) found a correlation that closed hospitals were located in areas with higher unemployment rates.

Unemployment often impacts rates of uninsured. When comparing uninsured rates in expansion versus non-expansion states, no difference was found in areas with uninsured rates of 10% or less. However, as uninsured rates increased above 10%, differences became significant, which indicates rates of uninsured may be a potential variable (Lindrooth et al., 2018).

An additional factor with regards to employment includes health care and provider workforce shortages. It is estimated that 20% of the population lives in rural areas, yet only 10% of physicians select to practice in rural America (Pollitz et al., 2019). Isaacs (2019) interviewed a rural hospital leader that stated the hospital workforce was at 23% of the necessary staff needed to operate and the situation continued to diminish. Often providers leave rural practice settings because the burden of 24/7 call falls directly on them, creating high-levels of burnout in short periods of time (Isaacs, 2019). Workforce shortages also lead to lack of primary care infrastructure, which contributes to hospital admissions. A lack of primary care and hospital providers creates a risk for rural hospital closures (Isaacs, 2019).

Thomas et al. (2016) focused on associations between community characteristics, closed rural hospitals, and open rural hospitals in financial distress. The study considered other extrinsic

variables to include population density, proximity to another facility, and race and ethnicity. Findings highlighted that closed hospitals had smaller market share even though population density was higher and closed hospitals were located in close proximity to another facility (Thomas et al., 2016). Kaufman et al. (2106) also noted closed CAHs were closer to a larger hospital than open CAHs. When separating race and ethnicity, Thomas et al. (2016) found a statistical correlation that closed hospitals were located in counties with higher percentage of Black and Hispanic residents. This indicates closures may have further impact on health disparities in rural areas.

In addition to investigating the impact of internal hospital financial factors, Kaufman et al. (2015) also researched external factors for 42 closed hospitals (27 rural and 15 CAH) that included location of facility with regards to population insured, racial and ethnic minority residents, poverty, and uninsured rates. This study concluded that potential contributors include population decreases, lower rate of inpatient utilization, and the ACA (Kaufman et al., 2015). However, when comparing closed and open hospital community demographics, the results were similar (Kaufman et al., 2015). Thomas et al. (2016) discovered that open and closed hospitals were located in areas with similar populations age 65 and older, poverty rate, and unemployment rate. Closed rural hospitals had higher rates of Medicare payor mix than open rural hospitals, and hospitals in communities with elderly or poor residents were more likely to be in financial distress (Thomas et al., 2016). Overall, there were a relatively limited number of studies that examined factors beyond financial indicators for rural and CAH closures. Additionally, overwhelmingly the studies were focused on quantitative methods versus seeking out validation through qualitative analysis.

There was one qualitative study identified by Thomas et al. (2020) that focused on identifying best practices for CAH leaders related to ensuring the success of the hospital. Fourteen CAH leaders were interviewed to learn about daily operations and community health outcomes. As a result, four best practices were highlighted for successful CAH leaders to include the ability to take risks, using data to make decisions, engaging the workforce, and integrating with the community (Thomas et al., 2020). The findings stressed the importance of CAHs to assess community needs and align the mission of the CAH with the specific needs. Suggested efforts such as recruiting community members the hospital board, providing free or low-cost preventive screening events, and providing community educational events (Thomas et al., 2020).

The North Carolina Rural Health Research Program published an issue brief in 2021, entitled "Alternatives to hospital closure: Findings from a national survey of CAH executives," which focused survey responses from 227 CAH executives reflecting potential alternatives to complete closures for rural hospitals (Thomas et al., 2021). Alternative models considered were rural health clinics, emergent/urgent care, federally qualified health centers, clinics paid through outpatient model, free-standing emergency departments, post-acute care/rehabilitation, long-term care, and clinics reimbursed via Medicare provider fee schedule (Thomas et al., 2021). Results revealed that CAH executives felt the most financially viable alternative models to full closures were rural health clinics, emergent/urgent care centers, and federally qualified health centers (Thomas et al., 2021). However, this issue brief also discussed the need for additional research to understand how and when a hospital should begin considering a new care delivery model (Thomas et al., 2021).

Policy and Service Delivery Model Shifts as Solutions

Applying lessons learned from hospital closures can help inform future policy initiatives to prevent rural and CAH closures. Mason (2017) called for innovation and the need for serious policy change considerations from the federal government in order to preserve rural and CAHs. Policy change strategies that can positively influence the stability of rural hospitals include adjusting loan repayment plans to improve recruitment in rural areas and developing pipeline programs that start in primary school and encourage youth to select a career in rural health care back in their community (Isaacs, 2019).

Additional preservation strategies include leaders developing innovative care delivery models that meet the needs of the specific communities. In 2017 the Senate introduced the Rural Emergency Acute Care Hospital Act (Senate Bill 1130) that would have provided a Medicare payment designation framework for a Rural Emergency Hospital model (Isaacs, 2019). This type of hospital design results in lower overhead and focuses on emergency, outpatient, and observation care services (Isaacs, 2019; Mason, 2017). However, in 2018 SB 1130 failed to pass. Isaacs (2019) and Mason (2017) also stressed care models shifting to outpatient and primary care services done right for the community. Additionally, the Save Rural Hospitals Act, which was introduced at the federal level in 2015, was developed to address rural hospital financial challenges (Isaacs, 2019). Part of this Act includes a new care delivery model for Medicare designation, the Community Outpatient Hospital (Mason, 2017). These new designation models allow hospitals to shift care strategies to emergent care, primary care, prevention, wellness, and long-term care (Isaacs, 2019; Mason, 2017). However, reimbursement models must align with these care strategies (Isaacs, 2019). Thomas et al. (2021) stressed the need for policymakers to provide technical assistance to health care leaders on transitions to sustainable care models to

avoid CAH closures. Leaders need to consider community-level influences on care strategies and understand the community's health needs (Mason, 2017).

Overview of Current Study Methodologies

The majority of the studies examining rural hospital and CAH closures were empirical studies. The literature highlighted various methods for data analysis and variable comparisons. The studies used publicly available data sets such as Medicare and Medicaid Services Healthcare Cost Report Information Systems, market data from Neilsen Pop-Facts, Centers for Medicare and Medicaid (CMS) Provider of Services, the American Hospital Association national survey, and CMS Healthcare Provider Cost Reporting Information Systems report. Depending on the variables for each study, various statistical tests were utilized.

Three of the studies used difference-in-differences statistical analysis to determine expansion versus non-expansion state outcomes and rural versus urban outcomes (Kauffman et al., 2016; Lindrooth et al., 2018; Young et al., 2019). Miller et al. (2020) used difference-in-differences and quantile regression to analyze the impact of closures on EMS response times. Additionally, four studies used logistic regressions to measure hospital closures, profitability of hospitals, payor mix, the impact of efficiency and quality indicators, and specific hospital characteristics (Kaufman et al., 2015; Lindrooth et al., 2018; Pai et al., 2019; Thomas et al., 2016).

Researchers also used t-tests to indicate significant differences and ordinary least squares regression analysis to assess fiscal indicators (Reiter et al., 2015; Thomas et al., 2016; Young et al., 2019). Lindrooth et al. (2018) also used Herfindahl-Hirschman Index measure to determine market competitiveness. Both Kaufman et al. (2015) and Thomas et al. (2016) used Wilcoxon rank test of medians. Kaufman et al. (2015) also used Fisher's exact proportion test and

Pearson's Chi-Square test for categorical variables. Greenwood-Ericksen et al. (2021) used Chi-Square tests and Cohen's d and h tests on numerical and categorical variables to compare rural versus urban hospital data and CAH and non-CAH data. Young et al. (2019) used a multivariate regression to determine changes in payment. There was only one qualitative study that coded interview results from 14 CAH administrators to determine top strategies for successful CAHs.

Gaps in Literature

One major gap in the literature is that the majority of the literature focuses on the financial analysis of hospital closures with regards to payment methodologies, operating margins, and market share versus other potential non-financial variables. The literature significantly proves financial vulnerability contributes to closure rates. Holmes et al. (2017) developed a financial predictability model for hospital financial distress and closure within a 2-year period. However, less is understood and studied regarding community level factors on closures.

Literature also indicates financial sustainability may be enhanced by Medicaid expansion versus non-Medicaid expansion. However, research focuses on all rural hospitals, for-profit and not-for-profit, versus a limited lens of CAH only, and there is an unexplained disproportionate share of hospital closures in southern states. Holmes (2015) explained that evidence is not conclusive that expansion is the root cause of closures and encourages additional research on other community-level factors that may contribute to closure rates such as the impact of population, percent insured, and age demographics. There are a few studies focused on contributing community characteristics, but again, those are focused on all rural hospitals versus CAHs only.

Of the studies reviewed for this literature review, 100% of the studies pertaining to rural and CAH closures were quantitative. There were no mixed methods or qualitative data studies focused on closures. Qualitative data can provide human insight into community and county level factors that may contribute to CAH closures that is lacking in quantitative data focused studies. There was one qualitative data study focused on interviews with successful CAH leaders versus learning more about risk factors for closures. Furthermore, there was a gap in multiple year studies. Most studies viewed data from smaller time periods ranging from 1 to 5 years, which limits the ability to ensure trend data.

Health care is consistently evolving and changing. The ability for hospitals to adapt to change internally and externally is critical, as grounded by the neo-institutional theory stressing the need for the ability to adapt to large scale policy change impacts, such as Medicaid expansion and evolving reimbursement models (Dimaggio & Powell, 1983). According to Dimaggio and Powell (1983), some organizations respond to external pressures quickly while others resist. External forces of change referenced in the neo-institutional theory include material resources such as demographics for consideration (Dimaggio & Powell, 1983). Researchers have not been able to identify exactly why some CAHs are closing and whether the closures are impacted by internal or external contributing factors.

There is a need for more research to understand why some hospitals manage to stay open versus others in expansion and non-expansion states (Young et al., 2019). Kaufman et al. (2015) called for continued monitoring of hospital closures to inform policymakers of the economic and medical well-being impact of closures. Continued research is imperative to help inform and prevent future closures, to continue to identify trends that need further scientific evidence, and to keep CAHs vital to communities as the center for preventive, chronic, and emergent medical

care. Although research makes the case for higher rates of closures in non-expansion states versus expansion states, there still remains a significant gap in the research pertaining to external county-level variables that may impact CAH closures that needs further exploration.

Methodology

The purpose of this mixed methods study to was to explore the impact of a state's decision to expand or not expand Medicaid from 2010-2020 on CAH closures. The study focused on three research questions: (1a) Is there a difference in the number of CAH closures in Medicaid expansion versus non-Medicaid expansion states from 2010-2020? (1b) Is there a statistical correlation for CAH closures from 2010-2020 in Medicaid expansion versus non-Medicaid expansion states with regards to AADC? (2) Are there statistical correlations of county-level predictors for CAH closures from 2010-2020 in Medicaid expansion versus non-expansion states with regards to percent population decline, population rates of 65 years plus, percent uninsured, race, ethnicity, and percent of individuals living at or below the FPL? Additionally, key informant interviews of former CAH leaders were conducted to further explore and obtain a better understanding of the non-financially related variables that may impact CAH closures such as but not limited to questions regarding ability to retain/recruit providers, the relationship with the community, and whether a hospital was part of a system or not.

Study Design

The study was a mixed methods nationwide study. The initial phase of the research study is an ecological analysis of secondary data. To illuminate and explain findings from the data analysis, there were subsequent qualitative interviews with former leaders from the 25 closed CAHs.

Phase 1: Secondary Data Analysis

The secondary data analysis used three data sets to include the UNC Cecil G. Sheps Center for Health Services Research rural hospital closure data (n.d.), the CAHPAS database hosted by UNC Cecil G. Sheps Center for Health Services Research (n.d.), and U.S. Census

Bureau Quick Facts (n.d.) data sources. The population of interest is CAHs that closed between 2010-2020. In the rural hospital closure data, during this specified timeframe there were CAH closures in 11 non-Medicaid expansion states to include Alabama, Florida, Georgia, Kansas, Mississippi, North Carolina, South Carolina, Tennessee, Texas, and Virginia. There were also four Medicaid expansion states with closed CAHs to include Arizona, Arkansas, Kentucky, and Minnesota. Two of the states, Virginia and Missouri, adopted expansion in 2019 and 2020, after the CAH already closed. For purposes of this study, these two states were classified as non-expansion at the time of the hospital closure.

Target Population

The target population for the quantitative portion of this study was CAH closures. There were three data sets used for this study, the rural hospital closure data from UNC Cecil G. Sheps Center for Health Services Research (n.d.) CAH closure data set, the UNC Cecil G. Sheps Center for Health Services Research CAHPAS database (n.d.), and the U.S. Census Bureau Quick Facts (n.d.) county-level data. The rural hospital closure data set includes data on all rural hospitals that closed from 2005 to 2022 (UNC Cecil G. Sheps Center for Health Services Research, n.d.). This study focused on data reflective of the 25 CAHs completely closed between 2010-2020. Additionally, the study utilized a database that is hosted by the UNC Cecil G. Sheps Center for Health Services Research entitled CAHPAS (n.d.), which includes nationwide CAH AADC for both acute care and swing beds. This database was used to obtain the AADC 1 year prior to each hospital closure.

Sampling and Inclusion Criteria. For this study, a closed CAH was defined as a CAH that ceased inpatient and outpatient services. The rural hospital closure data Medicare payment indicates “none” for complete hospital closures. From 2010-2020 there were 42 CAH closures

with 25 complete CAH closures versus 17 partial closures (UNC Cecil G. Sheps Center for Health Research, n.d.). This study focused on the 25 complete CAH closures in four Medicaid expansion states and 11 non-Medicaid expansion states.

Exclusion Criteria. Since this study focused on complete CAH closures, the study excluded other rural hospitals that were not categorized as a CAH and CAHs with partial closure status as indicated by the Medicare payment method. Partial closure was defined as CAHs that maintained services such as emergency room, outpatient clinic, long-term care facility, or other health care provider. Additionally, this study excluded rural and CAHs that closed prior to 2010, because those closings were not reflective of the adoption of Medicaid expansion, and hospitals that closed after 2020.

Sample Size. With the inclusion and exclusion criteria, the data set consists of 25 complete CAH closures. Of these CAH closures, 20 are in non-expansion states and five are in expansion states. The sample size represents the entire target population; therefore, a G Power test is not necessary. Normative tests were conducted to determine if any data was non-normative. Cohen's d Hedges' test was used to test the effect size of the correlations.

Data Collection

Data collection began with downloading the free, publicly available rural hospital closure data from the UNC Cecil G. Sheps Center for Health Services Research (n.d.) at the following URL address: https://www.shepscenter.unc.edu/programs-projects/rural-health/rural-hospital-closures/. This data set is updated by the UNC Cecil G. Sheps Center for Health Services Research every time a rural or CAH is closed. This data set is used to track rural and CAH closures and whether hospitals transitioned to another service format such as a nursing home or urgent care versus full-closure. For the purposes of this study, the entire database was

downloaded to ensure data was captured for closures from 2010-2020. The data set included the hospital name, address, city, state, zip code, confirmation of CAH status, year of hospital closure, Medicare payment status, and number of beds. Data was download in a Microsoft excel spreadsheet .XLS file.

The data set included 183 rural hospital closures. After exclusion criteria data for hospitals closed prior to 2010 and non-CAH status are eliminated from the spreadsheet, there were 42 CAH in the data set. Of the 42 CAH, 17 were eliminated due to partial open status based on Medicare Payment status. Data remaining reflects 25 complete CAH closures from 2010-2020 with details that included hospital name, street address, city, state, zip code, and number of beds. For purposes of this study, each hospital was assigned a unique number one through 25 and coded "CAHC."

Additionally, a column was added to the excel spreadsheet that indicates the AADC the year prior to the hospital closure based on the data from the CAHPAS database (n.d.). located at https://cahmpas.sirs.unc.edu/login. The UNC Sheps Center queried a data report based on the hospital name, zip code, and year of closure. The data set included the hospital name and the AADC 1 year prior to the date of closure. This data was added to the excel spreadsheet and coded AADC with a value of one to 25 based on the data. The AADC was recoded as AADC_RC as a categorical, ordinal independent variable with (1) indicating 1-9 AADC and (2) indicating 10 – 25 AADC to determine if the number of closures with higher versus lower AADC rates. Reference Appendix A for the code book.

To compare the impact of Medicaid expansion versus non-expansion, a column was added to the excel spreadsheet to reflect the Medicaid expansion status and labeled MEDICAID. The Medicaid expansion status was determined by the state where the closed CAH is located and

the timeframe of the closure. The MEDICAID column was dichotomously coded as expansion (1) and non-expansion (2) based on the previously mentioned expansion and non-expansion states.

To correspond confounding variable data with each of the 25 CAHs, a column entitled "county" was added to the excel spreadsheet. Based on the CAH city and zip code, the county name was identified and entered into the spreadsheet. The county name was used to collect data on the confounding variables in the U.S. Census Quick Facts (2022) data set. Prior to data collection, columns for the confounding variables were added to the excel spreadsheet to include percent population change (PRCTPOPCHANGE), percent of population age 65 and over (ELDERAGE), percent of population uninsured under (UNINS), and percent of individuals living at or below the federal poverty level (FPL). The percent of population by race was coded (NONWTRACE). The percent of Hispanic population was coded (HISP). Demographic data was based on U.S. Census Bureau Quick Facts (2022) data from July 1, 2021 population estimates.

The researcher entered the appropriate data values into the excel spreadsheet for the demographic variables as identified in the U.S. Census Bureau Quick Facts (2022) data set for the 25 CAHs. Once the data was populated into the excel spreadsheet, the county-level data was coded in preparation for data analysis. The percent of population change, indicating a positive or negative trend for population, is based on the April 1, 2010 population value and the April 1, 2020 population value (U.S. Census Bureau, 2022). The percent change was calculated and entered it into the excel spreadsheet. Positive growth was defined as any percent growth above zero and negative growth was defined as a negative percent indicating a population decline. For purposes of analysis, the percent of population that is 65 years and over data was recoded based on the U.S. average of 16.5 percent (AGE_RC). Data less than 16.5% was defined as low rates of

65 plus population (1) and greater than 16.5% was defined as high rates of 65 plus population (2). The persons without health insurance was recoded based on the U.S. average of 9.5% rate uninsured (UNINS_RC). Data less than 9.5% was defined as low rates of uninsured (1) and data greater than 9.5% was defined as high rates of uninsured (2). The percent of population living in poverty was recoded based on the U.S. average of 11.4% (FPL_RC). Data less than 11.4% was defined as low rates of poverty (1) and data equal to or greater than 11.4% was defined as high rates of poverty (2). The recoded data was used for descriptive statistical analysis. Reference Appendix A for recoding strategy.

All data was combined in Microsoft Excel, using a unique identifier for each CAH. The excel spreadsheet was uploaded to SPSS v29 for statistical analysis purposes. Reference Appendix B for a sample spreadsheet color coded data sources.

Data Analysis

All data was combined in Microsoft Excel. The Excel spreadsheet was uploaded to SPSS v29 for statistical analysis purposes. In the initial study design, the proposed statistical test included Pearson Chi Square and Logistic Regression tests. Due to the sample size, Pearson Chi Square was not a valid test. Logistic Regression tests could not be used to the fact that all of the hospitals were closed hospitals. Normative statistical tests were run to determine if any data were non-normal due to the small sample size.

To determine correlations of the variables, independent t-tests for normal data and independent samples Mann-Whitney u-tests for non-normal data were used to demonstrate statistical differences in the means between expansion and non-expansion states. T-tests are used to determine two-groups means and if the difference is statistically significant (Patten & Newhart, 2018). Levene’s test for equality of variances was used to determine equal or not equal

variances. For the non-parametric alternative test for non-normal data, independent samples Mann-Whitney U-tests are were used. The Mann-Whitney U-test is used to test quantitative data that does not have a normal distribution (Terrell, 2012). Statistical significance (p-value) was set at $p < 0.05$ for all statistical tests. The confidence interval (CI) was set at 95%. A Cohen's *d* test was used to determine the effect size of the correlation with the t-tests. Effect size values were analyzed with the following definitions for small effect size as $d <= 0.2$, medium effect size $<= 0.5$, large effect size $<= 0.8$, $<= 1.10$ very large, and $<= 1.40$ extremely large (Patten & Newhart, 2018).

RQ1(a): Is there a difference in the number of CAH closures in Medicaid expansion states versus non-Medicaid expansion states from 2010-2020?						
	Hypothesis	**IV**	**IV Data Type**	**DV**	**DV Data Type**	**Statistical Test**
H 1.1 a	N/A	MEDICAID	Categorical (Nominal, Dichotomous**)**	CAHC	Categorical (Ordinal)	Not applicable; used descriptive statistics
RQ1(b): Is there a statistical correlation for CAH closures from 2010-2020 in Medicaid expansion versus non-expansion states with regards to AADC?						
H 1.1 (b)	CAHs with an average annual daily census of less than 10 are more likely to close in non-Medicaid expansion states than expansion states.	MEDICAID	Categorical (Nominal, Dichotomous)	AADC	Interval	Independent T-test

RQ2: Are there statistical correlations of county-level predictors for CAH closures from 2010-2020 in Medicaid expansion versus non-expansion states with regards to population decline, percent of population of 65 plus, percent uninsured, percent non-White, percent Hispanic, and percent living at or below FPL?						
	Hypothesis	**IV**	**IV Data Type**	**DV**	**DV Data Type**	**Statistical Test**
H 2.1	CAHs located in non-Medicaid expansion states in counties with declining populations will have higher closures than CAHs in expansion states.	MEDICAID	Categorical (Nominal, Dichotomous)	PRCTPOPCHANGE	Continuous Ratio	Independent T-test
H 2.2	CAHs located in non-Medicaid expansion states with counties that have high rates of 65 plus population will have lower closures compared to CAH in expansion states.	MEDICAID	Categorical (Nominal, Dichotomous)	ELDERAGE	Continuous Ratio	Independent T-test
H 2.3	CAH located in non-expansion states in counties	MEDICAID	Categorical (Nominal, Dichotomous)	UNINS	Continuous Ratio	Independent t-test

	with high rates of uninsured based on the U.S. average will have higher closures than CAH in expansion states.					
H. 2.4	CAHs located in non-Medicaid expansion states in counties with a higher percentage of minority population based on the U.S. average will have higher closures.	MEDICAID	Categorical (Nominal, Dichotomous)	NONWTRACE	Continuous Ratio	Independent samples Mann-Whitley U-Test
H 2.5	CAHs located in non-Medicaid expansion states in counties with a higher than the U.S. average for Hispanic population will have higher closures.	MEDICAID	Categorical (Nominal, Dichotomous)	ETHN	Continuous Ratio	Independent samples Mann-Whitney U-test
H 2.6	CAHs located in	MEDICAID		FPL	Continuous	

	non-Medicaid expansion states in counties that have higher than the U.S. average of individuals living at or below the FPL will have higher closures.		Categorical (Nominal, Dichotomous)		Ratio	Independent samples Mann-Whitney U-test

Phase 2: Qualitative Study Design

The qualitative portion of the study included semi-formal, one-on-one interviews that were conducted and recorded via virtual meeting technology using the Zoom meeting platform. The researcher aimed to interview five to eight individuals who served in key roles from the 25 closed CAHs. Interviews were estimated to be approximately 30 to 45 minutes in length.

One-on-One Interviews

Qualitative data can assist researchers with exploring new meanings and interpretation and provide value-added information to further explain quantitative data (Eakin & Gladstone, 2020). Therefore, one-on-one interviews were used to confirm the secondary data results and provide the opportunity to further explore potential community level and non-financially related influences on CAH closures that cannot be captured in the existing data sets or quantitative data results. Former leaders of the closed CAHs, otherwise referred to as the "actors" in the neo-institutional theory (Macfarlane et al., 2013), were offered the opportunity to answer open-ended questions designed to provide insight into the human component of providing health care to rural, underserved communities.

These leaders have historical knowledge of external and internal barriers, contributors, and factors that may have impacted the hospital closure that are not apparent in data. The development of the interview guide was informed by the findings from the Phase 1 secondary data analysis. The goal of the interviews was to learn more about factors such as but not limited to (a) retaining medical providers in CAH, (b) the hospital relationship with the community, (c) the services offered and/or not offered by the CAH, (d) the readiness of the hospital to change service delivery, (e) the existence or lack of resources to enable the capacity to adapt to changing the care model, and (f) whether the hospital was part of a system or stand-alone facility. It is important to understand the willingness of the hospital's management team versus the capacity of a hospital as these hospitals endeavor to adapt to change. Answers to these types of questions can help guide leaders of CAHs in future initiatives and delivery models. Reference Appendix D for the interview guide with the questions.

By combining broad themes based on qualitative data and providing context and conceptual detail, the qualitative data study findings can be generalizable to others (Eakin & Gladstone, 2020). The qualitative phase of this study aimed to identify trends related to risk factors and confounding variables for closures. The interviews with the former health care leaders allows current leaders time to reflect on their facilities, service delivery models, and communities, and make changes based on past closed hospitals experiences and outcomes. According to the institutional theory, when organizations are in uncertain environments, organizations tend to model other organizations (Dimaggio & Powell, 1983). Organizations can learn through mimetic processes from successful models as well as unsuccessful models.

Target Population (Participants)

The target population for the qualitative portion of this study was the key informants from the closed CAHs. These key informants were former leaders of the one of the 25 closed CAHs. The study defined former leaders as individuals who served in essential and critical roles such as the President, Vice President, Chief Executive Officer, Chief Nursing Officer, and Director of Quality.

Sampling

The study sought to conduct interviews with former leaders of the closed CAHs as defined in the target population. The researcher conducted a media and Google search to identify former leaders names of the 25 closed CAHs.

Inclusion. The key informants were former leaders as defined in the target population from one of the 25 completely closed CAHs.

Exclusion. The study excluded any former employees of the closed CAH that did not hold a leadership position. The study excluded any leaders whose contact information was not attainable. Leaders who did not respond to the invitation to participate in the study were also excluded.

Sample Size. The qualitative portion of the study aimed to include five to eight key informant interviews.

Recruitment of Subjects

Key informants were identified through a web search of each hospital closure. The researcher sought names of former hospital leaders in articles, news stories, or historical records available online related to the closures. After the candidates were identified, the researcher sought out the key informants through LinkedIn and additional Google searches. Other sources

for potential identification and reaching out to key informants included resources such as the state level Office of Rural Health, other CAH leaders, and the Federal Office of Rural Health Policy. The names of leaders and identified contact information were entered into an excel spreadsheet for tracking purposes.

Once key informants were identified and contact information was obtained, an initial phone call or email invitation (depending on what contact information was obtained) was sent to each identified key informant that had contact information. A follow-up email and phone calls were made within a week of the initial invitation. A list of key informants that responded positively to being interviewed was kept in an excel spreadsheet. After 3 weeks, the researcher scheduled interviews with the positive responses. The researcher did not offer a formal incentive to participants.

Development of Interview Guide

The interview questions and a formal interview script were developed on the secondary data analysis trends. The interview questions were developed to explore clarification of unexpected data results as well as to explore other potential influences on closures. During the development of the interview questions, the researcher aligned the interview questions to the theory constructs of the three isomorphic processes to include if a question focuses on mimetic, normative, or coercive change based on the neo-institutional theory (Dimaggio & Powell, 1983; Macfarlane et al., 2013). A formal interview guide was developed to provide guidance for the interview process. Reference Appendix D for the interview guide to include the questions.

Data Collection

Scheduling Interviews. Interviews were scheduled via email communication. Confirmation emails were sent to all confirmed key informants with the informed consent form for signature and the Zoom link for the interview meeting. The interviews ranged from 30 to 45 minutes with nine interview questions that focused on non-financial contributors to closures.

Conducting Interviews. The researcher sent out a reminder email with the Zoom link and a reminder to sign and email a copy of the informed consent form prior to the interview. At the beginning of the interview, the researcher followed a script that included introductions, a review of the consent process, and permission to record the interview. The interviews were recorded using Zoom.

Recording and Transcription of Interviews. All of the interviews were recorded via Zoom. When saved to a cloud, Zoom provides three files to include a video file, an audio file, and a transcript document. To ensure the transcripts reflect verbatim results, all of the transcripts were reviewed and edited as appropriate by the researcher to prepare the transcripts for the data analysis process.

Data Analysis

Sort and Sift, Think and Shift Analysis. The researcher used the qualitative data analysis approach of Sort and Sift, Think and Shift (Maietta et al., 2021). This process is driven by five core principles that include (1) adopting flexibility to facilitate the process, (2) letting the data direct the process, (3) looking at the holistic picture of the data, (4) using diagramming and/or memoing to define themes, and (5) looking for opportunities to identify how data works together (Maietta et al., 2021). Through this process, the researcher reviewed the finalized transcripts in detail and highlighted significant responses or quotes. The researcher then

reviewed the highlighted text to develop a list of themes/recurring topics. Then the researcher used the mining technique to further review the themes across the various transcripts and questions. In the final analyzing phase, the researcher used the threading concept to identify overarching concepts/themes. The researcher then compared and contrasted the interview themes with secondary data analysis to further inform the study conclusions.

Institutional Review Board

The study required Institutional Review Board (IRB) approval due to the one-on-one interviews. An IRB application was submitted to the Radford University IRB. IRB approval was granted on February 15, 2023 and expires on February 14, 2026. The study was approved under the Expedited Category 7. Guidelines for the protection of documents as well as study records were followed accordingly. Reference Appendix E for a copy of the IRB approval.

Results

This chapter provides an overview of the quantitative and qualitative study results. These results include secondary data trends, statistical test data results related to the null hypothesis to include which variables reached statistical significance or not, and variables that demonstrate strong correlation values. Furthermore, the qualitative results highlight five themes that resulted from one-on-one interviews with former leaders of closed CAHs. These themes included the need to bridge revenue gaps, the need for engaging in creative service delivery solutions, the reputation of CAHs, the advantages and disadvantages of being part of a system, and reflections/words of advice for leaders facing the challenge of a potential closure.

Sample and Inclusion Criteria

This study focused on analyzing CAH closures. For the purposes of this study, a closed CAH was defined as a CAH that ceased inpatient and outpatient services. This was determined by the hospital data Medicare payment classification in the UNC Cecil Sheps Center for Health Research (n.d.). The rural hospital closure data Medicare payment indicates “none” for complete hospital closures (UNC Cecil Sheps Center for Health Research, n.d.). From 2010-2020 there were 42 CAH closures. Of those, 17 were partial closures (meaning the hospital converted to a long-term care facility and/or an emergency department/urgent care only) and 25 were complete closures. This study focused on the 25 complete CAH closures.

Medicaid expansion status was defined as the status of expansion or non-expansion the year of the closure. There were four expansion states with closures to include Arizona, Arkansas, Kentucky, and Minnesota. There were 11 non-expansion states with closures to include Alabama, Kansas, Mississippi, Georgia, Texas, North Carolina, Missouri, Virginia, Florida, Tennessee, and South Carolina. Two of these states, Virginia and Missouri, adopted expansion in

2019 and 2020, after the CAH already closed. For purposes of this study, these two states were classified as non-expansion at the time of the hospital closure.

Exclusion Criteria

Since this study focused on complete CAH closures, the study excludes other rural hospitals that were not categorized as CAH and CAHs with partial closure status, as indicated by the Medicare payment method. Partial closure is defined as CAHs that maintained services such as emergency room, outpatient clinic, long-term care facility, or other health care provider. Additionally, this study excludes rural and CAHs that closed prior to 2010, because those closings are not reflective of the adoption of Medicaid expansion.

Sample Size

With the inclusion and exclusion criteria, the data set consists of 25 complete hospital closures. Of these CAH closures, 20 are in non-expansion states and five are in expansion states. The sample size represents the entire population; therefore, a power analysis is not necessary, however, a Cohens *d* was used to estimate effect size for the independent t-tests and normative data tests were run to determine if any data was non-parametric.

Demographics

Of the 25 closed CAHs, there were five in expansion states and 20 in non-expansion states. There was one expansion state with two closures (Arizona). There were six non-expansion states with more than one CAH closure and five non-expansion states with one hospital closure. Additionally, of the CAH closures, there were 22 in Southern states and three in Northern states. Reference Table 2 for the expansion and non-expansion states and the number of CAH closures per state.

Table 2

Number of CAH Closures per State From 2010-2020

CAH Closures by State by Expansion and Non-Expansion Status

Expansion Status	State	Number of CAH Closures
Expansion	Arizona	2
Expansion	Kentucky	1
Expansion	Minnesota	1
Expansion	Arkansas	1
Non-expansion	Georgia	4
Non-expansion	Texas	3
Non-expansion	Kansas	2
Non-expansion	North Carolina	2
Non-expansion	Mississippi	2
Non-expansion	Missouri	2
Non-expansion	Alabama	1
Non-expansion	Florida	1
Non-expansion	South Carolina	1
Non-expansion	Tennessee	1
Non-expansion	Virginia	1

Quantitative Results of Study

For the quantitative portion of the study, the researcher used a combination of descriptive and inferential statistics to explore correlations and predictor variables for CAHs in expansion versus non-expansion states. Normative statistical tests were run to determine if there were any non-parametric data. These tests resulted in three variables with non-normal data patterns to include percent of non-White population, percent of Hispanic population, and percent of population living at the FPL. The independent samples Mann-Whitney U-test was run for these three variables. The Mann-Whitney U-test was used to determine whether the median between expansion versus non-expansion states for the dependent variables were statistically different. An independent t-test was used for the normally distributed data variables to determine whether the mean between the expansion versus non-expansion states for the dependent variables were

statistically different. Statistical significance was set at $p < 0.05$ for all analysis. As part of the comparison, effect size was tested using the Cohen's *d* test to determine the strength of correlation of the variable between expansion and non-expansion states. Effect size was established using Cohen's *d* levels from small effect size as $d >= 0.2$, medium effect size $>= 0.5$, large effect size $>= 0.8$, $>= 1.10$ very large, and $>= 1.40$ extremely large (Patten & Newhart, 2018). The results of the study are as follows.

RQ1(a): Is there a difference in the number of CAH closures in Medicaid expansion states versus non-Medicaid expansion state from 2010-2020?

Descriptive statistics were used to determine the difference. Data reflect that 80% of the CAH closures are in non-expansion states (20) versus 20% in expansion states (five). Reference Table 2 for closure data by state. Therefore, the data demonstrate the number of CAH closures are higher in non-expansion states than expansion states.

RQ1(b): Is there a statistically significant correlation for CAH closures from 2010-2020 in Medicaid expansion versus non-expansion states with regards to AADC?

Hypothesis 1.1b: CAHs with an average annual daily census of less than 10 are more likely to close in expansion than non-expansion states.

Alternate Hypothesis 1.1b: CAHs with an average annual daily census of less than 10 are not more likely to close in expansion than non-expansion states.

AADC values were based on a query report run from UNC Cecil G. Sheps Center for Research for the specific hospital name, zip code, month and year of closure. The AADC represents the value 1 year prior to the hospital closure. All of the CAH closures had a AADC of 9 or less. In expansion states the range was 3.15 to 0.92 patients. The AADC in non-expansion states ranged from a high of 6.21 and a low of 0.01 patients. The data indicate that 1 year prior to

closure, all of the CAHs had a low AADC. The AADC directly impacts inpatient revenue. Reference Table 3 for the number of CAHs closures related to AADC.

Table 3

Number of CAHs With AADC

Number of CAH Closures With AADC 1 Year Prior to Closure Date

AADC	CAH Closures in Non-expansion States	CAH Closures in Expansion States
10 or greater	0	0
9 or less	20	5

The closed CAHs in expansion states (M = 2.27, SD = 0.899) compared to the closed CAHs in non-expansion states (M = 2.06, SD = 1.97) did not demonstrate significant differences in AADC, $t = 0.224$, $p = 0.824$. The p-value is > 0.05 indicating this variable is not statistically significant. Cohen's $d = 0.112$, which demonstrates a small effect size that indicates there is not a correlation for the AADC variable with CAH closures in expansion versus non-expansion states. The t-test concludes to fail to reject the null hypothesis.

RQ 2: Are there statistical correlations of county-level predictors for CAH closures from 2010-2020 in Medicaid expansion versus non-expansion states with regards to population decline, population rates of 65 plus, percent of uninsured, percent non-White, percent Hispanic, and percent of individuals living at or below FPL?

Hypothesis 2.1: CAHs located in non-Medicaid expansion states in counties with declining populations will have higher closures than CAHs in expansion states.

Alternate Hypothesis 2.1: CAHs located in non-Medicaid expansion states in counties with declining populations will not have higher closures than CAHs in expansion states.

In the data set, there were less hospital closures in non-expansion states with positive percent difference growth in the county from 2010-2020 and more with negative percent growth during that timeframe. In expansion states, there were more counties with closures that had positive percent difference growth than negative percent difference in population growth. Reference Table 4 for the number of closures per non-expansion and expansion states with regards to population shift.

There was no significant effect for percent population decline $t = 1.759$, $p = 0.092$ between expansion (M = 2.16, SD = 8.06) and non-expansion (M = 4.73, SD = 7.80) states. The p-value was not statistically significant. The test concludes to fail to reject the null hypothesis for the percent difference in county-level population growth from 2010-2020. However, there was a large effect size ($d = 0.880$), which indicates there is a potential correlation between percent difference in population growth in closures in non-expansion versus expansion states.

An analysis was also run on the percent difference in population estimates from July 1, 2021 and the population percent change from April 1, 2020 to July 1, 2021 (U.S. Census Bureau Quick Facts, 2021) to determine potential impact on population after CAH closures. During this timeframe, there were equal amounts of closed CAHs in non-expansion states for an increase in population growth and a decrease in population growth. In comparison, the counties with closures in expansion states had more closures in counties demonstrating population growth. Reference Table 4 the number of closures based on population shifts.

Table 4

Percent Population Growth by CAH Closures in Non-Expansion and Expansion States

County-level Percent Population Shifts

Percent Population Change	CAH Closures in Non-expansion States	CAH Closures in Expansion States
Increase in Percent Population from 2010-2020	4	3
Decrease in Percent Population from 2010-2020	16	2
Increase in Percent Population from April 2020-July 2021	10	4
Decrease in Percent Population from April 2020-July 2021	10	1

There was a statistically significant effect $t = 2.075$, $p = 0.049$ for population decline from April 2020 – July 2021 between expansion (M = 1.70, SD = 2.44) and non-expansion (M = .010, SD = 1.43) states. The p-value is < 0.05, therefore, there is a statistically significant difference between population growth between expansion and non-expansion states in this timeframe. Furthermore, there was a large effect size of $d = 1.037$, which demonstrates a very strong correlation. This result suggests that population growth is stronger in expansion states with closures versus non-expansion states with closures, which suggests individuals may be leaving non-expansion states after a CAH closure to seek access and coverage. The data also indicates that hospitals in non-expansion states with declining populations are at risk for closures. This statistical test was not related to a hypothesis.

Hypothesis 2.2: CAHs located in non-Medicaid expansion states with counties that have high rates of 65 plus population will have lower closures compared to CAH in expansion states.

Alternate Hypothesis 2.2: CAHs located in non-Medicaid expansion states with counties that have high rates of 65 plus population will not have lower closures compared to CAH in expansion states.

According to the U.S. Census Bureau Quick Facts (2021), the U.S. average percent of population 65 and older is 16.5%. The study defines high population of 65 plus as more than the U.S. average of 16.5% and low population of 65 plus as 16.5% or less of elderly at age 65 plus. There were more CAH closures in non-expansion states in counties with a high population of 65 plus than a low population of 65 plus. There were no notable differences in the expansion states related to population age 65 plus. Based on the 99% cost reimbursement, it was expected that counties with high populations of 65 plus would have lower closure rates. However, the secondary data suggests it is opposite. Counties with higher than the U.S. average population of 65 plus actually have more CAH closures. Reference Table 6 for CAH closures related to high or low populations of 65 plus.

Table 5

Percent of Population 65+ in Non-Expansion and Expansion States With CAH Closures

CAH Closures in Counties With High or Low Population of 65+

Percent Population 65+	CAH Closures in Non-expansion States	CAH Closures in Expansion States
High population 16.6% or higher	16	2
Low population 16.5% or less	4	3

There was no significant effect, $t = 1.15$, $p = 0.264$, for percent of population 65 plus in expansion ($M = 18.34$, $SD = 3.81$) and non-expansion ($M = 20.41$, $SD = 3.56$). With a p-value > 0.05, there is no statistically significant difference in CAH closures in non-expansion and expansion states with regards to percent population 65 plus. The test result concludes to fail to

reject the null hypothesis. However, it should be noted that there was a medium effect size of d = 0.572 suggesting a potential moderate correlation.

Hypothesis 2.3: CAHs located in non-expansion states in counties with high rates of uninsured based on the U.S. average will have higher closures than CAHs in expansion states.

Alternative Hypothesis 2.3: CAHs located in non-expansion states in counties with high rates of uninsured based on the U.S. average will have lower closures than CAHs in expansion states.

The average percent of uninsured in the United States is 9.5% (U.S. Census Quick Facts, 2021). For this study, counties with greater than 9.5% of the population being uninsured were considered having high rates of uninsured. All of the CAHs in non-expansion states were in counties with high rates of uninsured with a mean of 15.68% uninsured population in non-expansion states. There was almost an even split with CAHs closures in expansion states with regards to population of uninsured. CAH closures in expansion states had a mean of 11.56% uninsured. There was a 4% difference in means in non-expansion versus non-expansion. Reference Table 6 for number of CAHs by percent population of uninsured.

Table 6

Percent Uninsured in Non-Expansion and Expansion States

CAH Closures in Counties With High and Low Percent Uninsured

Percent Uninsured	CAH Closures in Non-expansion States	CAH Closures in Expansion States
9.5% or less uninsured	0	2
9.6% or greater percent uninsured	20	3

There was a statistically significant effect, $t = 2.31$, $p = 0.030$, for the percent of population that was uninsured in expansion ($M = 11.56$, $SD = 4.18$) and non-expansion ($M = 15.69$, $SD = 3.43$) states. The p-value is < 0.05, which indicates a statistically significant difference between non-expansion and expansion states. There are higher populations of uninsured in non-expansion states with CAH closures versus expansion states. With a $d = 1.15$, percent uninsured represents a strong correlation for closed CAHs in non-expansion states. The tests conclude to reject the null hypothesis.

Hypothesis 2.4: CAHs located in non-Medicaid expansion states in counties with a higher percentage of minority population based on the U.S. average will have higher closures.

Alternative Hypothesis 2.4: CAHs located in non-Medicaid expansion states in counties with a higher percentage of minority population based on the U.S. average will not have higher closures.

The average White population in the U.S. is 75.8% versus 24.2% of non-White. There were less closed CAHs in non-expansion states in counties with greater than 24.2% of non-Whites than in counties with lower rates of non-White population. All of the closed CAHs in expansion states were in counties that had a low population of non-Whites compared to the U.S. average. The mean value in expansion states for population of non-White was 11.96 versus 27.77 in non-expansion states. Reference Table 7 for the number of CAH closures and in counties with high and low rates of non-White populations.

Table 7

Percent Non-White Population in Non-Expansion and Expansion States

CAH Closures in Counties With High and Low Rates of Non-White Population

Percent Non-White Population	CAH Closures in Non-expansion States	CAH Closures in Expansion States
24.2% or less Non-White	11	5
24.3% or more Non-White	9	0

The percent of non-White population did not pass the test for normalized data. Therefore, a Mann-Whitney U-test results indicated that there were no significant differences in CAHs closures related to the percent of non-White population in expansion and non-expansion states, $U = 71.00$, $p = 0.169$. The p-value did not demonstrate statistical significance. There are not higher rates of minority populations in non-expansion states with CAH closures versus expansion states. The test concludes to fail to reject the null hypothesis.

Hypothesis 2.5: CAHs located in non-Medicaid expansion states in counties with a higher than the U.S. average for Hispanic population will have higher closures.

Alternate Hypothesis 2.5: CAHs located in non-Medicaid expansion states in counties with a higher than the U.S. average for Hispanic population will not have higher closures.

The U.S. average percent of population of Hispanic/Latino ethnicity is 18.9% (U.S. Census Bureau Quick Facts, 2021). Secondary data demonstrate that there were more CAH closures in counties in non-expansion states with a low percent of Hispanic/Latino population versus a high percent of Hispanic/Latino population. There were more CAH closures in expansion states in counties with greater than 18.9% Hispanic/Latino population. There were an equal number of CAH closures in non-expansion and expansion states with a higher population of Hispanic/Latino. Reference Table 8 for the number of closures based on Hispanic/Latino population.

Table 8

Percent Hispanic/Latino in Non-Expansion Versus Expansion States

CAH Closures in Counties With High and Low Percent of Hispanic/Latino Population

Percent Hispanic/Latino Population	CAH Closures in Non-expansion States	CAH Closures in Expansion States
18.9% or less Hispanic/Latino	17	2
19.0% or more Hispanic/Latino	3	3

The percent of Hispanic/Latino population did not pass the test for normalized data. As such, the Mann-Whitney U-test was run. The test results indicate that there was no significant difference in CAH closures in counties with a high percentage of Hispanic/Latino population in expansion versus non-expansion states, $U = 31.50$, $p = 0.216$. The test concludes to fail to reject the null hypothesis.

Hypothesis 2.6: CAHs located in non-Medicaid expansion states in counties that have higher than the U.S. average of individuals living at or below the FPL will have higher closures.

Alternate Hypothesis 2.6: CAHs located in non-Medicaid expansion states in counties that have higher than the U.S. average of individuals living at or below the FPL will not have higher closures.

The average percent of individuals living at the FPL in the U.S. is 11.6% (U.S. Census Bureau Quick Facts, 2021). All of the CAH closures in non-expansion states had greater than the U.S. average of individuals living at or below FPL. The CAH closures in expansion states were almost even with regards to individuals living at or below FPL. Reference Table 9 for the number of CAH closures based on county rates of individuals living in poverty.

Table 9

Percent Living at the Federal Poverty Level in Non-Expansion and Expansion States

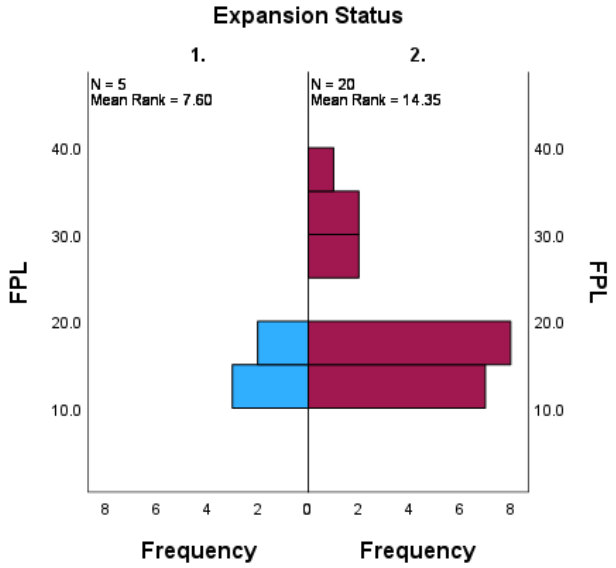
CAH Closures in Counties With High or Low Percent of Individuals Living at or Below FPL

Percent of Population Living at or Below FPL	CAH Closures in Non-expansion States	CAH Closures in Expansion States
11.6% or less living at FPL	0	2
11.7% or more living at FPL	20	3

The percent of individuals living in poverty did not pass the normalized data test. Therefore, a Mann-Whitney U-test was performed. The results indicate there was no significant difference in the percent of population living at the FPL in counties with closed CAHs between expansion and non-expansion states, $U = 77.00$, $p = 0.071$. The t-test concludes to fail to reject the null hypothesis. However, the result was almost statistically significant. Figure 1 demonstrates there were no counties in expansion states with high levels of poverty.

Figure 1

Frequency of FPL in Expansion and Non-Expansion States



Summary of Quantitative Results

With regards to RQ1, data indicate there is a higher number of CAH closures in expansion versus non-expansion states from 2010-2020. When analyzing data related to county-level variables as predictors of CAH closures, data demonstrate that percent of uninsured population correlates with CAH closures in non-expansion versus expansion states. Although the other county level variables did not reach statistical significance, there were two variables that had medium to large effect sizes suggesting potential correlations with the variables. For instance, there was a medium effect size for population 65 plus and a large effect size for population change from 2010-2020.

Table 10

Summary of Quantitative Study Results

Statistical Test Results

Hypothesis	Variable	p-value	Result	*d*-value	Effect	u-value
1.1b	AADC	0.824	Fail to reject null	0.112	Small	N/A
2.1	Population shift 2010-2020	0.092	Fail to reject null	.880	Large	N/A
2.2	Population 65 plus	0.264	Fail to reject null	0.572	Medium	N/A
2.3	Population uninsured	0.030	Reject null	1.15	Very large	N/A
2.4	Population non-White	0.169	Fail to Reject null	N/A	N/A	71.00
2.5	Population Hispanic/Latino	0.216	Fail to reject null	N/A	N/A	31.50
2.6	Population living at FPL	0.071	Fail to reject null	N/A	N/A	77.00

The Qualitative Research Activity

Sample

The researcher sought to identify leaders from the 25 closed CAHs. Through Google searches conducted based on the name of the hospital and using the word closure, there were 24 leader names identified. During the leader research, the researcher also discovered four of the CAHs were owned by one company whose leader was federally indicted on Medicare fraud and is currently serving a prison sentence. Additionally, one leader of a CAH was federally indicted on fraudulent telemedicine claims along with 12 additional people involved in that system. This case has not yet gone to trial. Through further searches on LinkedIn and Google, contact information was obtained for 10 of the 24 leaders identified. The researcher was able to contact three leaders who agreed to participate in the study (N = 3).

Exclusion Criteria

Leaders who the researcher could not find contact information were excluded. The leader who was federally indicted and the leader currently under federal indictment charges were not contacted. Leaders who did not respond to emails, LinkedIn invitations, and phone calls were excluded.

Sample Size

Three former leaders of CAHs participated in the study.

Demographics

For the qualitative portion of the study, the key informants included two males and one female. One informant served as Chief Executive Officer (CEO) for 1.5 years, one served as CEO for 4 years, and one served as CEO for 6 years. One of the facilities was a stand-alone not-for-profit county/public owned CAH, one was part of a non-profit, private-owned health care system, and one was part of a for-profit, privately owned health care system.

Services provided at each facility were similar. All of the CAHs had an associated rural health clinic. One had two clinics initially, but one clinic was closed during the tenure due to lack of volume. All three facilities offered inpatient and outpatient general surgery. None of the hospitals offered specialty care services. All of the hospitals offered allied health services to include respiratory therapy, occupational therapy, physical therapy, laboratory, and imaging. One facility offered a geriatric psychology program that included group therapy, but this service was discontinued due to low participation rates.

Qualitative Study: Themes

As part of conducting the Sort and Sift, Think and Shift approach to the qualitative data analysis, the researcher analyzed field notes from the interviews and transcripts (Maietta et al.,

2021). The researcher identified key quotations per interview question. The process of mining, bridging, and threading was used to determine which themes were common throughout the answers to the questions. As a result, there were five key themes identified. These include (1) CAHs must find a way bridge the revenue gap due to high rates of uninsured and cost-based reimbursement to increase cash flow for capital investments and services expansion, (2) there is a need for CAH to engage in creative solutions for service delivery and growth, (3) CAHs have a reputation in the community for providing limited, low quality services, and are described as "band-aid stations," (4) being part of a system has advantages and disadvantages that can contribute closures, and (5) leaders provided words of advice for current leaders of hospitals at-risk of closure.

Need to Bridge Revenue Gap

Through the interview process, key informants shared their experiences that ultimately impacted the fiscal status of the CAH. High rates of uninsured and lack of Medicaid expansion were brought up by all key informants. For instance, one key informant shared, "All the states [the systems hospitals] were in, that nobody expanded Medicaid, and they all went under." Another key informant stated, "…you just cannot collect the amount of money you need from those people that don't have insurance….you're not going to have money [to put] aside." Another challenge highlighted was unexpected funding cuts from local government, such as county budget and tax dollar support for public CAHs. One key informant shared, "The county provided $1.2 million in assistance, $500,000 of it was for EMS contract and they took all of those monies away based on budget and the hospital could not survive."

The leaders openly shared that budget constraints prohibited repairing older facilities and the ability to purchase new equipment. This then impacted the ability of the CAH to grow the

services, increase utilization volumes, offer specialty care services, and attract commercial payers with depth of services. This is critical because commercial payers tend to reimburse at higher levels than Medicare and Medicaid, and can be part of the solution to closing the revenue gap. In addition to budget constraints, the ability of leaders at the system level to adapt to changing care models was highlighted as a challenge for bridging the revenue gap. One leader clearly stated, "There was not a readiness to adapt to change," and leaders expressed a lack of awareness for the need to adapt the care model. Overall, responses reflected a lack of ability to bridge the revenue gap due to lack of Medicaid expansion, lack of coverage, lack of capital resources that impacted the ability to grow services, and a lack of awareness and preparation to be able to shift to new models of care or services.

Need Creative Solutions for Service Delivery

Key informants highlighted the need for creativity in solutions to changing service delivery. The leaders emphasized the need to engage employees beyond the leadership team. Bring in managers and front line workers that are respected by others. They also stressed the need to be transparent regarding the need to control expenses and increase revenue. One leader stated, "Empower managers and hold them accountable to come together and find solutions." The leaders also discussed that CAHs should consider what services need to be discontinued due to lack of generating revenue or figure out new means of delivering that service to reduce losses.

Another strategy mentioned by the key informants included staffing at appropriate levels to control costs. However, the leaders also shared how this presents a challenge in recruiting staff with the right skill level to work in a smaller facility and this challenge goes beyond nursing care. One leader's words reflected, "finding the skill set that you need and not just nursing." There is a need for the care team to function at the top of their capabilities. For instance, one

leader highlighted at larger facilities imaging technicians can specialize in one or two imaging tests. An example highlighted was a night shift imaging department at a CAH only staffs one imaging person; this technician is going to need to have the capability to facilitate all of the imaging tests.

Using internal resources creatively was also mentioned. One leader shared the idea of leasing unused space in the facility. Another leader shared the idea of creating fee-for-service laboratory tests, such as pregnancy test, hemoglobin A1c tests, and cholesterol tests. This type of service model was a benefit for the community that needed a lab test and also was a source of revenue as test were performed in the hospital at low-cost.

Collaboration with external organizations/larger tertiary care facilities that are seeking in-migration provides opportunities to create new services. CAHs have opportunities to partner with other health care systems and providers to expand access to services. Examples shared included a partnership for the implementation of a tele-stroke program that included training volunteer Emergency Medicine Technicians in the county on the signs and symptoms of strokes and treatment protocols during transport. Other examples included developing a low-dose CT scan program and partnering with larger tertiary care facilities for life flights. These types of collaborations are "win-win" for the CAH and the tertiary care facility. One leader summarized, "They're (larger hospitals) looking for in-migration. You know they're looking for transfers, it ends up being a win-win."

CAH Community Image and the Need to Build Trust With the Community

As smaller facilities, leaders shared that CAHs are often viewed as "band-aid stations" by the community. There is a lack of awareness and understanding of the services that can be offered. One leaders shared community reflections stating, "I wouldn't go there. They're a

bandage station." Another leader shared, "When I first got there…, one of the perceptions that we had to change is and you hear the naysayer, saying, oh, you're just a band aid station."

The leaders shared there is a lack of knowledge regarding the level of care that can be delivered at CAHs. One leader stated, "Well. There are lots of things that we can't do in critical access for small hospitals. But if you need immediate care, that's the best place to go." If someone is in a medical crisis, CAHs are prepared to stabilize the patient and transfer the patient to a larger care facility if deemed necessary. Sharing success stories of high profile individuals in the community can make a big difference in raising awareness. Leaders spoke about shared survivor stories and the positive reaction from the community. One leader stated that "volume certainly started to increase….but that doesn't happen with a marketing campaign. It happens with talking to your community and letting them know what you are doing."

To build trust and engage the community, leaders must "strike a balance" between being in the hospital and being in the community. Leaders can engage in local radio talk shows, share what services are offered at the facility, highlight patient testimonials, and serve on local community and organization boards and committees to gain exposure. "The community needs to see you as approachable." These types of efforts that focus on building community trust can result in community individuals seeking care and services at the CAH, and ultimately increase patient volumes.

Being Part of a System has Advantages and Disadvantages

The concept of having central office services that serve multiple hospitals such as but not limited to accounting, billing, quality, and purchasing services is a "great model." There are economies of scale for sharing system support services. However, leaders cautioned, "good models can have poor execution." Within systems, there can be competing priorities that prohibit

a focus on improving the CAH outcomes. Additionally, leaders highlighted poor relationships within the system can lead to tensions, lack of collaboration, and power struggles, which leads to poor outcomes for the CAH. Central offices can make disconnected decisions and mandates. For example, a leader shared, if a central office is located in one state, and the CAH is located in another, there can be differences in rules and regulations from state to state. To be successful, there needs to be a "partnership" with the central office leaders.

Furthermore, corporate overhead fees, which are assessed to the CAH hospital from the system, ultimately increases the CAH expenses. Leaders shared a few closure scenarios that related to belonging to a system. If overhead costs are unmanaged, a hospital that operates in a positive operating margin may be at risk of closure because the system is operating in a negative operating margin. Additionally, if a system is too weak to financially support the CAH, that can also contribute to the decision to divest of the CAH in order to improve the systems financial status.

Words of Advice

Closing a hospital is a difficult decision. A leader reflected, "It is painful to let people go." When asked to reflect on their lived experiences and provide words of advice to leaders who are currently serving in leadership positions at hospitals at risk of closure, the leaders provided some insight. There is "no cookie cutter approach." Take time to dive deep into the data and engage employees to determine the root of the problem. Ask questions such as "what value does it add to the organization? How much time does it add? If it's adding…and it doesn't have any value, and it's not dictated by regulatory, don't be afraid….to cross it off and get rid of it." Leaders discussed focusing quality efforts and initiatives on areas losing money and trying to

find ways to add value by either divesting of services or programs, or expanding services or programs through creativity and partnerships.

Another message shared was around the concept of building trust and relationships both internally and externally. Leaders stressed the need to seek to partner with larger, stable hospitals or systems versus smaller systems with limited fiscal resources. Reasons given included that larger systems have more capital resources and strong business models that can benefit a CAH. These types of external partnerships can provide opportunities for service growth. The leaders also reflected that internal relationships at the facility level as well as the system level have an impact on the success or failure of a facility. They advise other leaders to increase employee engagement and accountability to address the CAH fiscal challenges, decrease expenses, and increase volumes.

Summary of Qualitative Results

The qualitative interviews provided an opportunity for leaders to share their lived experiences, reflect on challenges, and share lessons learned that can guide current and future leaders of CAHs. Themes pertained to the ability to reflect on the CAH business model and adapt the service model to address fiscal challenges. Leaders focused on the need for collaboration with external partners to expand service growth and provide win-win opportunities. Furthermore, leaders also discussed the importance of the relationship with the community and the need to develop relationships with the community that foster trust and increase hospital usage rates. Most importantly, leaders believed Medicaid expansion can contribute to closing the revenue gap and save CAHs at risk of closure. A leader stated, “This is America; it is not acceptable for people to die especially for lack of health care.”

Discussion

This study focused on exploring the impact of Medicaid expansion and non-expansion specifically on complete CAH closures between 2010-2020. The current literature, which largely focuses on rural and CAHs, suggests that in addition to a state's decision to expand or not expand Medicaid, there are other contributing variables to hospital closures (Frakt, 2019; Holmes, 2015). As such, this study sought to explore county and facility-level variables in expansion and non-expansion states with CAH closures through statistical analysis as well as through speaking with leaders with lived experience and historical knowledge.

The study found one statistically significant variable: percent of population uninsured. The study results also demonstrated three variables with medium, large, and very large effect sizes to include: (a) percent of population 65 plus, (b) percent of population shift from 2010-2020, and (c) percent of population uninsured (which also had a statistically significant p-value). The percent of individuals living at or below the FPL was close to statistically significant and the test results demonstrated there were no counties with CAH closures in expansion states that had high rates of individuals living in poverty.

Major Findings

Impact of Expansion Versus Non-Expansion Status on CAH Closures

This study demonstrated that 80% of the complete CAH closures from 2010-2020 were in non-expansion versus expansion states. This result is consistent with other studies pertaining to higher closure rates of rural hospitals in non-expansion versus expansion states. Holmes (2015) stated the rates of closures are greater in non-expansion than expansion states. Lindrooth (2018) also concluded that non-expansion states had a larger number of rural hospital closures from 2008-2012 and 2015-2016. The research suggests that the rural hospital closures are related to lack of operating margins, which are influenced by the state's decision to not expand coverage

causing high rates of uninsured and uncompensated care in non-expansion states (Sharfstein, 2016).

In the qualitative portion of this study, leaders shared that financial vulnerability and lack of capital funds were challenges the CAHs faced prior to closure and were contributors to the closures. Leaders highlighted the critical need to increase cash flow and improve operating margins so that CAHs could grow services and market share. Speaking from the direct experience of closing a CAH in a non-expansion state, all of the leaders reflected that Medicaid expansion had the potential to save their facility from closure by decreasing uncompensated care and increasing revenue due to having a lower percentage of uninsured patients. Leaders concurred that a state's decision to implement Medicaid expansion can improve financial margins and provide the financial capability to expand services, purchase new equipment, and maintain older facilities.

This study supports and adds to the current literature in seeking to understand the impact of states opting not to expand Medicaid on hospital closures. This remains a critical issues as two additional CAHs closed in 2021. According to the American Hospital Association (AHA) (2022) report entitled "*Rural Hospital Closures Threaten Access: Solutions to Preserve Care in Local Communities*," there were 136 rural hospital closures of which 19 happened in 2020. Furthermore, this same study concluded that 74% of the closures were in non-Medicaid expansion states (AHA, 2022). The National Rural Health Association (NRHA) (n.d.) stated that 40% of rural hospitals are operating with negative margins. Currently rural hospitals make up 35% of the hospitals in the United States of which nearly 50% of them have 25 or fewer beds (AHA, 2022). In a 2023 news story published in the Richmond Times Dispatch, the article stated out of 28 rural hospitals in Virginia, 13 were operating in the red (Powell, 2023).

According to data released by iVantage Analytics, there are 673 rural hospitals at risk of closing with 210 being at "extreme risk" (NRHA, 2016). If these hospitals were to close, it is estimated that 11.7 million people would lose access to care. It is imperative that hospital leaders and policymakers understand what impacts and contributes to the vulnerability of rural and critical access hospitals so that solutions can be implemented to prevent additional closures.

Percent Uninsured Influence on CAH Closures

There was one statistically significant county-level variable in this study: percent of the population that are uninsured. The percent of the population uninsured independent t-test resulted in $p = 0.030$ and a $d = 1.15$. Both of the statistical tests conclude that there is a statistically significant relationship and a very strong correlation between closed CAHs located in counties with a high percent of uninsured population in non-expansion versus expansion states. This indicates that CAHs may be more likely to close in non-expansion states that have high rates of uninsured individuals than in expansion states. Lindrooth et al. (2018) found rates of uninsured over 10% may influence closures. Conversely, this is consistent with other studies that demonstrate that Medicaid expansion has a positive impact on rates of uninsured, which contributes to decreases in uncompensated care and improved fiscal stability (Corcoran & Waddell, 2019; Lindrooth et al., 2018; Young et al., 2019).

Medium and Large Effect Sizes in Three Out of Six County-Level Variables

Although five out of the six county-level variables (population shift from 2010-2020, population age 65 plus, population of non-White, population of Hispanic/Latino, and population living at or below FPL) did not reach statistical significance, the study results reflected one medium, one large, and one very large effect size for three of six county-level variables. This indicates there are practical findings in the data results. This study found a medium effect size

for percent of population 65 plus indicating a potential for a correlation if there was a larger sample size. This study also found a large effect size between CAH closures in counties with declines in percent population change (d = 0.880). Furthermore, there was a very large effect size related to percent population uninsured (d = 1.15), which strengthens the statistical significance of the relationship between closed CAHs in counties with high rates of uninsured in non-expansion states. This study concludes that these county-level variables in non-expansion states may have potential correlations with CAH closures but were unable to meet statistical significance.

These findings are parallel to and are supported by other hospital closure studies. For instance, Frakt (2019) found shrinking populations may contribute to hospital closures due to lower occupancy rates. Corcoran and Waddell (2019) and Thomas et al. (2016) cited declining populations as a challenge for rural hospital viability. In this study, the average AADC for CAHs in non-expansion and expansion states 1 year prior to closure was 2.10 patients, which demonstrates low utilization rates in these facilities. Lower utilization rates have a direct impact on operating margins as well as the hospital's ability to participate in performance and quality improvement activities to include innovative payment models that can provide increased revenue (AHA, 2022).

Former leaders of the closed CAHs shared that utilization rates can also be impacted by the hospital's reputation in the community and whether the community seeks services at the CAH or a larger facility further away. When asked about the relationship of the CAH with the community, leaders explained that the community perceived the CAH as a "band-aid station," meaning there was a perception that the facility lacked the ability to provide quality care for serious illnesses. Leaders stressed there is a need to ensure that communities understand services

offered at CAHs. These facilities have the capability of providing quality care for urgent/emergent needs and safely transporting patients if higher level care is needed. Leaders reflected the need to improve awareness of services and ensure that the hospital leader/s have visibility and develop relationships in the community that can have a positive impact on the facility image and ultimately increase utilization rates.

Other Findings

Percent of Individuals Living at FPL

The study results highlighted individuals living at or below the FPL almost reached statistical significance. This trend is consistent with other research studies on rural and CAH closures. AHA (2022) stated rural hospitals treat poorer patients and there are higher rates of uninsured in rural areas. In this study, the average FPL in counties with CAH closures in non-expansion states was 19.4% of individuals living at FPL versus expansion states with 13.96%. The data actually indicate that counties with CAH closures in expansion states did not have any high rates of poverty.

For additional reflection, high rates of uninsured are associated with higher poverty levels. This was also demonstrated in this study with CAHs located in non-expansion states averaging a county uninsured rate of 15.68 versus expansion states averaging 11.56% for county uninsured rates that had CAH closures. This is important because poverty levels determine eligibility for Medicaid expansion and expansion is associated with increased health care coverage. Lindrooth et al. (2018) found that expanding coverage eligibility to 100% of the FPL lessened the chance of a hospital closing.

Minority and Hispanic Populations

Although this study did not find percent of non-White and percent Hispanic/Latino statistically significant as a variable for CAH closures, other studies have found a correlation. Thomas et al. (2016) found a correlation between closed hospitals located in counties with higher percentage of Black and Hispanic residents. This data introduces the argument that closed CAHs perpetuate minority health disparities due to lack of access to care with disproportionate share of closures in counties with high percent of minority populations (Thomas et al., 2016). Closures decrease access to care for preventive as well as urgent/emergent health care needs for the most vulnerable populations. One of the leaders interviewed shared that after the CAH closure, there were two preventable deaths that he was aware of that occurred due to the amount of time it took to get to the closest hospital.

Higher Closures in Southern States

Literature demonstrates that there are a higher number of closures in Southern states (Corcoran & Waddell, 2019; Holmes, 2015; Holmes et al., 2017; Kaufman et al., 2016). Consistently, this study also found out of 25 closures, 22 were in Southern states versus three in the Northern or Midwest states. Consistent with the statistical data from this study, these states have high rates of uninsured with 11 of the 13 Southern states with CAH closures exceeding the U.S. average of 9.8% (reference Table 11). Additionally, these states also had high rates of individuals living at or below the FPL with 11 of the 13 Southern states exceeding the U.S. average of 11.6% (reference Table 11). These two variables were highlighted as statistically correlating with CAH closures in this study. This data contributes to why there are more closures in Southern states.

Table 11

Southern States With CAH Closures Demographics

Percent Poverty and Uninsured in Southern States With CAH Closures

State	Percent Population Living at or below FPL	Percent of Uninsured
Alabama	16.1	11.8
Arizona	12.8	12.9
Arkansas	16.3	11.0
Florida	13.1	15.1
Georgia	14.0	14.7
Kentucky	16.5	6.7
Mississippi	19.4	14.2
Missouri	12.7	11.3
North Carolina	13.4	12.4
South Carolina	14.6	12.2
Tennessee	13.6	11.9
Texas	14.2	20.4
Virginia	10.2	8.0
United States	11.6	9.8

(U.S. Census Bureau Quick Facts, 2023)

Homogeneity of Services Limits Ability to Adapt to Change

In the interview process, former leaders shared the scope of services offered as part of their CAH. All three facilities provided the same inpatient and outpatient services. This aligns with the theory construct of homogeneity of services. In the neo-institutional theory, Dimaggio and Powell (1983) argued that organizations that compete for customers and resources, such as hospitals, limit their ability to adapt to change because the institutions model after each other creating homogeneity of services. These CAHs did not differentiate themselves with specialty services. In fact, one leader stressed the inability of the organization to grow services and market share due to the business model.

Furthermore, in consistency with the theory, all of the leaders reported the lack of ability to adapt to a changing model. The neo-institutional model also stresses one form of change is

coercive change, which is a top-down methodology to change (Dimaggio & Powell, 1983; Macfarlane et al., 2013). This was reflected in the qualitative data with leaders sharing that system leadership made decisions that impacted hospitals without regard or input from the hospital leaders and local government made decisions regarding budget cuts at the county-level that ultimately impacted the hospital's destiny for closure. The qualitative results reinforce that institutional norms and external forces have an impact on the ability for CAHs to adapt to change and grow services.

Need for Creative Collaboration to Grow Services

In the key informant interviews, leaders shared the need to explore collaborations to grow services, increase revenue, and provide financial stability for the CAH. Advice included partnering with larger institutions to offer specialty services, engaging front line employees and managers in creative solutions, developing trusting relationships within the community and the system, and using data to steer change efforts. Although these CAHs closed, there were external and system-level factors that prevented the leaders from being able to fully integrate these strategies. However, these recommendations by the leaders were extremely consistent with a qualitative study conducted by Thomas et al. (2020) that interviewed leaders of successful CAHs and concluded that engaging workforce, integrating community, and using data to make decisions were best practices for successful hospitals. The one best practice Thomas et al. (2020) highlighted that was not mentioned by the leaders interviewed for this study was the ability to take risks. In fact, leaders actually expressed that they were unable to take risks and pursue service growth due to lack of cash flow and fiscal resources.

Impact of Closures on Percent Population Change 2020-2021

Although percent population change from 2010-2020 was not statistically significant, as mentioned, there was a large effect size. To further investigate population shift, the researcher performed an additional statistical test to determine if percent population change from April 2020-July 2021 correlated with closures. This test resulted in a p-value = 0.049, indicating statistical significance and d = 1.037 indicating a very large correlation between closed CAHs in counties with a declining population. This data reflects the impact of CAH closures on population out-migration. The data indicate that individuals are moving away from counties with CAH closures in non-expansion states. These individuals may be leaving these counties to seek access to care and/or health care coverage. The data demonstrates that CAH closures can have an impact on out-migration, which in turn can have a determinantal impact on the economic stability of communities.

Potential Policy Implications

The neo-institutional theory regulative pillar, which refers to laws and regulations, suggests that policy change initiatives can have positive or negative influences on organizations' ability to adapt to change (Dimaggio & Powell, 1983; Macfarlane et al., 2013). Data clearly indicate critical access and rural hospitals are at risk of closures and further demonstrates that the hospitals located in non-expansion states are closing at higher rates than hospitals in expansion states. With North Carolina passing legislation in March 2023 to expand Medicaid, that leaves 10 states that have not opted to expand Medicaid as of April 2023. This study contributes to the argument that Medicaid expansion can have an impact on CAH closure rates.

CAH leaders need the opportunity to be innovative to differentiate themselves and stabilize the fiscal status of the hospital. In 2020, the Centers for Medicare and Medicaid shared

a value-based payment model entitled Community Health Access and Rural Transformation (CHART) that can help rural hospitals (AHA, 2022). This model provides rural hospitals with an opportunity to have a flexible care model that provides upfront payments (AHA, 2022). Additionally, the Rural Emergency Hospital designation, which is a new designation for critical access and small rural hospitals at risk of closing was established in 2020 and holds promise for ensuring access to care in rural areas (AHA, 2022). This model provides an option for hospitals to continue outpatient and emergency care services without having to provide inpatient care (AHA, 2022). The NRHA's policy platform for 2023 urges law makers to consider two Acts, the Save America's Rural Hospitals Act and the Rural Hospital Closure Relief Act, that both aim to reduce rural hospital closures (NRHA, n.d.). This study contributes to the literature to help inform leaders and policymakers regarding contributing factors to CAH closures and to provide an early opportunity to engage in a change model that can promote CAH stability.

Implications for Future Research and Practice

While researching media stories and reading about the CAH closures to find the names of the former leaders, it became apparent that there are stories behind the closure stories. For example, there was the discovery that five of the 25 CAH closures were due to financial fraudulent behaviors of the leaders; behaviors that resulted in the closure of the CAHs and the indictment of the hospital leaders. Areas for further research may include how investors are taking advantage of vulnerable communities, themes in the media stories regarding the closures, fraudulent behaviors, mismanagement, and lack of ability to adapt to changing models.

Qualitative interviews provided an opportunity to explore the lived experience behind the three closures. Each interview highlighted recurring themes as well as some unique challenges. The interviews brought the human experience to the data. With a limited number of leaders who

agreed to interview, future research may include a deeper dive into the qualitative stories behind the closures. It may also be beneficial to expand the literature by interviewing leaders of at-risk hospitals and how the leaders are currently adapting and expanding services compared to successful CAHs.

Future studies may expand on the number of community and facility-level variables and/or include further exploring the types of facilities and potential impact on closures such as were the closed CAHs stand-alone, county owned, or part of a system and whether the closed facility was for-profit or not-for-profit status. Additionally, literature could benefit from additional studies that include a more extensive look at services offered. Another area for further investigation includes broadening the sample size by comparing variables in open versus closed CAHs and/or expanding the sample size to include the partial CAH closures in addition to the full closures.

Delimitations and Limitations

One study delimitation is the small sample size due to the focus on complete CAH closures only versus including partial CAH closures. Additionally, the study focused on six specific community-level variables versus expanding on other county-level variables included in the Quick Facts data such as housing, family and living arrangements, education level, and economic indicators such as total employment.

A data set limitation is the U.S. Census Quick Fact data is reflective of data from July 1, 2021 versus population data reflective of the year of the hospital closure. The Census Bureau also notes a data caution regarding the percent of the population without insurance as data sources vary from state to state. Furthermore, although mixed methods adds to the strength of the

findings, a limitation was that there was a small response to participate in the interviews (three) versus feedback from all 25 closed CAHs.

Conclusion

CAHs are crucial health care safety nets that serve the most vulnerable of populations. These nationwide study findings are consistent with similar studies of rural hospital closures. External forces such as demographics and external funding; institutional forces such as leadership and resources; and coercive forces such as policies and laws, have an impact on CAH closures and aligns with the constructs of the neo-institutional theory (Macfarlane et al., 2013). This study and the literature highlight that the decision of states to pass Medicaid expansion legislation correlates with higher rates of CAH closures in non-expansion states versus expansion states.

Additionally, the study found external and institutional forces that correlate with CAH closures. Results indicate that percent uninsured was statistically significant and had a strong correlation for CAH closures in non-expansion versus expansion states. Furthermore, potential correlations were found for county-level variables to include population shift and population age 65 plus. Also, percent living at the FPL was close to statistically significant. Qualitative data themes reinforced the secondary data findings. Former CAH leaders shared institutional forces that influenced the closures to include fiscal challenges, internal relationships, trust of the community, lack of resources to grow services, and the inability to engage in innovation. Literature demonstrates policies such as Medicaid expansion have a correlation with financial stability of hospitals.

There is no one solution nor one cause for CAH closures. However, literature and this study support that policies, county-level variables, and organizational practices have an influence on the stability of a CAH. Leaders and policymakers have the opportunity to recognize the characteristics of closed hospitals, learn from experiences, and engage in solutions to prevent

further closures. In the words of a former leader, “This is America; it is not acceptable for people to die especially for lack of access to health care.”

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Appendices

Appendix A: Codebook

Question	Variable Name	Values	Variable Type and Data Type
Critical Access Hospital	CAHC	Unique identifier for each 25 CAH closures	DV Categorical (nominal)
Medicaid Expansion Status	MEDICAID	1. Expansion 2. Non-expansion	IV Categorical (nominal, dichotomous)
Annual Average Daily Census (year of closure)	AADC	1 – 25	DV Continuous
Annual Average Daily Census (year of closure) Recode	AADC_RC	1. 1 – 9 2. 10 – 25	DV Categorical (ordinal)
Percent Population Change	PRCTPOPCHANGE	-N – N	DV Continuous
Percent Population Change Recode	PRCTPOPCHANGE_RC	1. Positive 2. Negative	DV Categorical (nominal, dichotomous)
Percent Population Change April 2020-July 2021	POP	-N – N	DV Continuous
Percent Population Change April 2020-July 2021	POP_RC	1. Positive 2. Negative	DV Categorical (nominal, dichotomous)
Percent of population age 65+	ELDERAGE	0 – N	DV Continuous
Percent of population age 65+ Recode	ELDERAGE_RC	1. less than or equal to 16.5 % (low) 2. greater than 16.5% (high)	DV Categorical (nominal, dichotomous)
Percent of population uninsured under age 65	UNINS	0 – N	DV Continuous
Percent of population	UNINS_RC	1. less than or equal to 9,5% (low)	DV Categorical

uninsured under age 65		2. greater than 9.5% (high)	(nominal, dichotomous)
Percent of population by race	RACE	1. White 2. Non-White	DV Categorical (nominal, dichotomous)
Percent of population by ethnicity	ETHN	1. Hispanic/Latino 2. Non-Hispanic/Latino	DV Categorical (nominal, dichotomous)
Percent of population living in poverty	FPL	0 – N	DV Continuous
Percent of population living in poverty	FPL_RC	1. below 11.4 % (low) 2. greater than or equal to 11.4% (high)	DV Categorical (nominal, dichotomous)

Appendix B: Excel Data Set Example

Hospital (CAHC)	Address	City	State	Zip	CAH	Closure Year	Medicaid Expansion Status (MEDICAID)	County	Annual Ave. Daily Census (AADC)	AADC_RC	Population Percent Change (POP)	Declining Population (POP_RC)	% Pop 65 and over (AGE)	% Pop 65 and over (AGE_RC)	Percent Pop Uninsured (UNINS)	Percent Pop Uninsured (UNINS_RC)	Percent Race (RACE)	Percent Ethnicity (ETHN)	Percent of living in poverty (FPL)	Percent pop living above/below US ave FPL (FPL_RC)
Southwest Georgia Regional Medi	361 Randolph St	Cuthbert	GA	39840	CAH	2020	2													
De Queen Medical Center	1306 WEST COLLIN RAYE DRI\	De Queen	AR	71832	CAH	2019	1													

Blue – UNC Cecil G. Sheps Center for Health Service Research

Orange – UNC Cecil G. Sheps Center for Health Services Research or state Office of Rural Health

Green – U.S. Census Bureau Quick Facts

Appendix C: Statistical Test Data

Normative Test Results

Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
AADC	25	35.7%	45	64.3%	70	100.0%
POP	25	35.7%	45	64.3%	70	100.0%
ELDERAGE	25	35.7%	45	64.3%	70	100.0%
UNINS	25	35.7%	45	64.3%	70	100.0%
NONWTRACE	25	35.7%	45	64.3%	70	100.0%
HISP	25	35.7%	45	64.3%	70	100.0%
FPL	25	35.7%	45	64.3%	70	100.0%
PRCTPOPCHANGE	25	35.7%	45	64.3%	70	100.0%

Descriptives

			Statistic	Std. Error
AADC	Mean		2.104000000000001	.357983239831141
	95% Confidence Interval for Mean	Lower Bound	1.365158906225619	
		Upper Bound	2.842841093774383	
	5% Trimmed Mean		1.962333333333334	
	Median		1.550000000000000	
	Variance		3.204	
	Std. Deviation		1.789916199155704	
	Minimum		.010000000000000	
	Maximum		6.840000000000000	

	Range		6.830000000 00000	
	Interquartile Range		2.325000000 00000	
	Skewness		1.236	.464
	Kurtosis		1.321	.902
POP	Mean		.332	.3516
	95% Confidence Interval for Mean	Lower Bound	-.394	
		Upper Bound	1.058	
	5% Trimmed Mean		.234	
	Median		.000	
	Variance		3.091	
	Std. Deviation		1.7582	
	Minimum		-3.0	
	Maximum		5.7	
	Range		8.7	
	Interquartile Range		1.6	
	Skewness		1.115	.464
	Kurtosis		2.860	.902
ELDERAGE	Mean		19.996	.7281
	95% Confidence Interval for Mean	Lower Bound	18.493	
		Upper Bound	21.499	
	5% Trimmed Mean		19.934	
	Median		20.700	
	Variance		13.252	
	Std. Deviation		3.6403	
	Minimum		14.1	
	Maximum		27.1	
	Range		13.0	
	Interquartile Range		6.8	
	Skewness		.116	.464
	Kurtosis		-.940	.902
UNINS	Mean		14.860	.7758

	95% Confidence Interval for Mean	Lower Bound	13.259	
		Upper Bound	16.461	
	5% Trimmed Mean		14.941	
	Median		15.100	
	Variance		15.048	
	Std. Deviation		3.8791	
	Minimum		6.8	
	Maximum		21.2	
	Range		14.4	
	Interquartile Range		5.6	
	Skewness		-.188	.464
	Kurtosis		-.488	.902
NONWTRACE	Mean		24.608	4.0682
	95% Confidence Interval for Mean	Lower Bound	16.212	
		Upper Bound	33.004	
	5% Trimmed Mean		23.051	
	Median		15.600	
	Variance		413.765	
	Std. Deviation		20.3412	
	Minimum		2.2	
	Maximum		77.8	
	Range		75.6	
	Interquartile Range		25.0	
	Skewness		1.220	.464
	Kurtosis		.725	.902
HISP	Mean		11.120	2.3678
	95% Confidence Interval for Mean	Lower Bound	6.233	
		Upper Bound	16.007	
	5% Trimmed Mean		10.267	
	Median		5.600	
	Variance		140.165	
	Std. Deviation		11.8391	

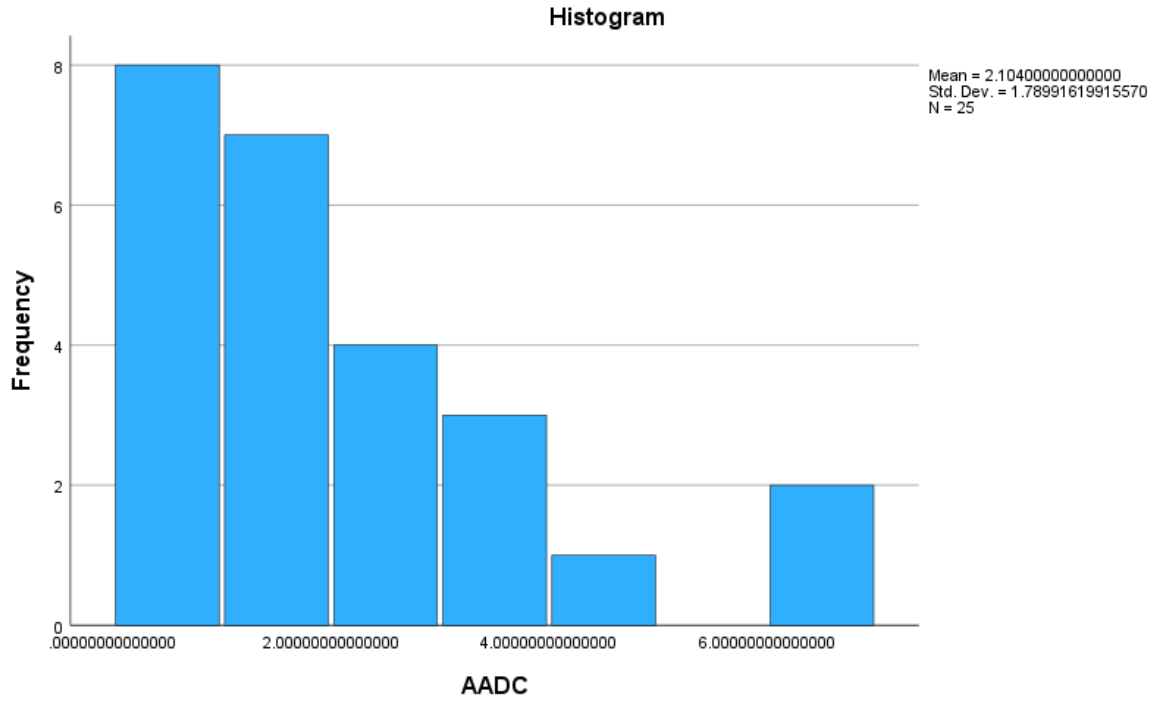
	Minimum		1.8	
	Maximum		35.9	
	Range		34.1	
	Interquartile Range		12.9	
	Skewness		1.318	.464
	Kurtosis		.144	.902
FPL	Mean		18.312	1.3921
	95% Confidence Interval for Mean	Lower Bound	15.439	
		Upper Bound	21.185	
	5% Trimmed Mean		17.800	
	Median		16.800	
	Variance		48.447	
	Std. Deviation		6.9604	
	Minimum		10.6	
	Maximum		35.6	
	Range		25.0	
	Interquartile Range		6.4	
	Skewness		1.326	.464
	Kurtosis		.921	.902
PRCTPOPCHANGE	Mean		-3.3588	1.63611
	95% Confidence Interval for Mean	Lower Bound	-6.7356	
		Upper Bound	.0180	
	5% Trimmed Mean		-3.5041	
	Median		-4.5900	
	Variance		66.921	
	Std. Deviation		8.18053	
	Minimum		-18.50	
	Maximum		14.86	
	Range		33.36	
	Interquartile Range		8.86	
	Skewness		.235	.464
	Kurtosis		.298	.902

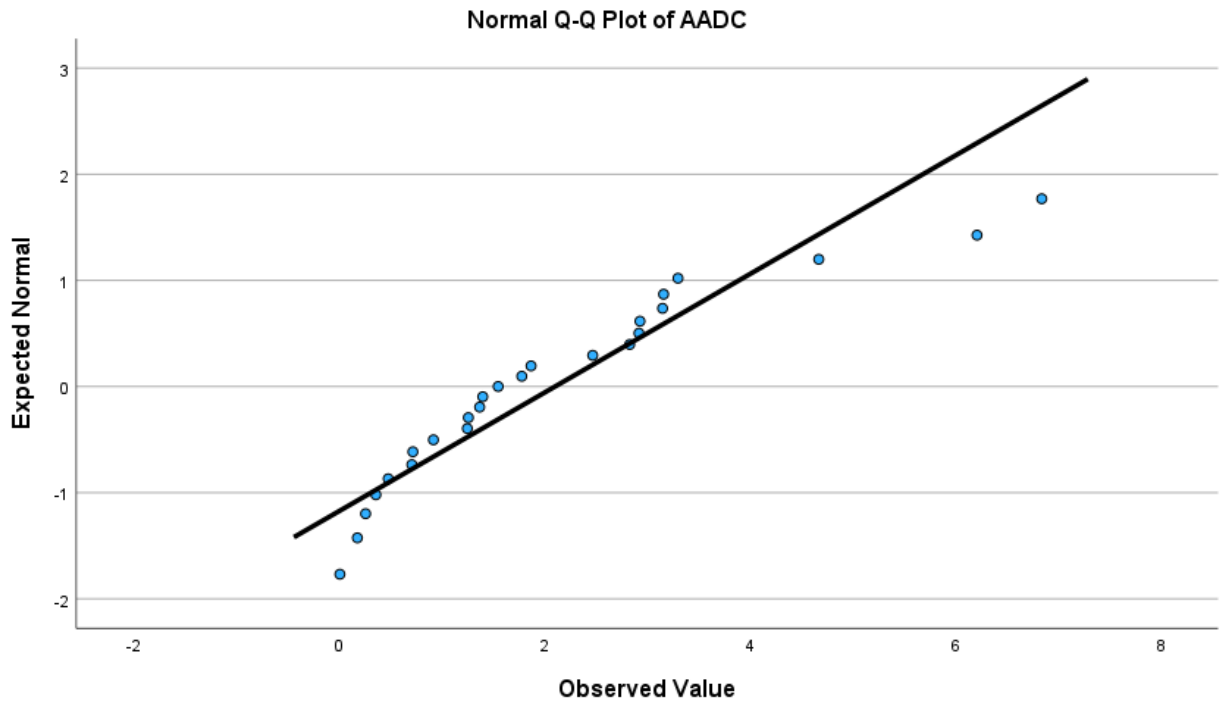
Tests of Normality

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
AADC	.152	25	.140	.883	25	.008
POP	.182	25	.032	.921	25	.054
ELDERAGE	.131	25	.200*	.956	25	.339
UNINS	.085	25	.200*	.976	25	.793
NONWTRACE	.197	25	.014	.862	25	.003
HISP	.307	25	<.001	.723	25	<.001
FPL	.232	25	.001	.837	25	<.001
PRCTPOPCHANGE	.110	25	.200*	.971	25	.669

*. This is a lower bound of the true significance.

a. Lilliefors Significance Correction

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Expected Normal
Observed Value
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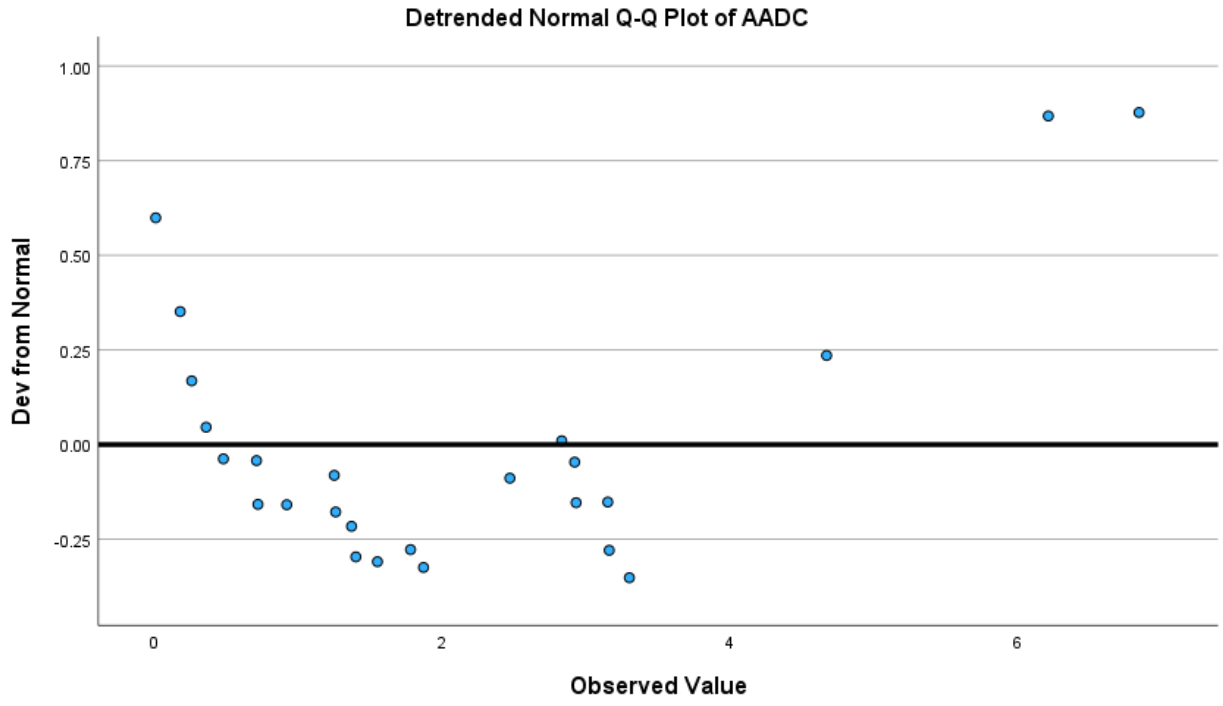
-1
-2
-2
0
2
4
6
8


Detrended Normal Q-Q Plot of AADC
Dev from Normal
Observed Value
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0.50
0.25
0.00
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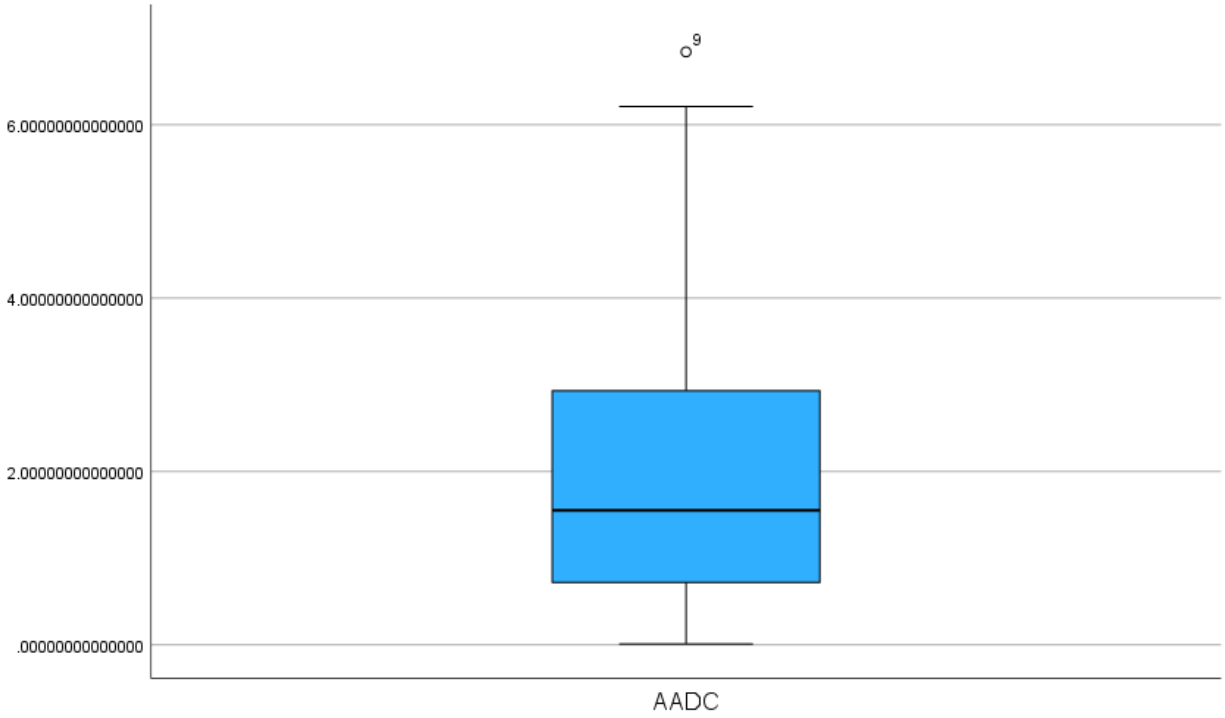
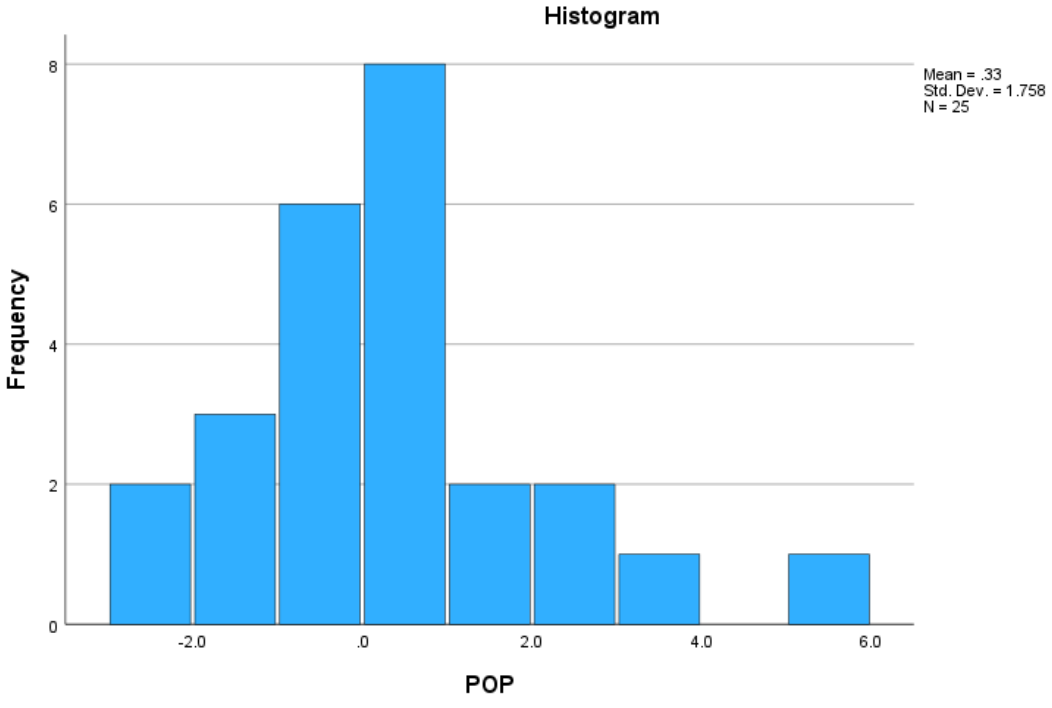
0
2
4
6


9
6.00000000000000
4.00000000000000
2.00000000000000
.00000000000000
AADC


Histogram
Mean = .33
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Frequency
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6
4
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0
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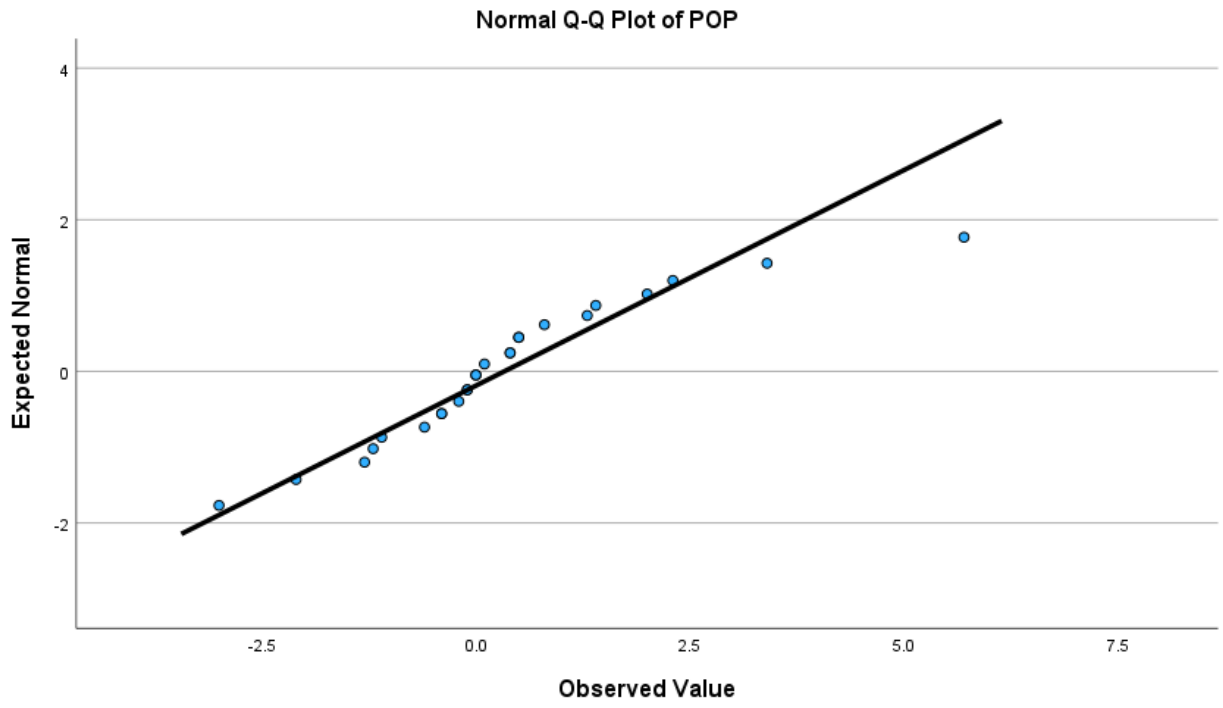
.0
2.0
4.0
6.0
POP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Expected Normal
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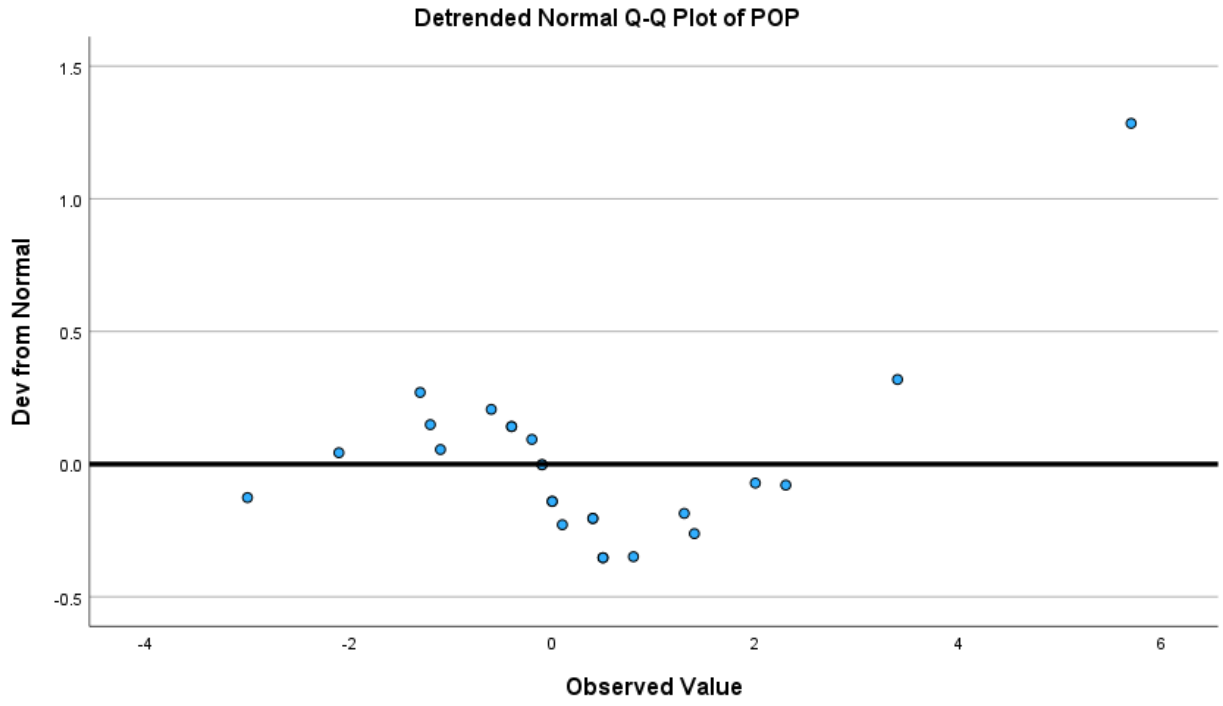
5.0
7.5
Observed Value


Detrended Normal Q-Q Plot of POP
Dev from Normal
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0.0
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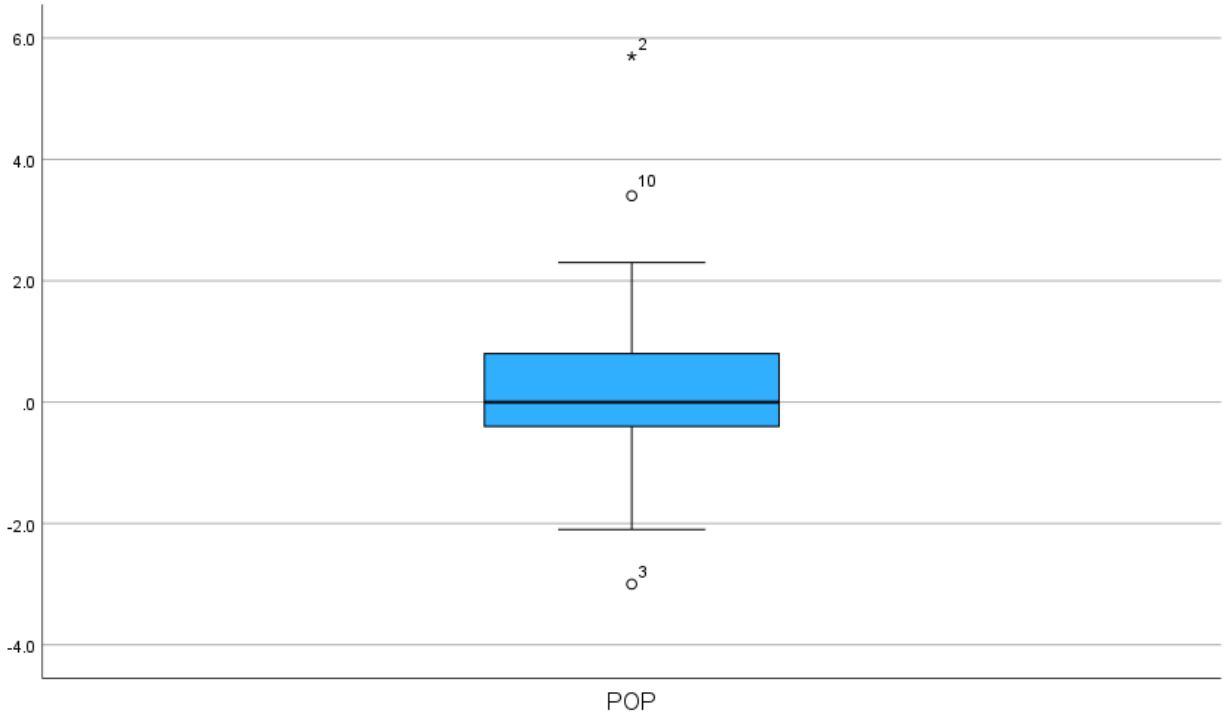
-4
-2
0
2
4
6
Observed Value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4.0
2.0
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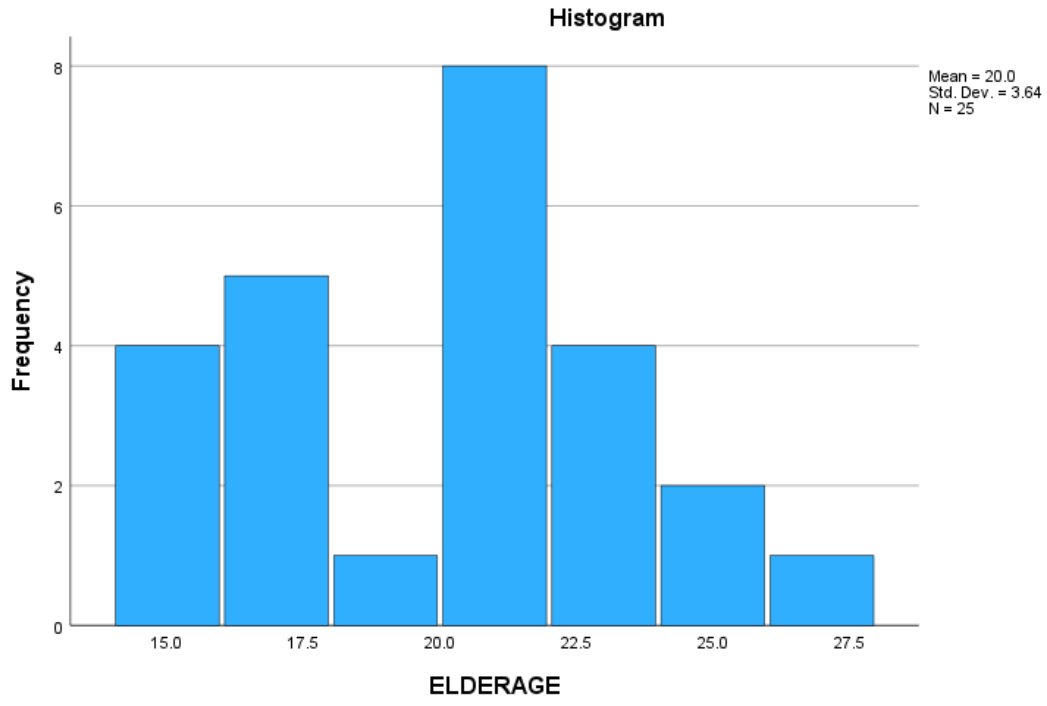
-4.0
2
10
3
POP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6
4
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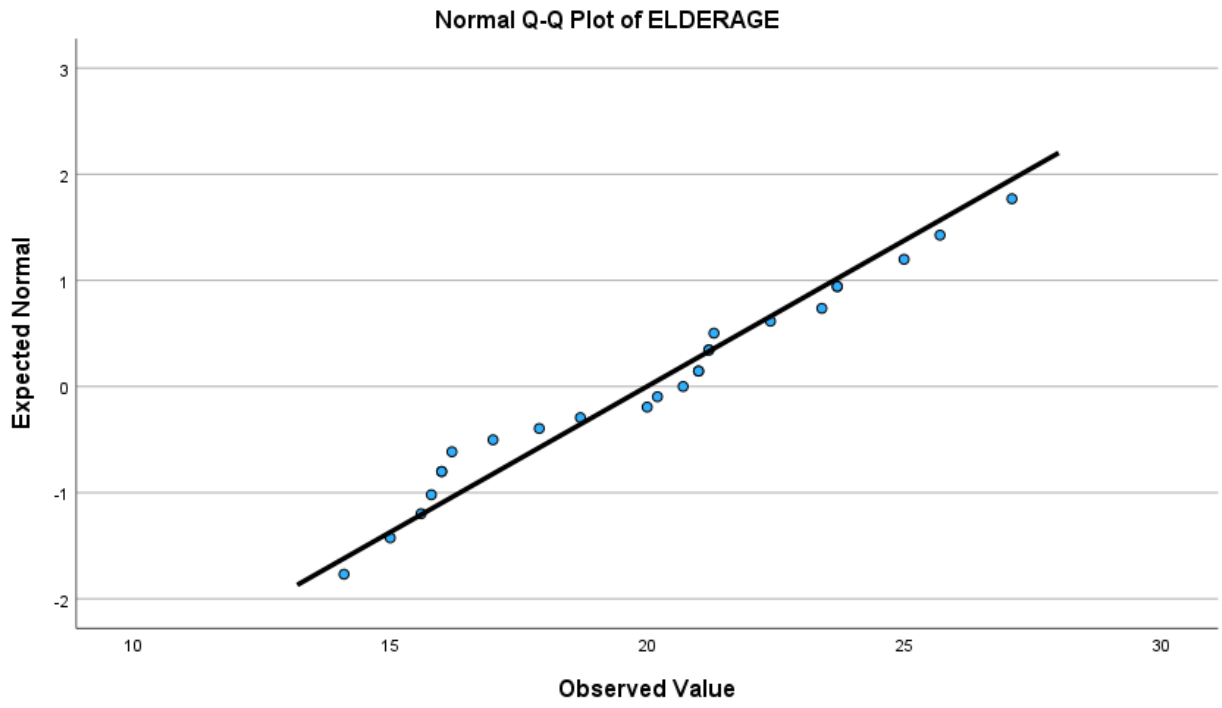
0
15.0
17.5
20.0
22.5
25.0
27.5
ELDERAGE


Normal Q-Q Plot of ELDERAGE
Expected Normal
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-2
10
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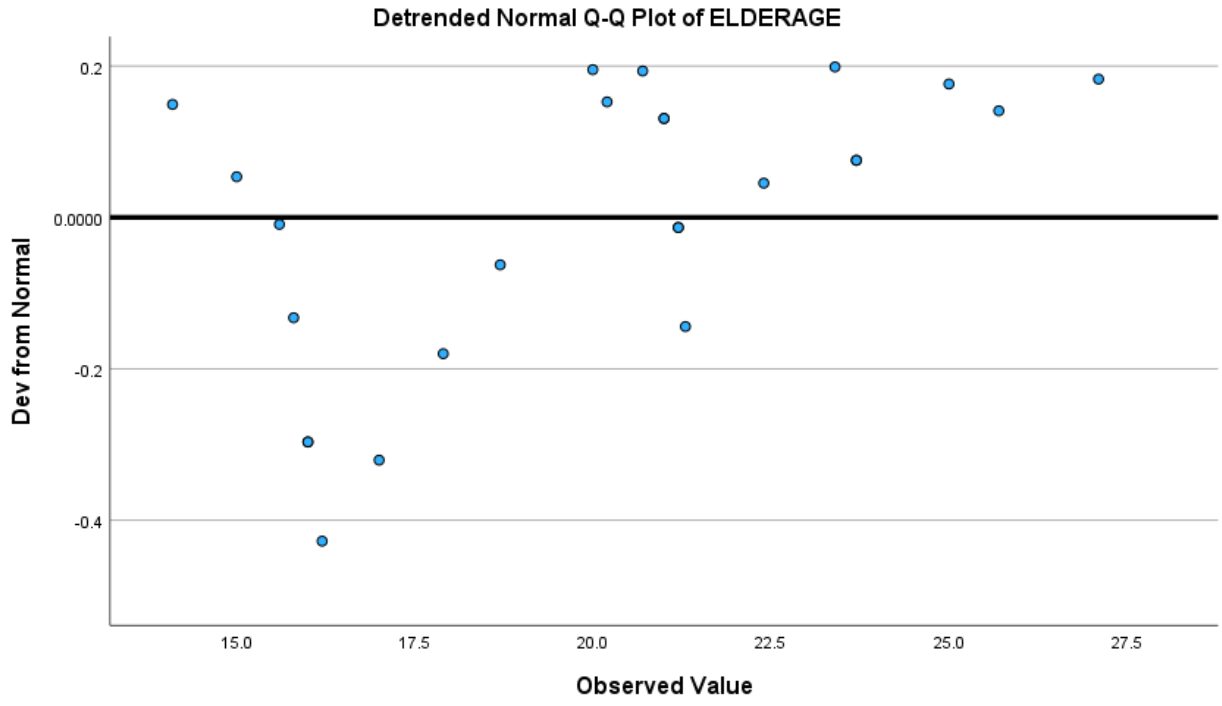
20
25
30
Observed Value


Detrended Normal Q-Q Plot of ELDERAGE
Dev from Normal
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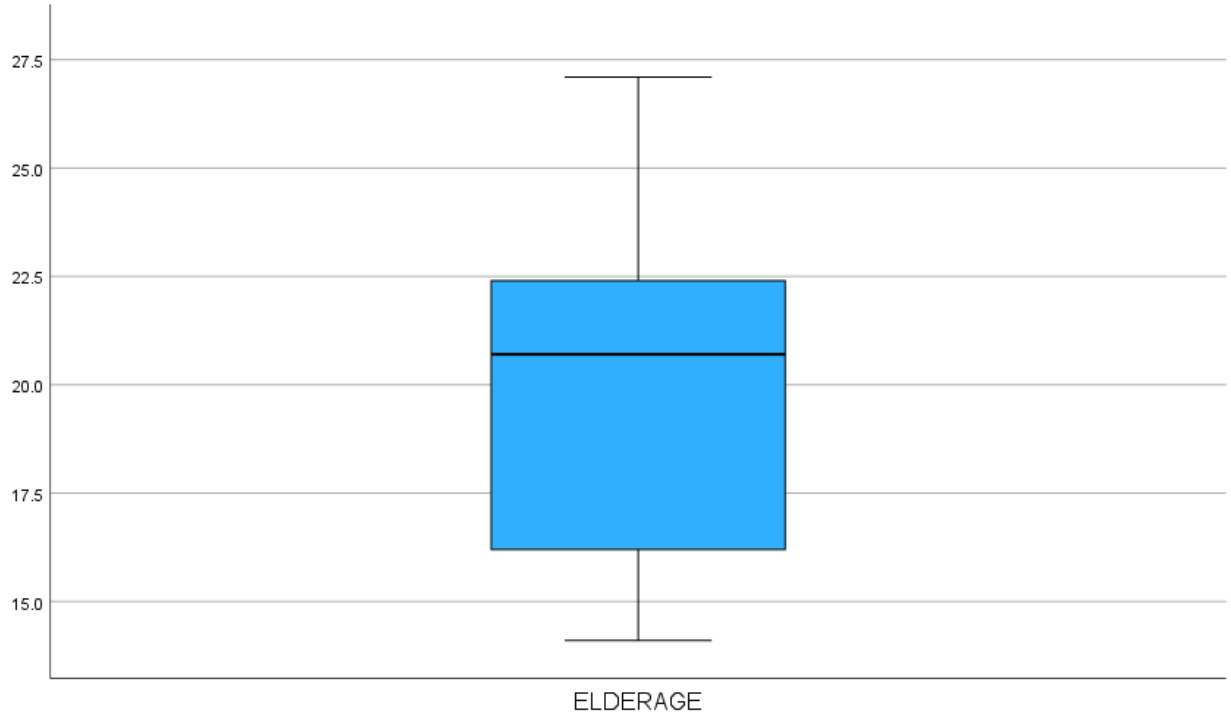
17.5
20.0
22.5
25.0
27.5
Observed Value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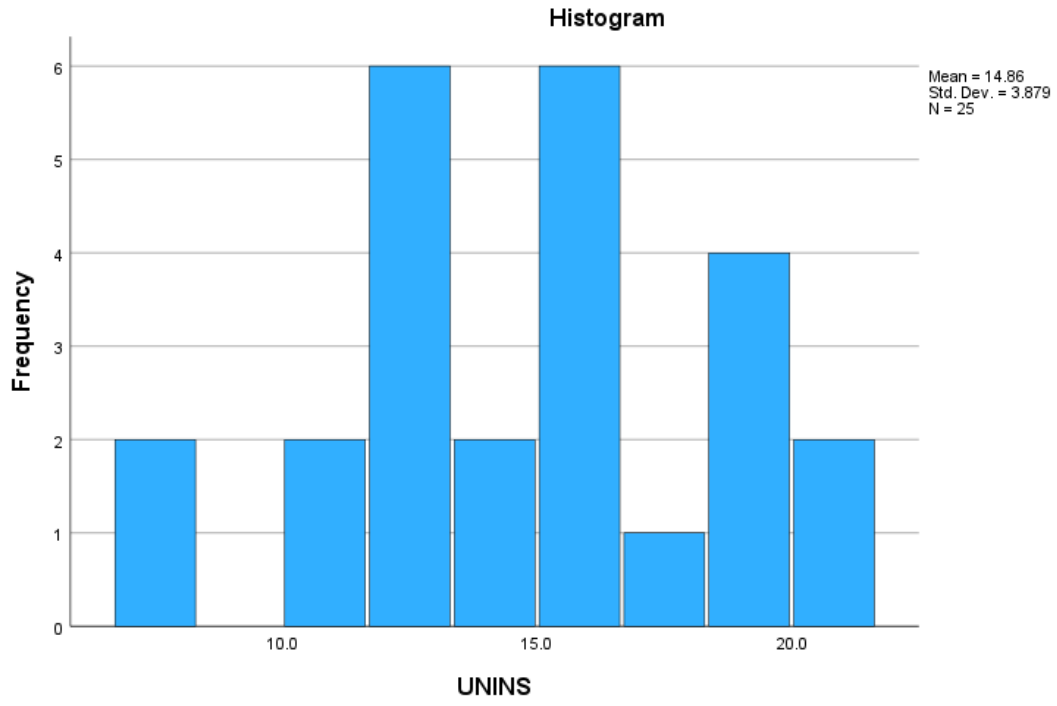
22.5
20.0
17.5
15.0
ELDERAGE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Mean = 14.86
Std. Dev. = 3.879
N = 25
Frequency
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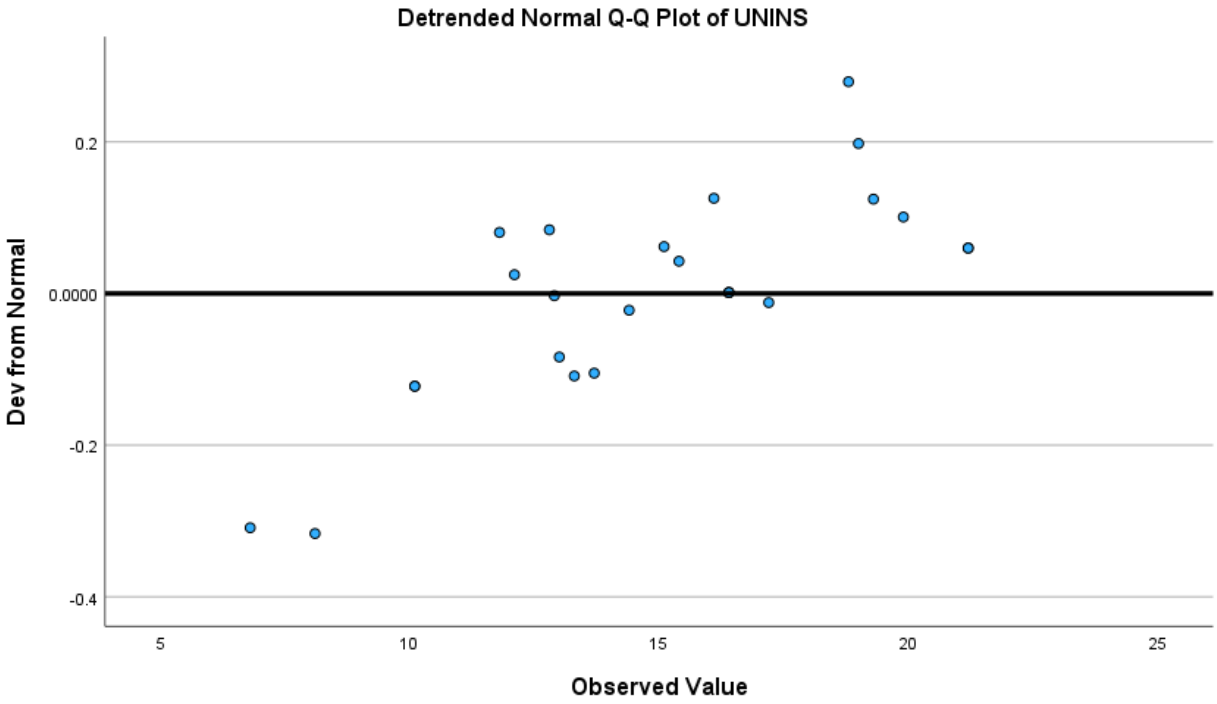
5
4
3
2
1
0
10.0
15.0
20.0
UNINS


Detrended Normal Q-Q Plot of UNINS
Dev from Normal
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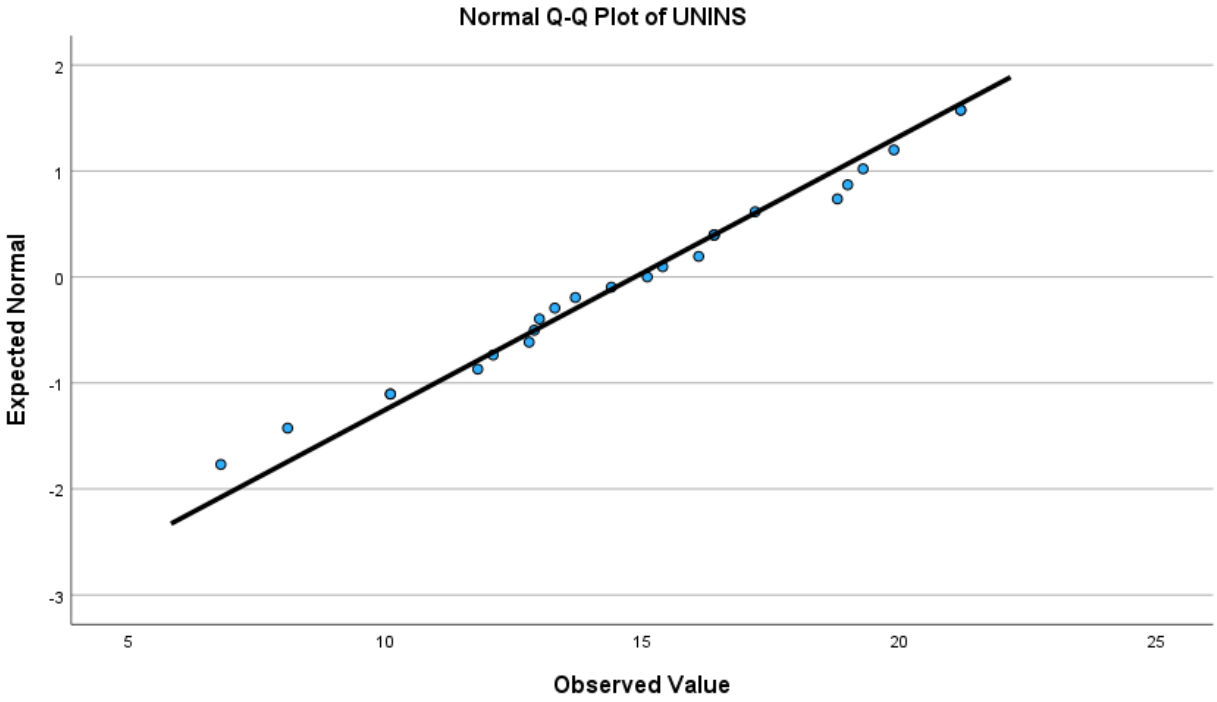
0.0000
-0.2
-0.4
5
10
15
20
25
Observed Value


Normal Q-Q Plot of UNINS
Expected Normal
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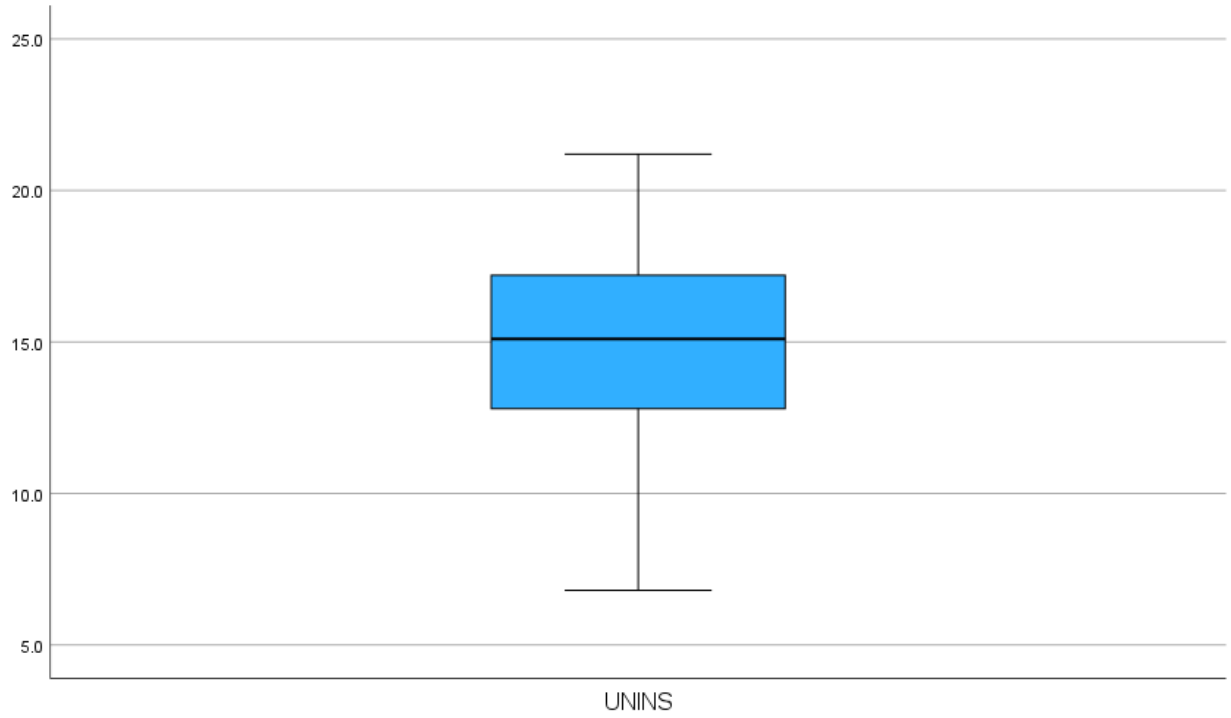
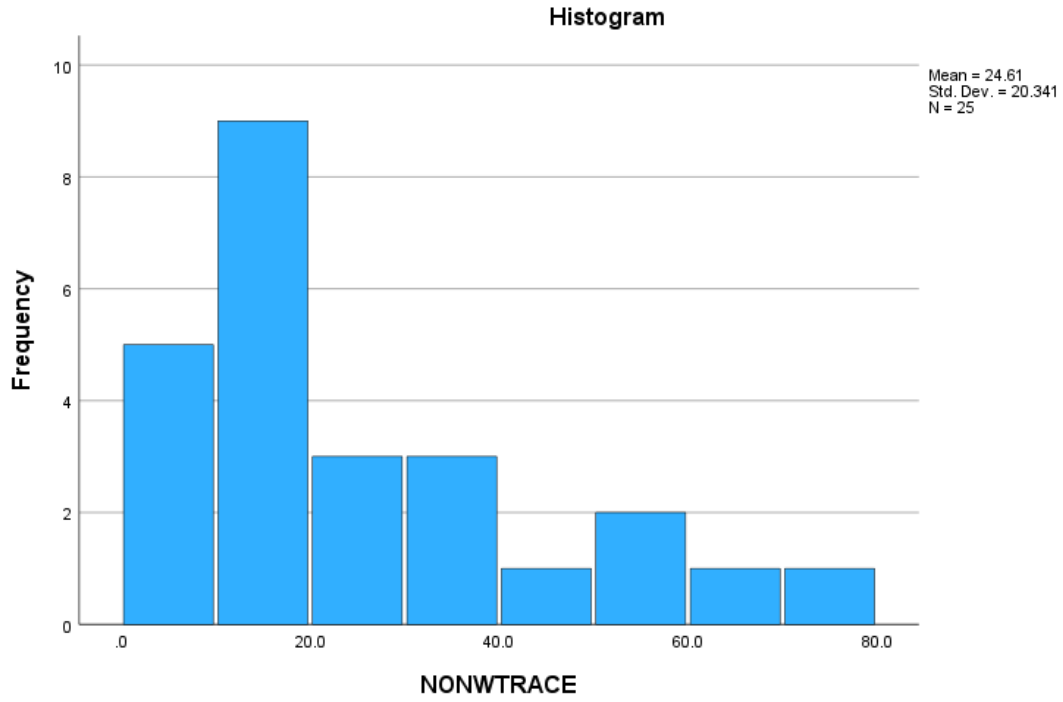
1
0
-1
-2
-3
5
10
15
20
25
Observed Value


25.0
20.0
15.0
10.0
5.0
UNINS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6
4
2
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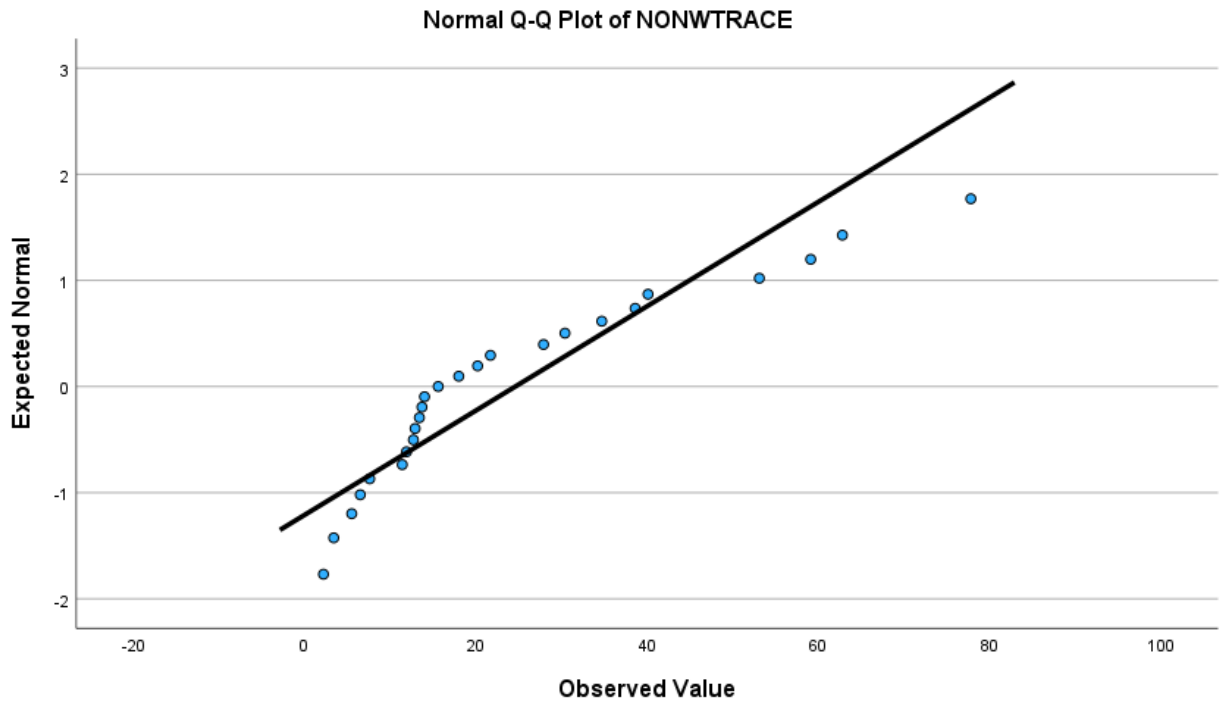
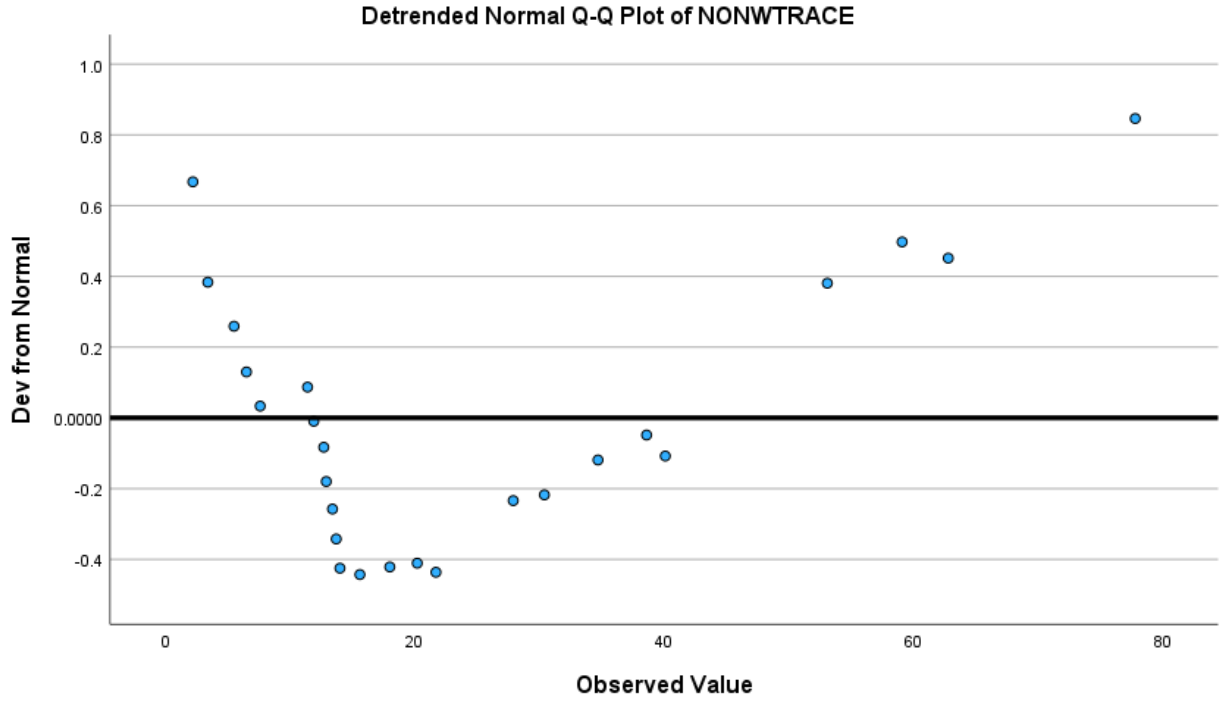
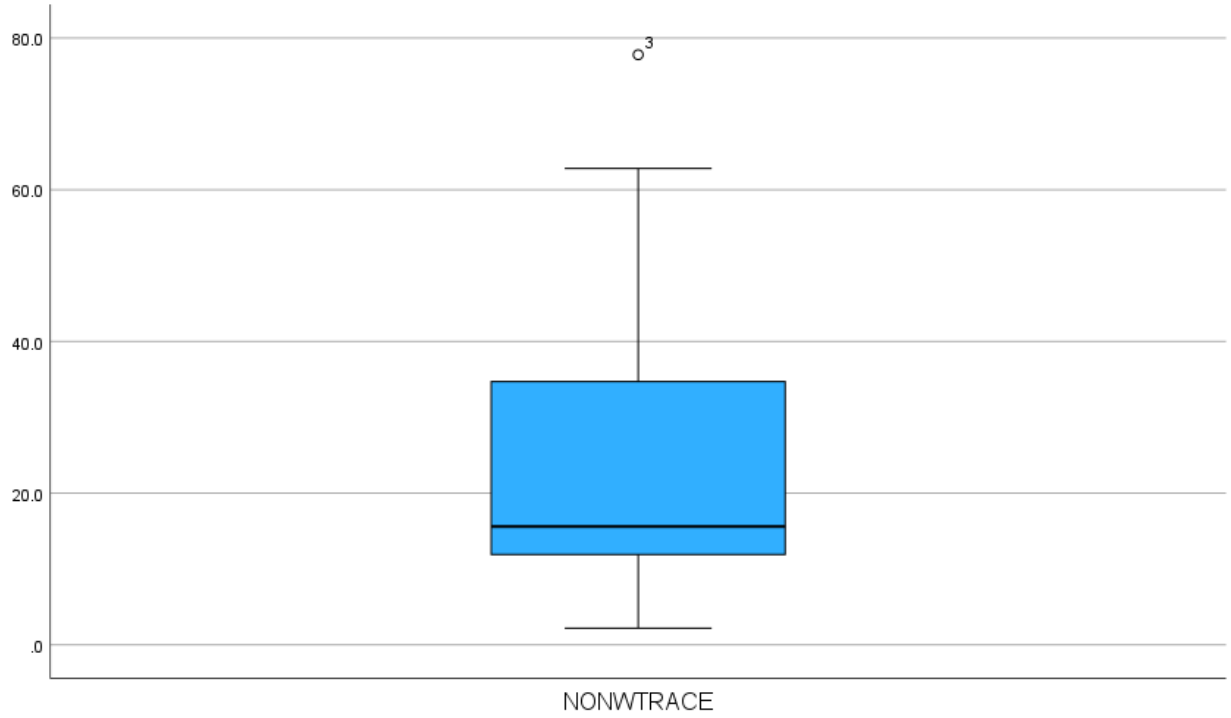
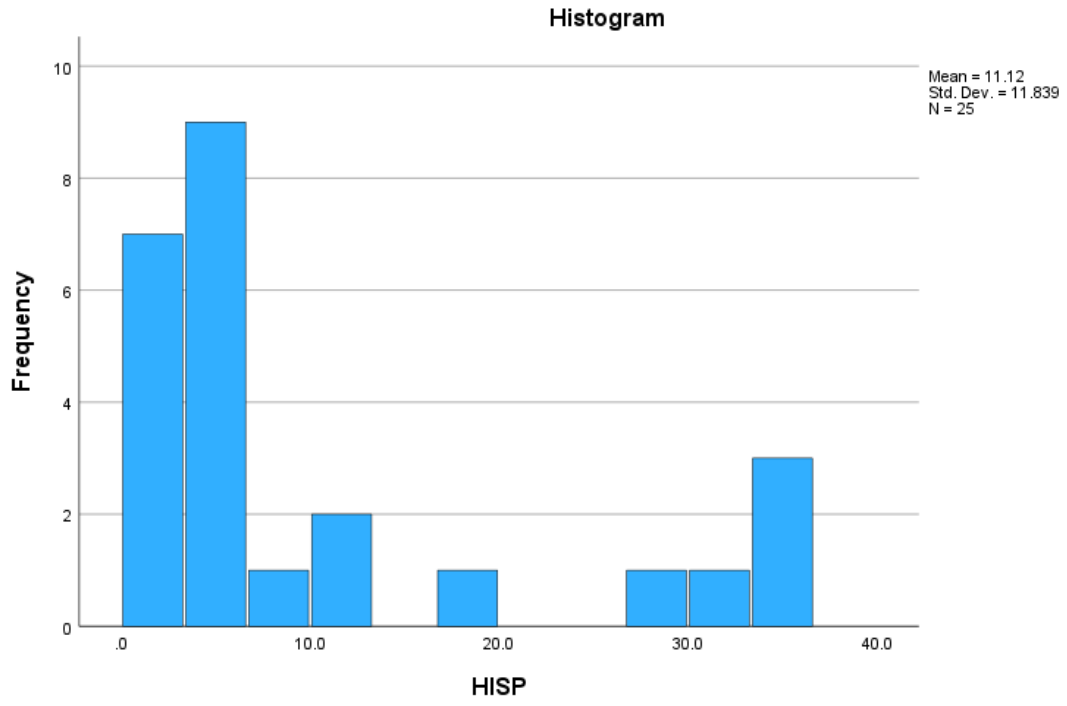
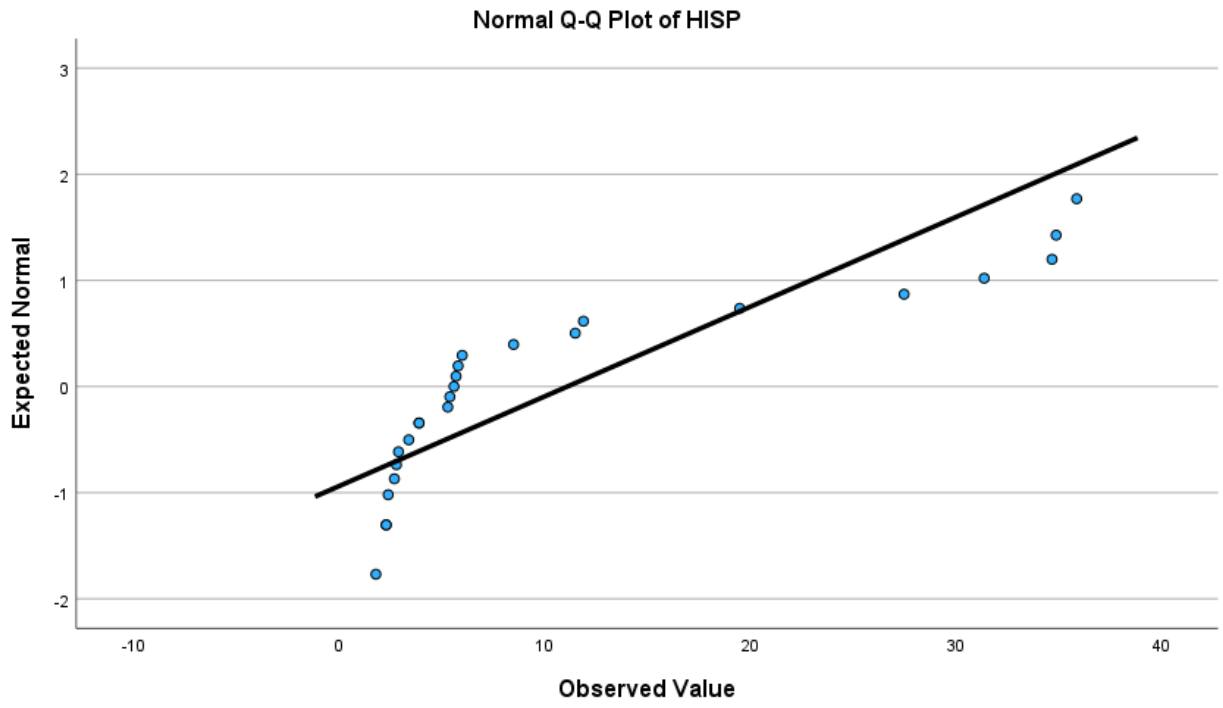
.0
20.0
40.0
60.0
80.0
NONWTRACE

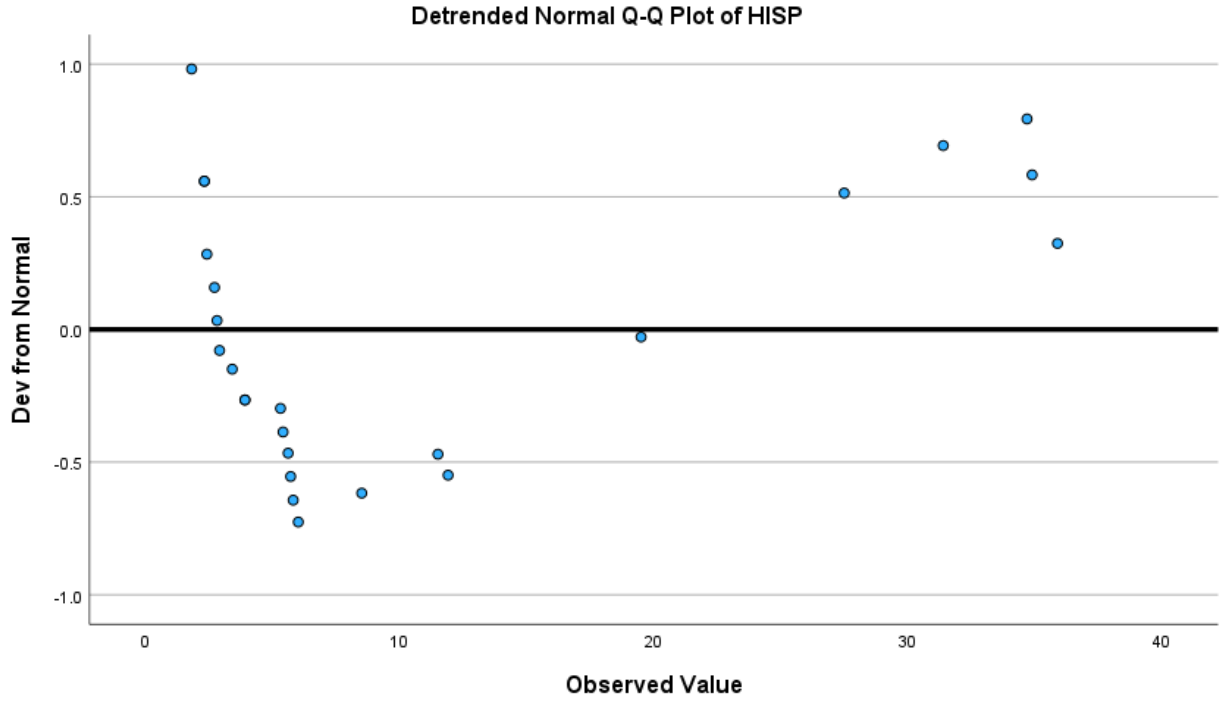

Normal Q-Q Plot of NONWTRACE
Expected Normal
3
2
1
0
-1
-2
-20
0
20
40
60
80
100
Observed Value

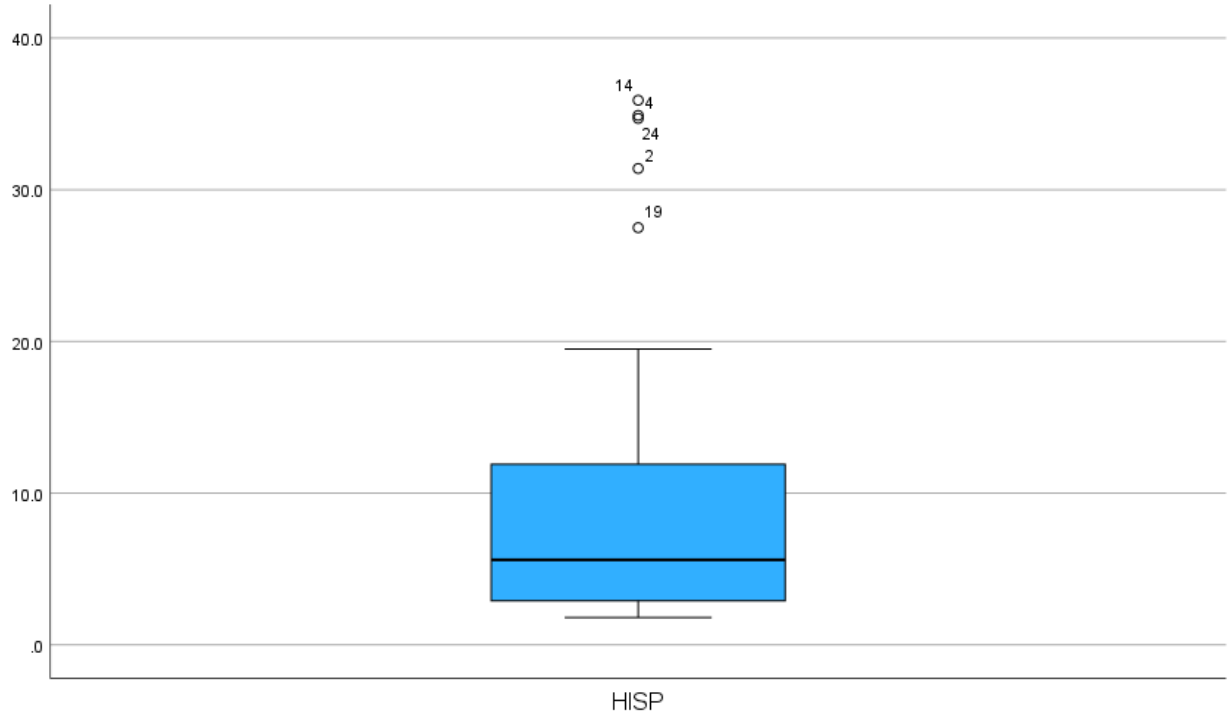

Detrended Normal Q-Q Plot of NONWTRACE
Dev from Normal
1.0
0.8
0.6
0.4
0.2
0.0000
-0.2
-0.4
0
20
40
60
80
Observed Value

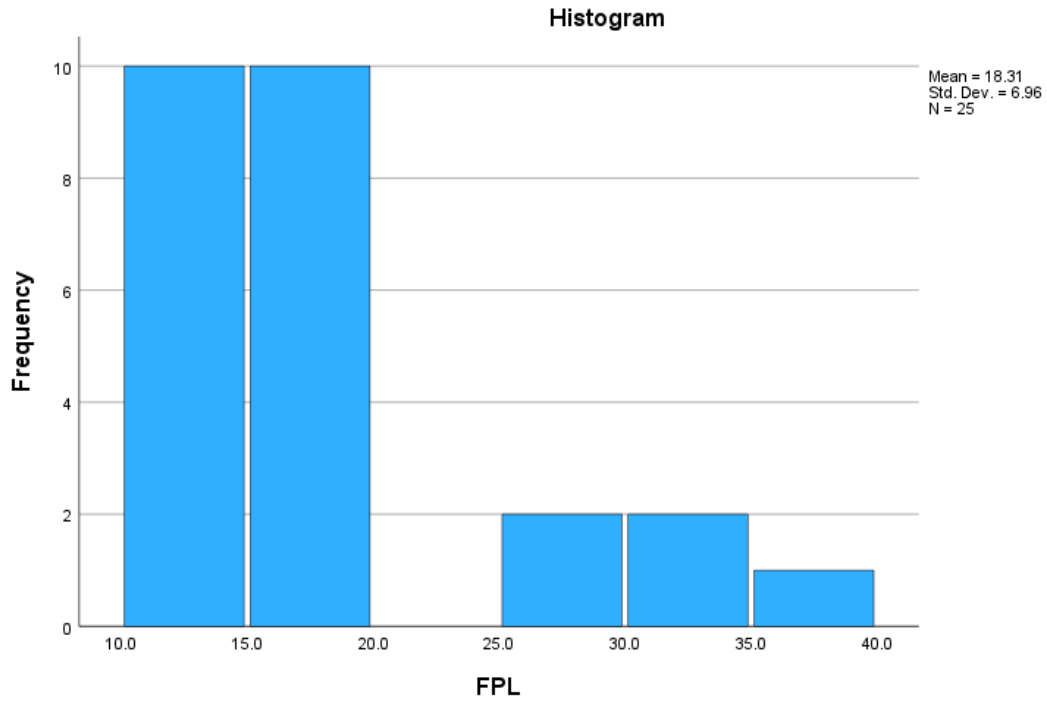

80.0
60.0
40.0
20.0
.0
3
NONWTRACE


Histogram
Mean = 11.12
Std. Dev. = 11.839
N = 25
Frequency
10
8
6
4
2
0
.0
10.0
20.0
30.0
40.0
HISP


Normal Q-Q Plot of HISP
Expected Normal
3
2
1
0
-1
-2
-10
0
10
20
30
40
Observed Value


Detrended Normal Q-Q Plot of HISP
Dev from Normal
1.0
0.5
0.0
-0.5
-1.0
0
10
20
30
40
Observed Value


40.0
30.0
20.0
10.0
.0
14
4
24
2
19
HISP


Histogram
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Std. Dev. = 6.96
N = 25
Frequency
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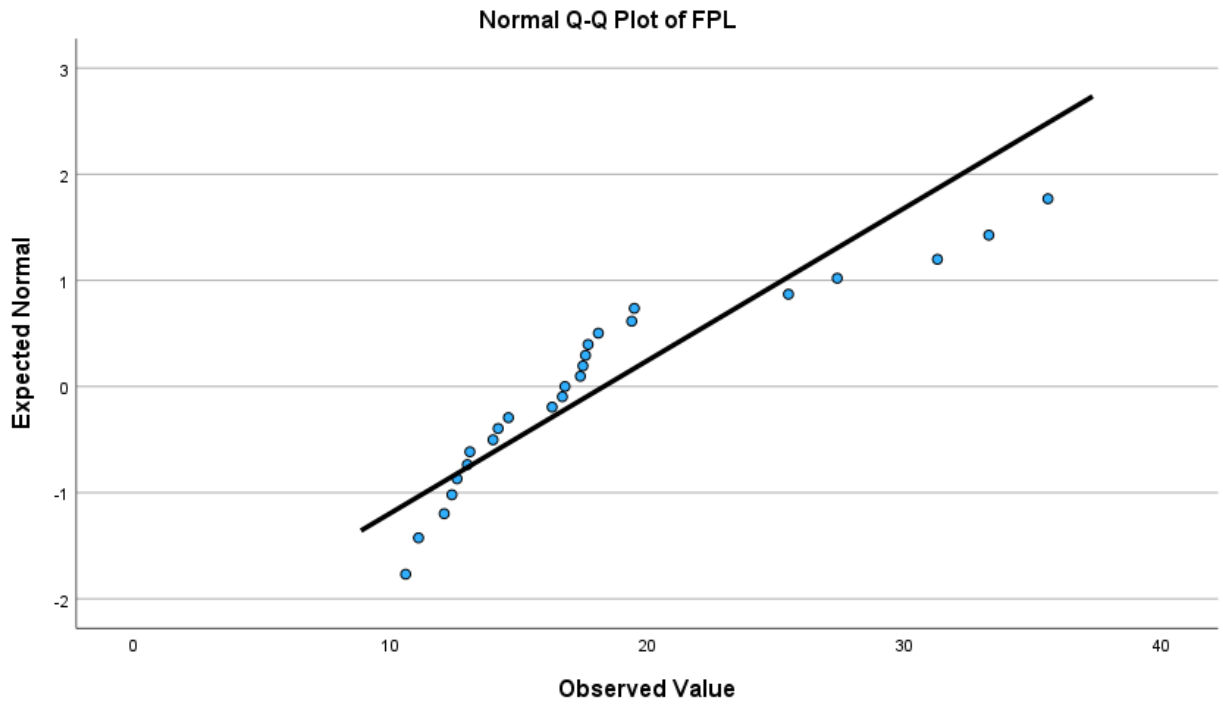
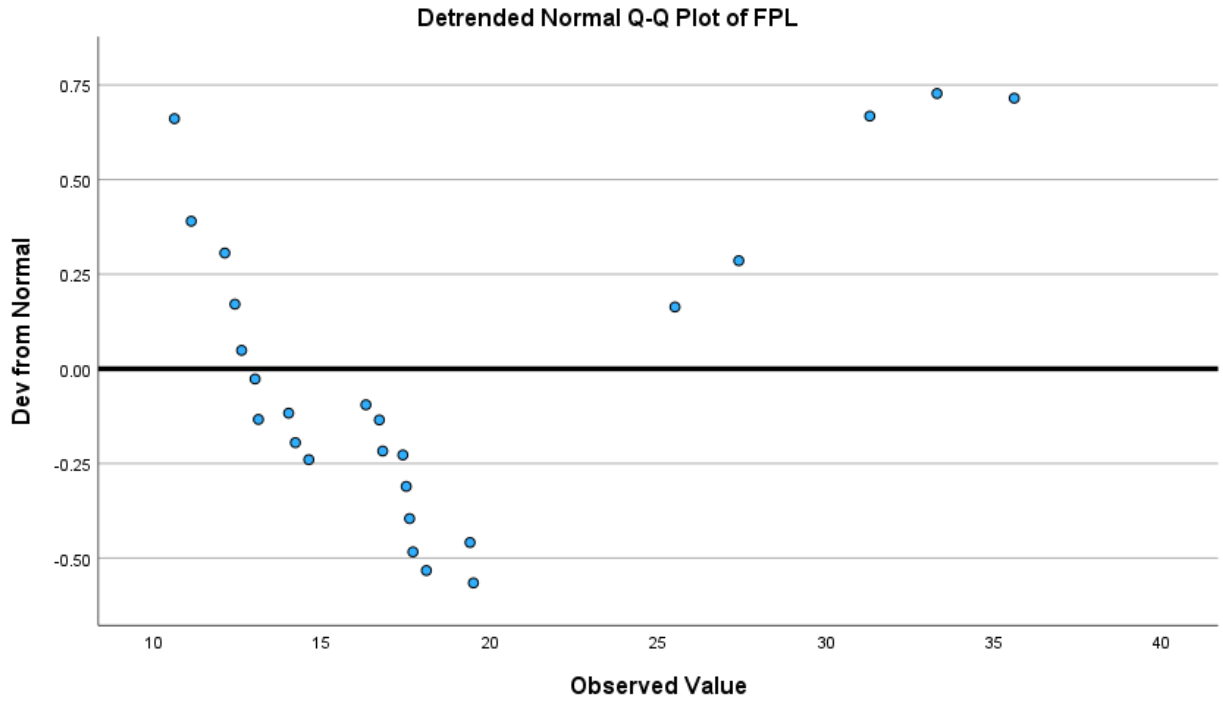
8
6
4
2
0
10.0
15.0
20.0
25.0
30.0
35.0
40.0
FPL


Normal Q-Q Plot of FPL
Expected Normal
Observed Value
3
2
1
0
-1
-2
0
10
20
30
40


Detrended Normal Q-Q Plot of FPL
Dev from Normal
Observed Value
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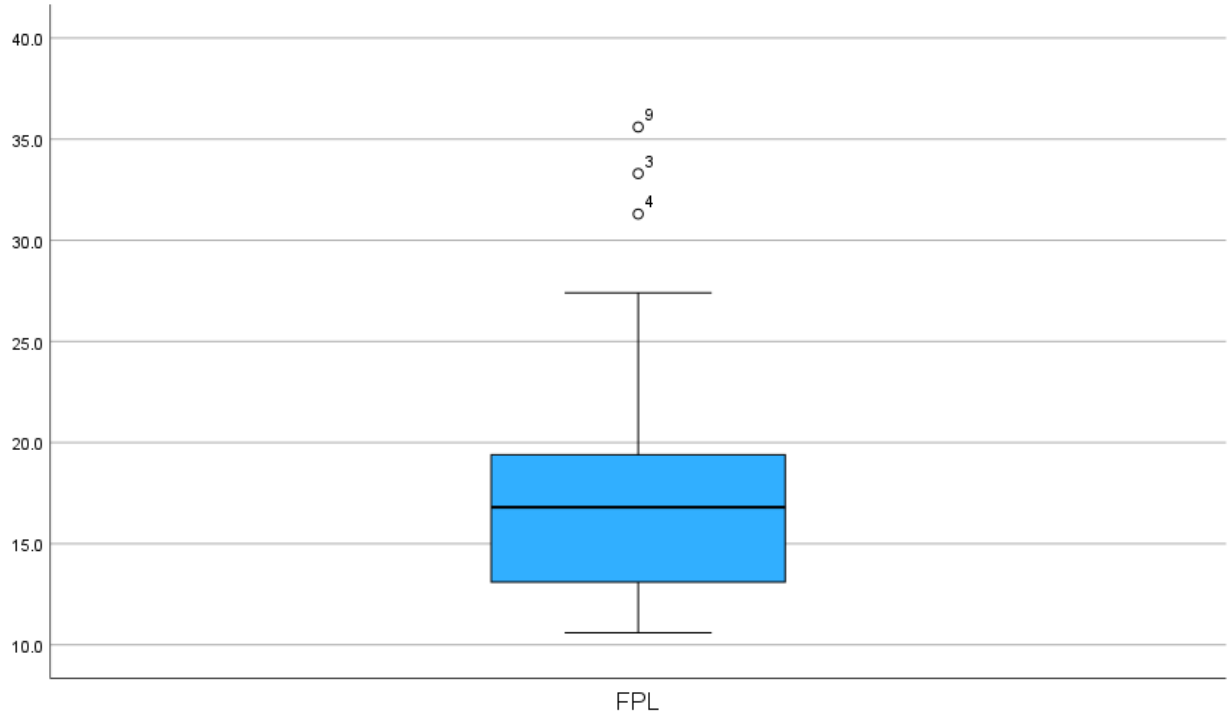
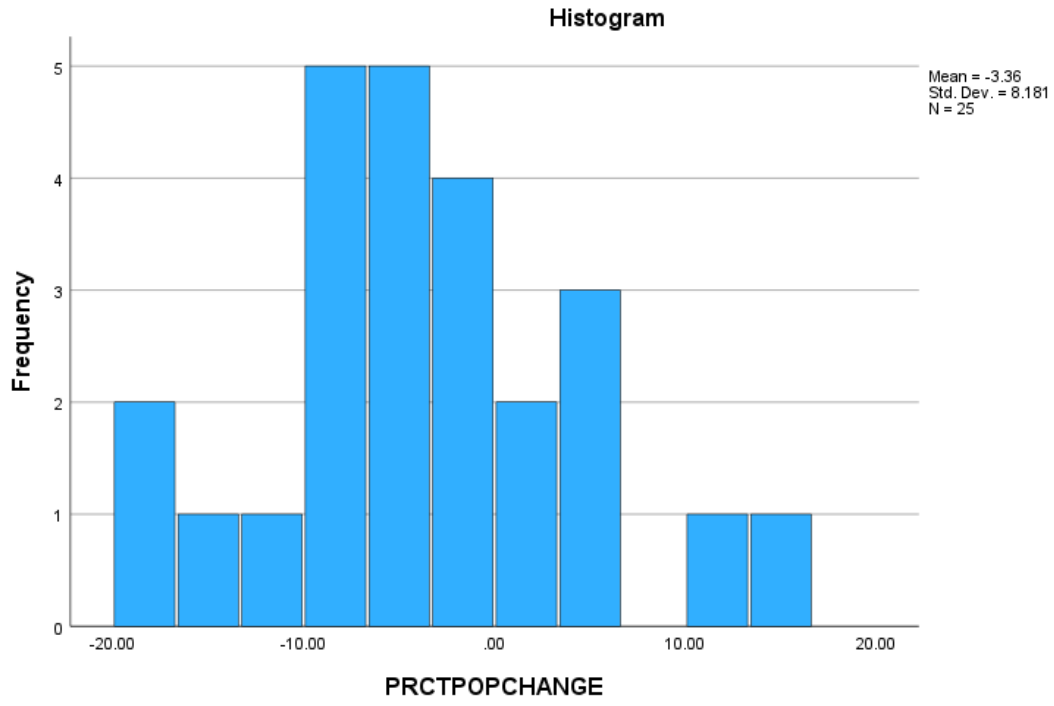
0.25
0.00
-0.25
-0.50
10
15
20
25
30
35
40


40.0
35.0
30.0
25.0
20.0
15.0
10.0
9
3
4
FPL


Histogram
Mean = -3.36
Std. Dev. = 8.181
N = 25
Frequency
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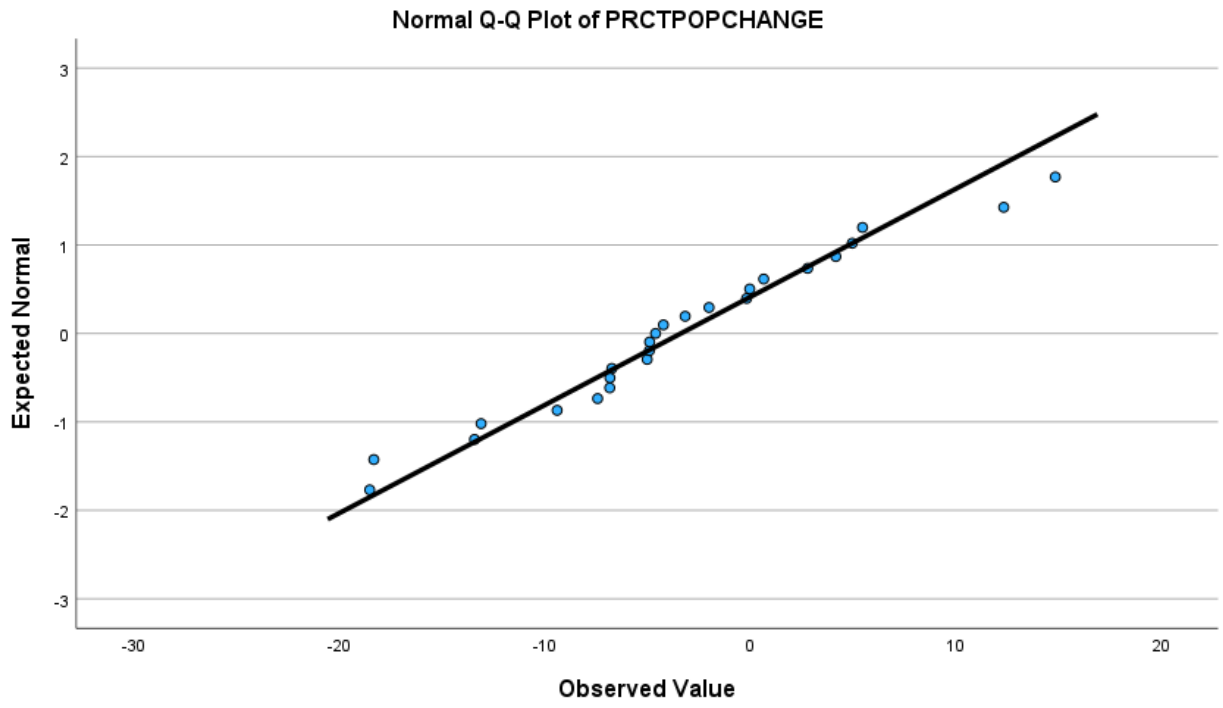
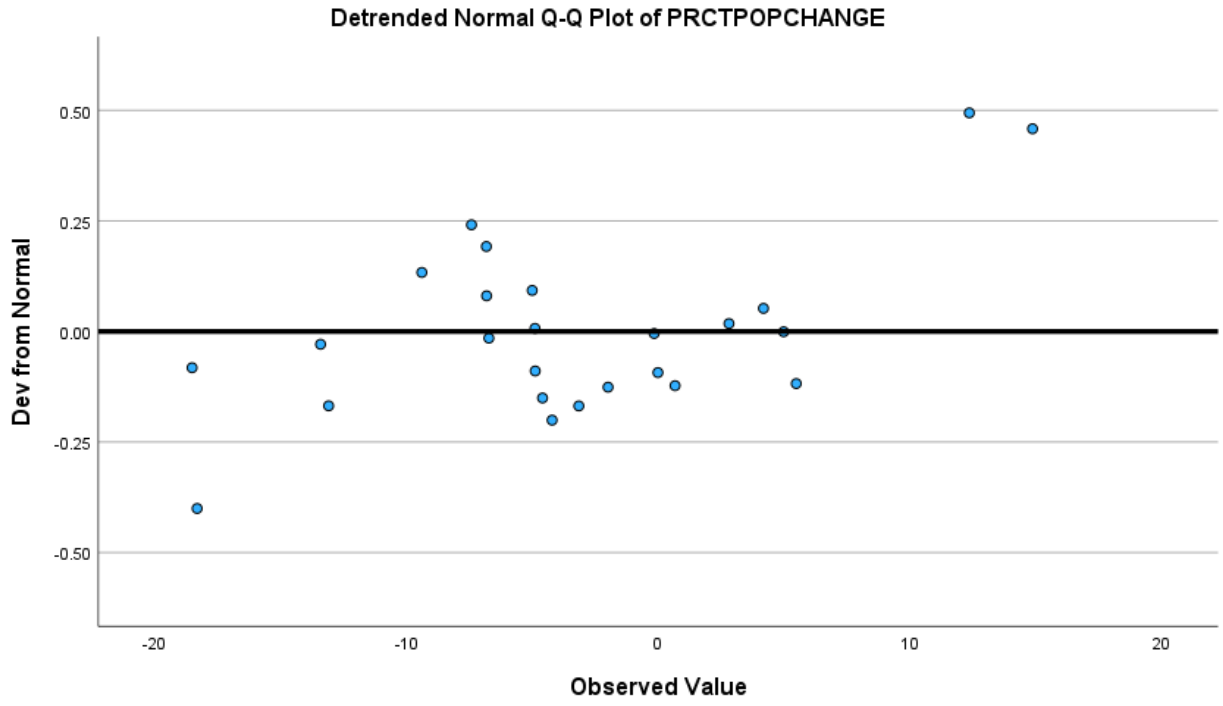
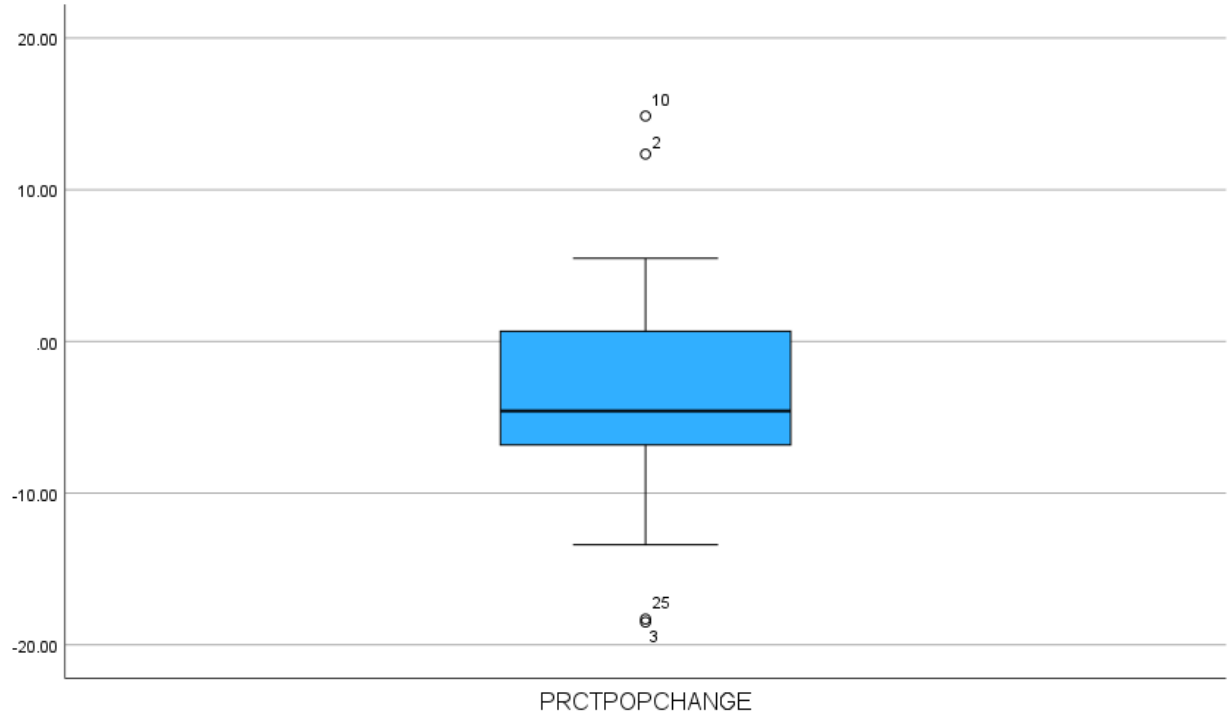
4
3
2
1
0
-20.00
-10.00
.00
10.00
20.00
PRCTPOPCHANGE


Normal Q-Q Plot of PRCTPOPCHANGE
Expected Normal
3
2
1
0
-1
-2
-3
-30
-20
-10
0
10
20
Observed Value


Detrended Normal Q-Q Plot of PRCTPOPCHANGE
Dev from Normal
0.50
0.25
0.00
-0.25
-0.50
-20
-10
0
10
20
Observed Value



Nonparametric Test: Man Whitney Test Results

Hypothesis Test Summary

	Null Hypothesis	Test	Sig.[a,b]	Decision
1	The distribution of NONWTRACE is the same across categories of EXPANSION.	Independent-Samples Mann-Whitney U Test	.169[c]	Retain the null hypothesis.
2	The distribution of HISP is the same across categories of EXPANSION.	Independent-Samples Mann-Whitney U Test	.216[c]	Retain the null hypothesis.
3	The distribution of FPL is the same across categories of EXPANSION.	Independent-Samples Mann-Whitney U Test	.071[c]	Retain the null hypothesis.

a. The significance level is .050.

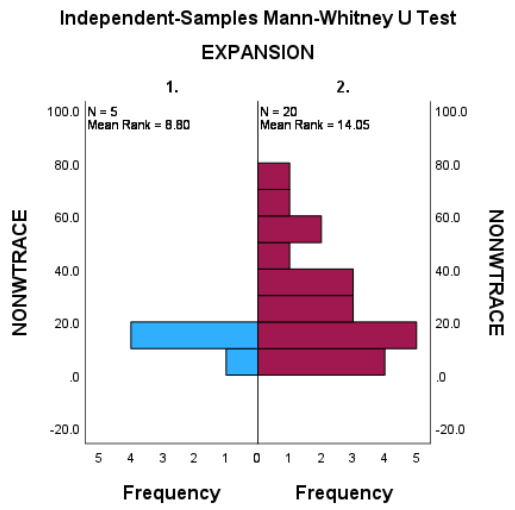
b. Asymptotic significance is displayed.

c. Exact significance is displayed for this test.

Minority Population Across Expansion

Independent-Samples Mann-Whitney U Test Summary

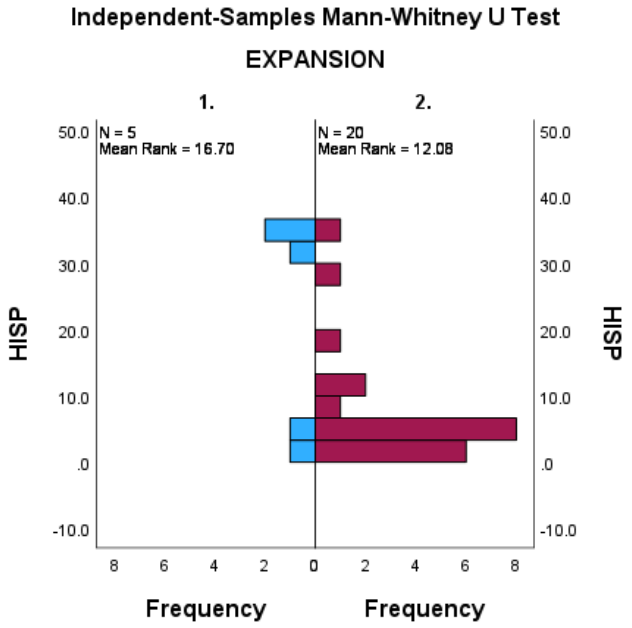
Total N	25
Mann-Whitney U	71.000
Wilcoxon W	281.000
Test Statistic	71.000
Standard Error	14.720
Standardized Test Statistic	1.427
Asymptotic Sig.(2-sided test)	.154
Exact Sig.(2-sided test)	.169



Percent Hispanic Population Across Expansion

Independent-Samples Mann-Whitney U Test Summary

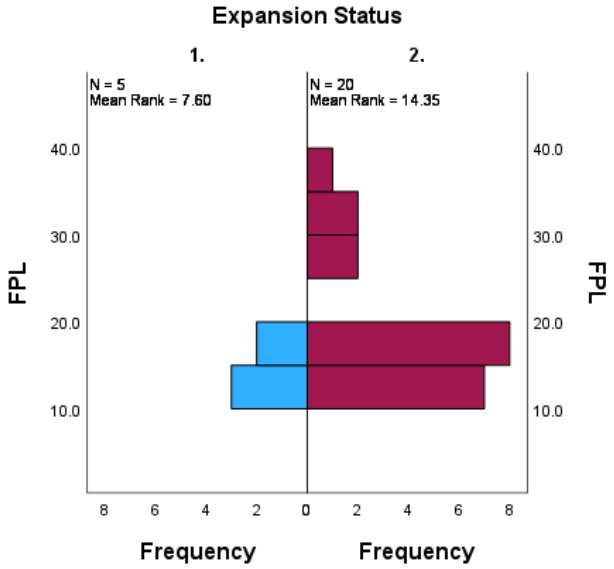
Total N	25
Mann-Whitney U	31.500
Wilcoxon W	241.500
Test Statistic	31.500
Standard Error	14.714
Standardized Test Statistic	-1.257
Asymptotic Sig.(2-sided test)	.209
Exact Sig.(2-sided test)	.216

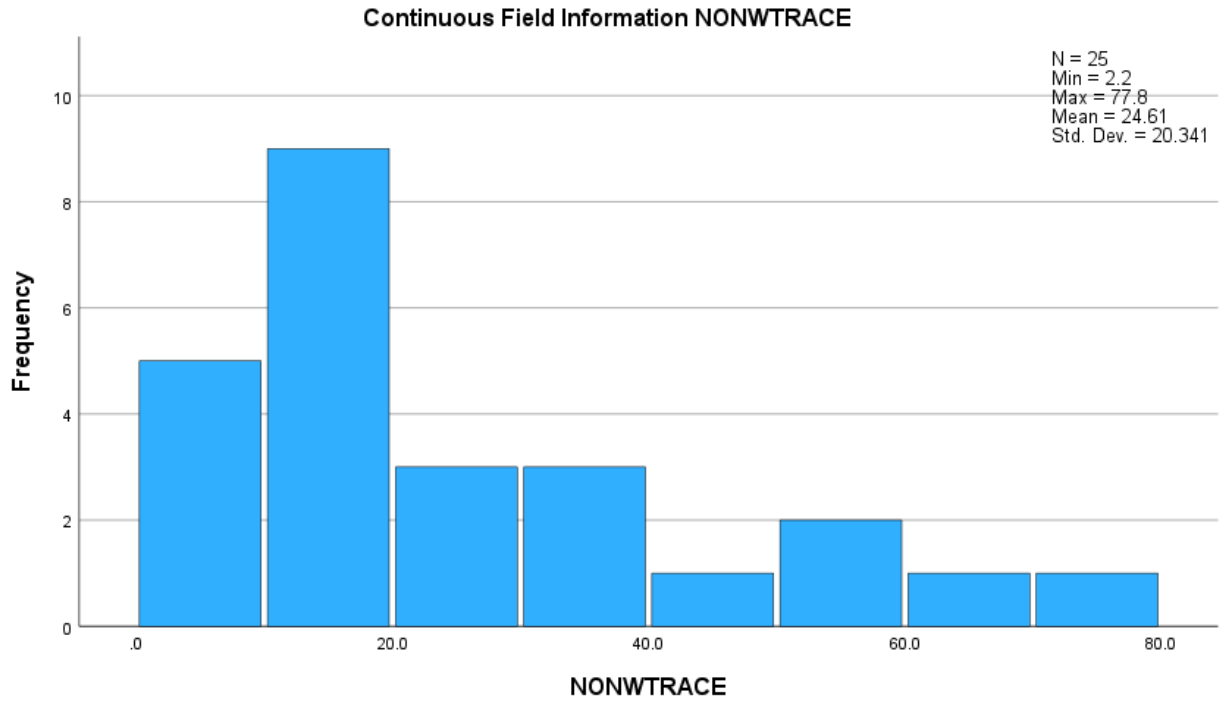


Federal Poverty Level Across Expansion

Independent-Samples Mann-Whitney U Test Summary

Total N	25
Mann-Whitney U	77.000
Wilcoxon W	287.000
Test Statistic	77.000
Standard Error	14.720
Standardized Test Statistic	1.834
Asymptotic Sig.(2-sided test)	.067
Exact Sig.(2-sided test)	.071




Continuous Field Information NONWTRACE
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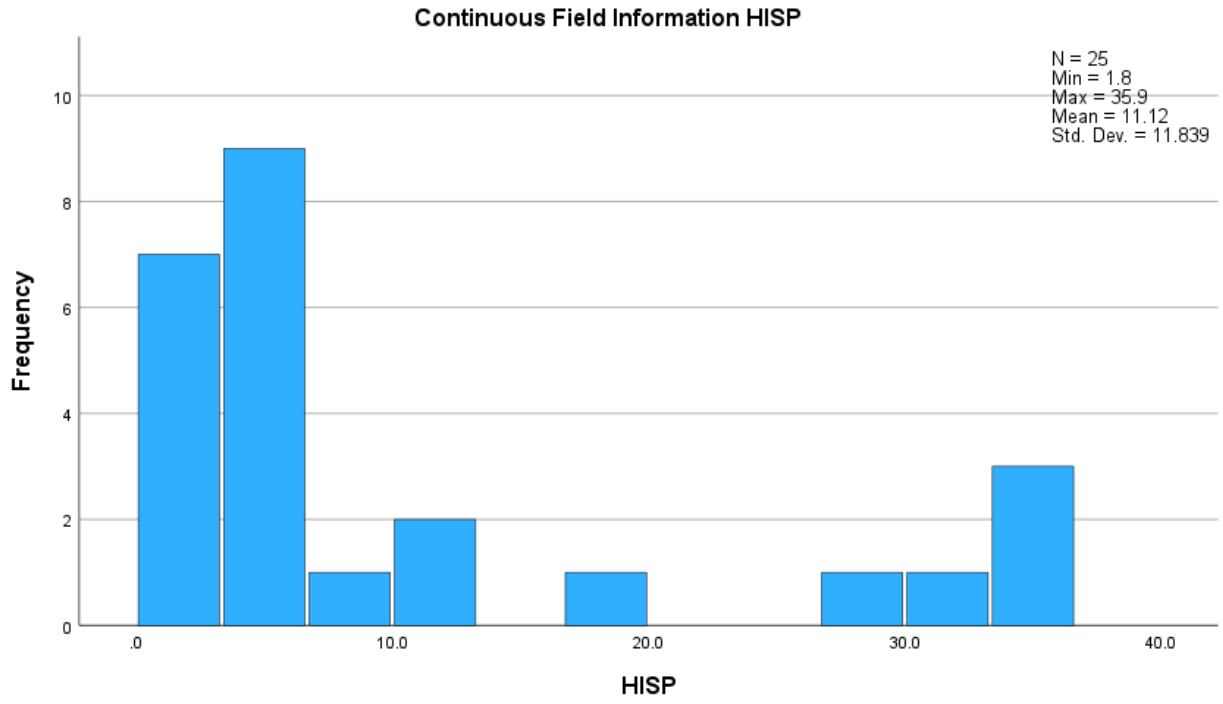
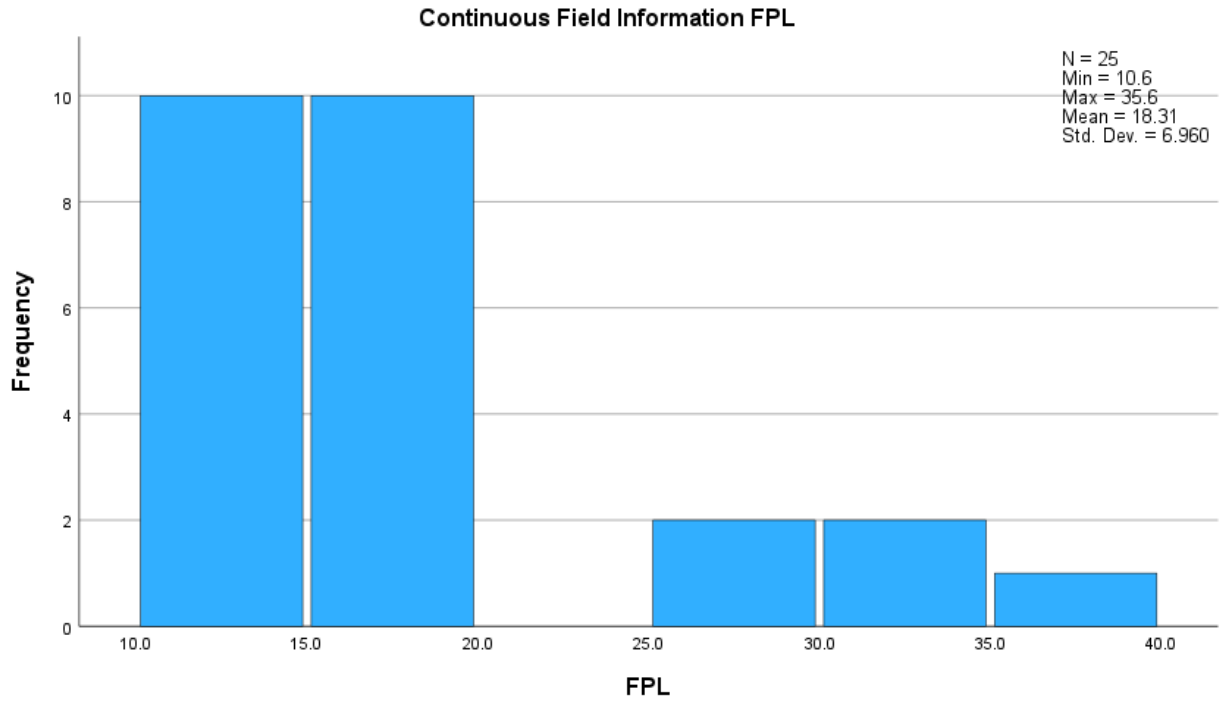
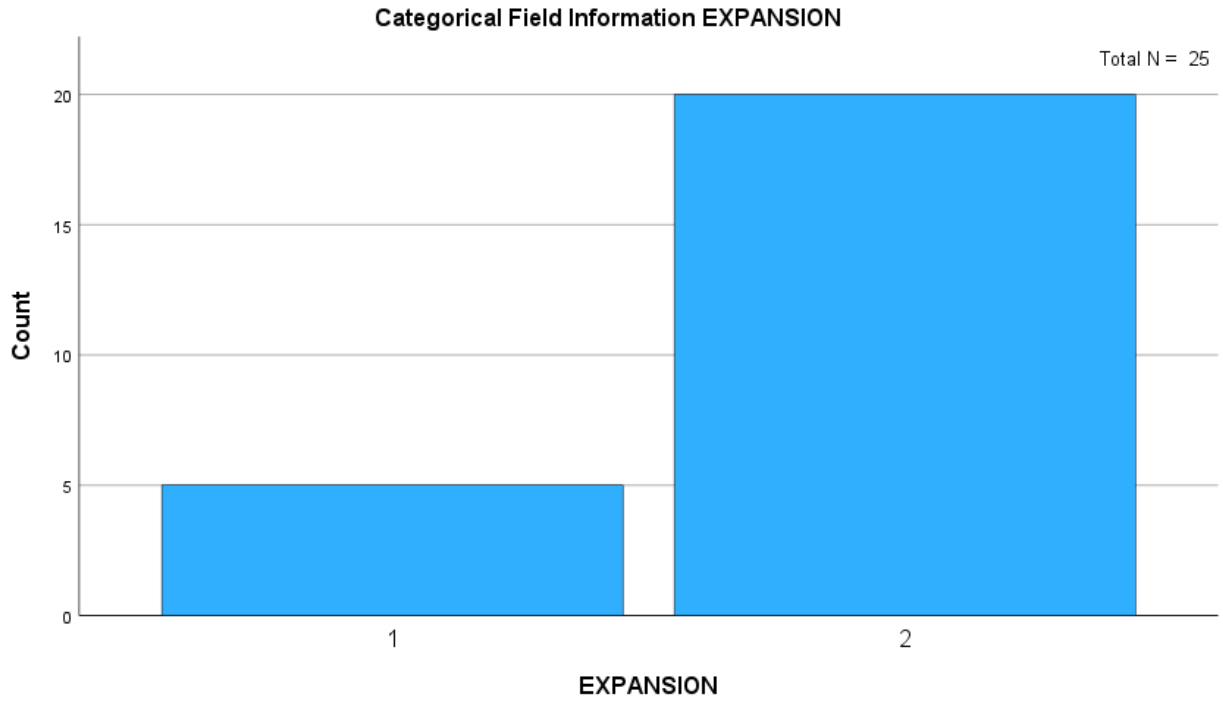
Min = 2.2
Max = 77.8
Mean = 24.61
Std. Dev. = 20.341
Frequency
0
2
4
6
8
10
.0
20.0
40.0
60.0
80.0
NONWTRACE


Continuous Field Information HISP
N = 25
Min = 1.8
Max = 35.9
Mean = 11.12
Std. Dev. = 11.839
Frequency
0
2
4
6
8
10
.0
10.0
20.0
30.0
40.0
HISP


Continuous Field Information FPL
N = 25
Min = 10.6
Max = 35.6
Mean = 18.31
Std. Dev. = 6.960
Frequency
0
2
4
6
8
10
10.0
15.0
20.0
25.0
30.0
35.0
40.0
FPL


Categorical Field Information EXPANSION
Total N = 25
Count
0
5
10
15
20
1
2
EXPANSION

Independent T-Test Results

Group Statistics

	EXPANSION	N	Mean	Std. Deviation	Std. Error Mean
AADC	1	5	2.2680000000	.89895494882	.40202487485
	2	20	2.0630000000	1.9667046978	.43976853960
PRCTPOPCHANGE	1	5	2.1620	8.06161	3.60526
	2	20	-4.7390	7.79896	1.74390
ELDERAGE	1	5	18.340	3.8076	1.7028
	2	20	20.410	3.5756	.7995
UNINS	1	5	11.560	4.1765	1.8678
	2	20	15.685	3.4283	.7666
POP	1	5	1.700	2.4444	1.0932
	2	20	-.010	1.4253	.3187

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means							
						Significance				95% Confidence Interval of the Difference	
		F	Sig.	t	df	One-Sided p	Two-Sided p	Mean Difference	Std. Error Difference	Lower	Upper
AADC	Equal variances assumed	2.530	.125	.224	23	.412	.824	.20500000000	.91320684356	-1.684112287	2.0941122868
	Equal variances not assumed			.344	14.830	.368	.736	.20500000000	.59583585694	-1.066265355	1.4762653550
PRCTPOPCHANGE	Equal variances assumed	.147	.705	1.759	23	.046	.092	6.90100	3.92263	-1.21359	15.01559
	Equal variances not assumed			1.723	6.021	.068	.135	6.90100	4.00488	-2.89017	16.69217
ELDERAGE	Equal variances assumed	.154	.699	-1.145	23	.132	.264	-2.0700	1.8085	-5.8112	1.6712
	Equal variances not assumed			-1.100	5.898	.157	.314	-2.0700	1.8812	-6.6925	2.5525
UNINS	Equal variances assumed	.277	.603	-2.311	23	.015	.030	-4.1250	1.7848	-7.8172	-.4328
	Equal variances not assumed			-2.043	5.429	.046	.092	-4.1250	2.0190	-9.1941	.9441
POP	Equal variances assumed	2.539	.125	2.075	23	.025	.049	1.7100	.8242	.0050	3.4150
	Equal variances not assumed			1.502	4.702	.099	.197	1.7100	1.1387	-1.2738	4.6938

Independent Samples Effect Sizes

		Standardizer[a]	Point Estimate	95% Confidence Interval Lower	Upper
AADC	Cohen's d	1.8264136871	.112	-.869	1.092
	Hedges' correction	1.8887966335	.109	-.841	1.055
	Glass's delta	1.9667046978	.104	-.878	1.083
PRCTPOPCHANGE	Cohen's d	7.84527	.880	-.141	1.883
	Hedges' correction	8.11323	.851	-.137	1.821
	Glass's delta	7.79896	.885	-.145	1.893
ELDERAGE	Cohen's d	3.6170	-.572	-1.560	.427
	Hedges' correction	3.7406	-.553	-1.508	.413
	Glass's delta	3.5756	-.579	-1.568	.425
UNINS	Cohen's d	3.5697	-1.156	-2.179	-.110
	Hedges' correction	3.6916	-1.117	-2.107	-.106
	Glass's delta	3.4283	-1.203	-2.241	-.138
POP	Cohen's d	1.6484	1.037	.003	2.051
	Hedges' correction	1.7047	1.003	.003	1.984
	Glass's delta	1.4253	1.200	.135	2.237

a. The denominator used in estimating the effect sizes.
Cohen's d uses the pooled standard deviation.
Hedges' correction uses the pooled standard deviation, plus a correction factor.
Glass's delta uses the sample standard deviation of the control group.

Appendix D: Interview Guide

(Note: Informed consent will be signed and received prior to the scheduled interview due to needing permission to record with signature required)

Hello (insert name). I have received your informed consent form with signature. May I start the recording of this interview at this time? (if yes, start recording)

Introduce myself and role as student and my class assignment

Hello, my name is Roxanne Elliott. I am currently enrolled as a Doctor of Health Sciences student at Radford University Carilion. I am completing a capstone project entitled "*Critical Access Hospital Closures in Medicaid Expansion and Non-Expansion States: Exploring County-Level Variables as Predictors of Closures*." This is a mixed methods study to determine the impact of state's decisions to expand or not expand Medicaid from 2010-2020 on Critical Access Hospitals (CAHs) and if the annual average daily census is a factor. The secondary data portion of the study will also look at county-level factors that may be predictors of CAH closures in expansion versus non-expansion states to include variables such as population decline, percent of population 65 and older, rate of uninsured, population demographics, and population living in poverty. The qualitative portion of the study includes interviews with key informants that were former leaders of closed CAHs. The interview portion of the study is aimed at better understanding the secondary data results and to explore potential county-level variables for closures. This interview should take between 30 to 40 minutes of your time depending on the length of your answers and our discussion.

Thank the interviewee

I want to thank you in advance for agreeing to be part of this study. I sincerely appreciate you taking your time and contributing to this research.

Informed Consent: An informed consent form was sent to you with your interview confirmation. This consent addressed confidentiality, the reason for the interview, and reviewed the study risks. Thank you for signing and returning the informed consent form.

Confidence: Please know there are no wrong answers to the questions. I want you to share your lived experience and knowledge. At any time if you do not want to answer a question or want to discontinue the interview, that is your right.

Do you have any questions before we start the interview questions?

Interview Questions

- Can you review your title and role at (insert name of hospital) and how long you served in the leadership position at this facility?
- There are several different models for Critical Access Hospitals. Can you clarify if the CAH was part of a system or a stand-alone facility, whether the hospital was a for-profit or non-for-profit, and if it was private or public?
- Critical Access Hospitals provide essential health care services for rural, underserved areas. Critical Access Hospitals vary in the services offered at each facility. Can you describe the types of services that were offered at your hospital?
- Health care is an ever changing environment. Many rural and critical access hospitals are at risk of closing. According to the theory I am using for this research, the neo-institutional theory, when organizations are in uncertain environments, organizations tend to model after other organizations. How would you describe your approach to adapting to changes in care delivery models? Can you tell me about the resources or lack of resources that were available to enable the hospital to adapt to changing care models? (If the facility was part of a system, can you describe the readiness of the system to adapt to changes in health care models?)

- How did you seek opportunities for improvements?
- Critical Access Hospitals are often the backbone of rural communities. How would you describe the hospitals relationship with the community?
- As a leader, what were some of your greatest challenges at this facility?
- Thinking back and reflecting on your lived experience, what advice would you give to CAH leaders whose facilities are at-risk of closure?
- Do you have anything else you would like to share?