GEOGRAPHICAL DISPARITIES & DISBURSEMENT OF MICHIGAN ANESTHESIA PROVIDERS: A WORKFORCE STUDY

Ву

BIANCA ADAIR

&

SARAH CZARNOWCZAN

A doctoral research project submitted in partial fulfillment of the requirements for the degree of

DOCTOR OF NURSING PRACTICE

2021

Oakland University Rochester, Michigan

ACKNOWLEDGMENTS

The authors would like to acknowledge the following for their contributions to this research

project:

Project chair, Dr. Anne Hranchook, for your guidance and support throughout this doctoral

journey. We would not have been able to complete this project without you. Thank you.

The faculty at Oakland University-Beaumont Graduate Program of Nurse Anesthesia for their

advice, guidance, and support.

Our families: For their constant understanding, love, and support.

DEDICATION

I dedicate this to my wonderful parents and sister for their unwavering support and encouragement to pursue my dreams: My late father, James Adair, my mother, Fiorella Adair, and my sister, Amanda Adair.

I dedicate this to my wonderful family for their continued support and understanding during this journey to accomplish my dreams: My parents, Paul and Darlene, and my siblings, Scott,

Jennifer, Shelly, and Nicole.

Table of Contents

Abstract	5
Background And Significance	6
Literature Review	8
Problem Statement	16
Conceptual Framework	16
Project Methodology	17
Project Design	17
Key Stakeholders	17
Data Collection	17
Project Evaluation-Statistical Analysis	18
Plan for Project Dissemination	18
Project Implementation	19
Results	20
Discussion	26
Barriers	27
Unintended Consequences	28
Implications for Practice and Career Development	28
Contribution Of Project in Achieving DNP Essentials	29
Recommendations and Limitations	30
Conclusion	31
References	32
Appendices	36
Appendix A: Kingdon's Multiple-Streams Conceptual Framework	36
Appendix B: Collaborative Institutional Training Initiative (CITI) Certification Completion	37
Appendix C: Administration Area Resource File (ARF)	38
Appendix D: Rural Urban Continuum Codes Database (2013)	40
Appendix E: IRB Approval Letter	41
Appendix F: MANA Board of Directors PowerPoint Presentation	42
Appendix G: Legislative One-Pager	61

Abstract

As more Americans are insured now than ever before under the Affordable Care Act, the demand for healthcare services and healthcare providers has increased in the United States. It is crucial to examine the forces impacting the anesthesia workforce, as increasing numbers of insured individuals has a direct effect on availability and access to anesthesia, surgical, and pain management services. In Michigan, there are three types of anesthesia providers which include certified registered nurse anesthetists (CRNAs), anesthesiologists, and certified anesthesiologist assistants (CAAs). In response to intensive efforts on the part of the Michigan Association of Nurse Anesthetists to remove barriers to practice for CRNAs, the Michigan Society of Anesthesiologists has proposed that CAAs can replace CRNAs in rural and underserved areas of Michigan. The purpose of this workforce study was to answer the following question: In rural and underserved areas of Michigan, does the use of CAAs in comparison to the use of CRNAs provide increased access to high quality cost-effective anesthesia services?

Results revealed that CRNAs are the most prevalent provider in all population classifications: rural, urban, and metropolitan. On examining the number of anesthesia providers per 10,000 people in rural populations, it was determined that there is an average of 0.35 CRNAs present in rural areas compared to 0.05 anesthesiologists and 0.05 CAAs, indicating that CRNAs are seven times more prevalent than anesthesiologists and CAAs in rural areas. In addition, CRNAs are nearly 10 times more likely than anesthesiologists to work in a critical access hospital in Michigan. These results suggest that CAAs are not increasing access to anesthesia services in rural and underserved areas of Michigan.

Keywords: CRNA, certified anesthesiologist assistant, anesthesiologist, rural, underserved, critical access hospital

Geographical Disparities & Disbursement of Michigan Anesthesia Providers:

A Workforce Study

Background And Significance

As more Americans are insured now than ever before under the Affordable Care Act, the demand for healthcare services and healthcare providers has increased in the United States (Liao, Quraishi, & Jordan, 2015). It is crucial to examine the forces impacting the anesthesia workforce, as increasing numbers of insured individuals has a direct effect on availability and access to anesthesia, surgical, and pain management services. In Michigan, there are three types of anesthesia providers which include certified registered nurse anesthetists (CRNAs), anesthesiologists (MDAs), and certified anesthesiologist assistants (CAAs).

Although CAAs have existed since the 1970s, only 14 states and the District of Columbia have formally recognized CAAs in state laws or regulations and Louisiana has enacted legislation prohibiting CAA practice (AANA, 2017; Plagenhoef, 2008). Certified Anesthesiologist Assistants were first introduced as an answer to a shortage of anesthesiologists and CRNAs in the mid 1960s with little proliferation of the role until the early 2000s. In the early 2000s, the American Society of Anesthesiologists (ASA) launched a campaign to secure the anesthesia care team (ACT) and the push to proliferate CAA programs began as a political move. The ACT is defined as care led by a physician anesthesiologist who directs or supervises the care of qualified anesthesia personnel (CRNAs, CAAs, Student Nurse Anesthetists, CAA students, medical students) and meets the ASA Guidelines for the Ethical Practice of Anesthesiology (ASA, 2019). Certified Anesthesiologist Assistants function under medical direction by an anesthesiologist, while CRNAs function under medical supervision from either an anesthesiologist or an operating practitioner in the state of Michigan. The ASA's definition of

medical direction is: "A medically directing anesthesiologist is immediately available if s/he is in physical proximity that allows the anesthesiologist to re-establish direct contact with the patient to meet medical needs and any urgent or emergent clinical problems" (ASA, 2019). CRNAs, who function under medical supervision, are not limited to supervision only by anesthesiologists. Under federal law, a CRNA can be supervised by either the operating practitioner (such as the surgeon) or by an anesthesiologist. Operating practitioners may also include dentists and podiatrists. There is nothing in Medicare policy that requires MDA supervision of CRNA services, however Medicare does require CAAs to work under the direction of an MDA (AANA, 2017). A CRNA working autonomously is 25% more cost-effective than working under the ACT model in a 4:1 ratio (Hogan, Seifer, Moore, & Simonson, 2010). Certified Anesthesiologist Assistants are not licensed to practice in Michigan and thus there are very few in the state. In contrast, every state authorizes CRNAs to provide anesthesia care. Certified Registered Nurse Anesthetists are explicitly recognized in state laws or regulations in all 50 states, and the District of Columbia (AANA, 2017).

Since 2012, there have been intensive efforts on the part of the Michigan Association of Nurse Anesthetists (MANA) to remove barriers to practice for CRNAs. The most recent bill, House Bill 4359, recently passed the House and is currently awaiting a vote in the Senate. This bill will protect patients and reduce healthcare costs by removing unnecessary CRNA supervision laws in Michigan. Since 2001, finding that a federal requirement calling for CRNA supervision is not necessary to ensure patient safety, Medicare allowed states to opt-out of the physician supervision of CRNAs requirement entirely (AANA, 2017). Michigan is one of only nine states requiring physician supervision of CRNAs in medical or nursing board statutes or regulations. Placing unnecessary restrictions on CRNAs' scope of practice hinders patient access

to readily available anesthesia providers, causing patients to incur higher medical costs for anesthesiologist care (Liao et al., 2015). Because such burdens impair access to care, increase costs, and do not improve patient safety, Michigan CRNAs and other health care stakeholders continue working in Lansing to eliminate this burden (Negrusa, Hogan, Warner, Schroeder, & Pang, 2016).

For economic reasons, the ASA and thus the Michigan Society of Anesthesiologists (MSA) has strongly opposed allowing CRNAs to practice to the full extent of their education and licensure. In response to the bills proposed by MANA to remove antiquated language in the Michigan Public Health Code requiring physician supervision of CRNAs, the MSA has introduced bills in the Michigan House to license CAAs (House Bill 4709). The ASA has moved to greatly expand training programs and secure state licensure for CAAs across the United States in an effort to preserve the most expensive practice model; the ACT (Negrusa et al., 2016; Lewis, Nicholson, Smith, & Alderson, 2014). In keeping with the national agenda of the ASA and in response to legislation put forth by MANA, the MSA continues to provide misinformation on the role of CAAs and their ability to assist in improving access to care for Michigan residents.

Literature Review

A thorough literature search was performed for research publications dated between the years 2011 to 2021 Databases used to conduct the search included CINAHL, Cochrane, Google Scholar, and the American Association of Nurse Anesthetists (AANA) website. Search terms included certified registered nurse anesthetists (CRNAs), certified anesthesiologist assistants (CAAs), anesthesiologists (MDAs), cost-effective, and geographical disparities. Due to the low numbers of CAAs working in the United States, there is limited literature available, therefore restricting our search and results.

The search yielded 18 potential articles with relevant titles. The abstract/introduction of all 18 articles were reviewed. Of the 18 articles, five were duplicate studies, six were not available in full text versions, and three did not specifically address anesthesia providers in relation to geographical locations. Therefore, a total of four articles were found to be eligible for inclusion. Articles were rated for their level of evidence using the hierarchy of evidence table found in Melnyk and Fineout-Overholt's (2015) *Evidence Based Practice in Nursing and Healthcare: A Guide to Best Practice*. Three studies were classified as descriptive studies (level six evidence), while the other source was obtained from public government research, therefore this data could not be assessed in terms of level of evidence.

An analysis conducted by O'Neill (2017) discusses the history of anesthesia providers and cost-effectiveness. CRNAs are at the forefront of anesthesia, providing anesthesia to patients since the American Civil War more than 150 years ago. Sister Mary Bernard was the first nurse to specialize in anesthesia in 1877. In 1931, the National Association of Nurses Anesthetists (NANA) and the American Association of Nurse Anesthetists (AANA) was created (AANA, n.d.). The ASA was founded five years after the NANA and AANA in 1936. The CAA profession was introduced by the ASA in 1960 in an attempt to provide greater access to anesthesia services and to answer to the shortage of anesthesiologists and CRNAs, however, CAAs are trained to assist an anesthesiologist, under medical direction, and cannot function independently.

In 1965, Medicare, the largest public benefit health program in the United States, was enacted. In Michigan, CRNAs must be supervised by a physician of any type (the operating physician or surgeon would fulfill this requirement) and are not required to work under an anesthesiologist. However, Medicare reimbursement provided an economic incentive for MDA

supervision of CRNAs. When an MDA supervised multiple CRNAs, the Medicare payments were 140% of what an independent MDA would be paid (O'Neill, 2017). In 1986, CRNAs gained the ability to be directly reimbursed for their services from Medicare with the Omnibus Reconciliation Act of 1986. This act allowed CRNAs to work independently, most often in rural areas, which helped increase patient access to care in these regions (O'Neill, 2017). Recognizing their inability to work independently, Medicare has denied CAAs from receiving reimbursement for services that are performed autonomously.

In 1982, the Tax Equity and Fiscal Responsibility Act (TEFRA) was established to assist in decreasing anesthesia costs and to prevent Medicare fraud. TEFRA limits payment to anesthesiologists when they supervise more than four concurrent anesthesia cases. It also requires seven conditions that need to be fulfilled to qualify for payment. These conditions consist of the anesthesiologist being physically present and available for induction of anesthesia, emergence, provision of pre- and post- anesthetic care, and monitoring the anesthetic at frequent intervals (O'Neill, 2017).

The CAA profession has been introduced by the American Society of Anesthesiologists in an attempt to provide greater access to anesthesia services. However, CAAs can only work under the direct supervision of an anesthesiologist, which, in fact, does not increase access and only further increases cost of care. In comparison, CRNAs are trained to be autonomous providers who are not required to work with or under the supervision of an anesthesiologist, offering increased access to anesthesia services and greater cost-effectiveness. The median CRNA salary is 166,540 dollars compared to an anesthesiologist salary of 420,284 dollars (*Salary.com*, 2019). A CAAs average salary is estimated to be 158,383 dollars (*Salary.com*, 2019). When a CRNA works autonomously, the staffing cost is two million dollars for 12

CRNAs. When a CRNA is working in an ACT with a 3:1 ratio under the supervision of an anesthesiologist, the cost is 3.68 million dollars. In states where CAAs are used, CAAs are billed under the medical direction model, with no more than a 4:1 ratio. However, the costlier 2:1 ratio is more commonly used to avoid the risk of Medicare fraud. For CAAs working in a 2:1 ratio, the staffing cost of 4.52 million dollars for 12 anesthesiologists and six CAAs (AANA, 2017; Hogan, Seifer, Moore, & Simonson, 2010). The costs incurred by facilities utilizing the medically directed model are by far the highest and most inefficient of all models used (O'Neill, 2017). Analysis of the cost figures demonstrates that CRNAs are at least a million dollars more cost effective than CAAs.

A recent Michigan court document regarding fraudulent anesthesia services involving the employment of CAAs was analyzed for this review. In 2018, Traverse Anesthesia Associates gave CAAs access to controlled substances, which is in violation of Michigan law (United States/State of Michigan v. Traverse Anesthesia Associates, 2018). The hospital pharmacy opposed this and banned CAA's Pyxis access. Several weeks later, hospital administration sided with the anesthesiologists and overruled the pharmacists granting CAAs direct, unrestricted access to the Pyxis. In addition, current Michigan pharmacy regulations prohibit prescribers from delegating prescriptive authority for any drug to unlicensed personnel such as CAAs. Because CAAs are not licensed in Michigan, a CAA may not legally accept delegation of the task of selecting or ordering drugs (Beauchamp et al., 2019). Failure to comply with Michigan pharmacy regulations places the licensed personnel and healthcare facility at risk for disciplinary action.

The most important concern of an unlicensed personnel handling controlled substances is patient safety. For example, in the court document *United States/State of Michigan v. Traverse*

Anesthesia Associates (2018), an incident was reported in which a CAA gave 250 mcg of Fentanyl in a single injection to a patient in the recovery room. The CAA did not stay and monitor the patient. The patient developed respiratory compromise, ultimately needing further airway management (United States/State of Michigan v. Traverse Anesthesia Associates, 2018). A provider lacking sufficient education in pharmacology cannot truly understand the effects of medications, presenting a serious threat to patient safety. There were also concerns of CAAs falsely misrepresenting themselves or impersonating a licensed healthcare provider when talking to patients. In addition to these fraudulent activities, it was found that the MDAs changed anesthesia administration times to meet TEFRA requirements and were not immediately available and therefore not appropriately medically directing CAAs (United States/State of Michigan v. Traverse Anesthesia Associates, 2018).

An analysis done by Liao et al. (2015) examined the relationship between socioeconomic factors related to geographic location, types of insurance, and the distribution of different anesthesia providers. Under the Affordable Care Act, 22.3 million uninsured individuals qualify for Medicaid, thus increasing the demand for healthcare services and healthcare providers (Liao et al., 2015). Access to anesthesia providers is a critical area to examine, as it directly effects surgical and pain management services. This study used advanced correlation analyses to address whether access to CRNAs vs. anesthesiologists differs based on factors other than population density. An experimental approach was used to: a) identify whether CRNAs and MDAs are evenly distributed among geographic regions based on population density; b) to determine whether socioeconomic/economic conditions (i.e. geographic location and insurance type) among populations are associated with anesthesia provider type distribution; and c) to evaluate the extent of variations in anesthesia providers among populations of variable socioeconomic

conditions (Liao et al., 2015). Data was collected from the 2012 United States Health Resources and Services Administration Area Resource File (ARF). The ARF provided information by county in regard to employment status, household income, types of health insurance (including Medicare and Medicaid), operating rooms, and types of anesthesia providers available.

Anesthesia providers were defined as either anesthesiologists or CRNAs. Certified Registered Nurse Anesthetists were identified using the 2010 National Provider Identification file from the Centers for Medicaid and Medicare Services and nonfederal anesthesiologists were identified using the 2010 American Medical Association Physician Masterfile. Provider-to-population ratio was calculated as the number of anesthesia providers (CRNA or MDA) per 10,000 people. The 2013 Rural-Urban Continuum Codes (RUCC) was used to determine degree of urbanization and adjacency to a metropolitan area.

Variables related to anesthesia access were identified as: a) the number of anesthesia providers; b) the number of operating rooms; and c) the presence of insurance (Medicaid, Medicare, and individuals with/without insurance). Population density was calculated by normalizing the population within those counties where anesthesia providers reside. A radius range of 10.2 miles to 25.6 miles was calculated for those counties where anesthesia providers were located (Liao et al., 2015). Statistical analyses in this study included descriptive analysis and two advanced correlation analyses, partial least square correlation, and Pearson partial correlation. To assess whether anesthesia providers were distributed evenly, the locations of anesthesia providers was compared to the RUCC. Counties were grouped into metropolitan, nonmetropolitan/urban adjacent counties, and rural counties. Median household income was categorized by the 10th, 25th, 50th, 75th, and 90th median income percentiles. Analysis indicated that anesthesia provider distribution significantly correlated with county median income (Liao et

al., 2015). Of a total of 3,143 U.S. counties, anesthesia providers (CRNAs and MDAs) occupied 2,098 (67%) counties, of which 296,305,069 (97%) of the population resided. Anesthesiologists were located in 45% of counties that consist of 90.7% of the U.S. population and CRNAs were located in 59% of counties that consist of 91.9% of the U.S. population (Liao et al., 2015). Analysis of median household income revealed 64% of anesthesiologists occupied counties where the median household income was in the top 75th percentile, whereas only 42% of CRNAs were present in this same percentile. CRNAs were consistently found in counties where median income was less than the 25th percentile regardless of county population classification (Liao et al. 2015).

The three variables most influential in anesthesia provider distribution by county were found to be number of operating rooms, county median income, and population density (Liao et al., 2015). Results of this study also revealed that CRNAs correlated more with the eligible Medicaid population, Medicare disabled, Medicaid blind/disabled, unemployed, and uninsured population than anesthesiologists (Liao et al., 2015). Anesthesiologists were positively correlated with employed individuals and negatively correlated with those in poverty (Liao et al., 2015).

The results of this study indicate that CRNAs are more often found in vulnerable communities, including the uninsured, Medicaid, low-income, and unemployed populations.

MDAs tend to reside in more densely populated, urban counties (Liao et al., 2015). To maximize the use of CRNAs, removing barriers to scope of practice would assist in providing affordable, accessible anesthesia services in these vulnerable populations.

An analysis by Coomer, Beadles, Chew, Mills, Gillen, and Quraishi (2019) examined facility location in relation to three different anesthesia staffing models: anesthesiologists alone,

CRNAs alone, and anesthesiologist/CRNA teams. The two data sets used for this study included the 2014 Medicare Parts A and B claims files and the 2014 Medicare Provider of Services (POS) file. Surgical claims were identified and matched with the corresponding claims for anesthesia services provided by anesthesiologists and CRNAs. The POS file provided information regarding facility characteristics, such as urban or rural location. Facilities were classified as predominantly anesthesiologist based when 80% or more of the facility's anesthesia claims were anesthesiologist alone, predominantly CRNA based when 80% or more of anesthesia claims were CRNA alone, and as team based if the facility's claims did not reach either of those thresholds (Coomer et al., 2019).

Results of this study revealed that many rural ambulatory surgery centers and small hospitals used a predominately CRNA model. In large urban areas, anesthesiologist alone models were predominant. Studies evaluating anesthesia costs have shown that predominantly CRNA anesthesia models consistently provide cost-effective care when compared to other anesthesia models, while continuing to provide care of similar or higher quality (Coomer et al., 2019). This study concludes that CRNA predominate practices may aid in combatting anesthesia provider shortages, especially in underserved areas, while providing high quality care at reduced medical costs (Coomer et al., 2019). The results again demonstrate that CRNAs are the more prevalent anesthesia provider within rural areas, and therefore the use of CAAs would have no benefit to either access or cost in this population due to the need for anesthesiologist supervision.

Problem Statement

A knowledge gap exists regarding whether or not CAAs answer the need for anesthesia care in rural areas of Michigan. Certified Anesthesiologist Assistants cannot work without the medical direction of an anesthesiologist; therefore, if anesthesiologists are not present in rural, underserved areas of Michigan, CAAs should not be found working there. Our PICOT question is: In rural and underserved areas of Michigan, does the use of CAAs in comparison to the use of CRNAs provide increased access to high quality cost-effective anesthesia services? The aim of this workforce study analysis is to identify and assess where CAAs are working in the state of Michigan and whether they are located in geographic locations where a) anesthesiologists are working and b) where economic conditions are associated with rural populations in underserved areas.

Conceptual Framework

The conceptual framework that relates to this project is Kingdon's Multiple-Streams

Conceptual Framework (see Appendix A). Kingdon's framework is useful to aid in
understanding policy development and explains why certain policies are successful, while others
are not. Kingdon's framework outlines the policy process into three main streams: problem,
politics, and policy. The coupling of the three streams allows a policy window to open for a
policy change to occur (Krusi-Ampofo, Church, Conteh, & Heinmiller, 2015). For this project,
"the problem stream" includes rising health care costs, inadequate access to care, barriers to full
scope of practice for CRNAs, and misrepresentation of CAAs as a solution to increase access to
care in rural areas of Michigan. The second stream, "the political stream", consists of the current
political climate, which is constantly changing due to events such as elections or crises. The
political climate is affected by legislative norms, political involvement and power, and

competing priorities of stakeholders. The third stream, "the stream of policies", consists of all the proposals that exist to address the problem, such as HB 4359 and lobbying efforts for CRNA full scope of practice to increase access to cost-effective care. The way in which groups of interested parties come together to form a united front in order to influence legislators has a direct effect on proposals reaching the political agenda.

Project Methodology

Project Design

The project design is a workforce study of anesthesia providers in Michigan and an analysis of the types of geographical locations and population variables in which they are employed.

Key Stakeholders

Stakeholders include the MANA Board, Michigan residents, Michigan hospitals and CRNA members of the Michigan Association of Nurse Anesthetists. The population to be studied includes CRNAs, CAAs, and MDAs.

Key project personnel include Dr. Anne Hranchook, DNP, CRNA (Project Chair), Colleen Beauchamp, RPh, CRNA, MS (Committee Member), Bianca Adair (DNP-Nurse Anesthesia Student), and Sarah Czarnowczan (DNP-Nurse Anesthesia Student).

Data Collection

Data collection sources used include the Administration Area Resource File (ARF), Rural Urban Continuum Codes (RUCC), and the National Provider Identifier database (NPI). The ARF database was used to collect data on Michigan counties, including population size, median household income, poverty levels, employment levels, and health insurance information. The RUCC database determines degree of urbanization and adjacency to metropolitan areas. This

database was used to classify Michigan counties as either rural, urban or metropolitan. The NPI database identifies where the various types of anesthesia providers are employed in Michigan via their specific identification number. The geographic locations of anesthesia providers determined through the NPI database was compared to population density determined via the RUCC database to analyze if CAAs are located within rural areas of Michigan as the MSA claims. The locations of Critical Access Hospitals (CAHs) in Michigan were also examined. The researchers contacted all 38 CAHs in Michigan to determine the most prevalent anesthesia provider in these facilities. Information was also gathered on the locations of CRNA independent hospitals in Michigan.

Ethical considerations have been undertaken, with Collaborative Institutional Training Initiative (CITI) certification completion (see Appendix B). This project proposal was submitted to the Institutional Review Board (IRB) at Oakland University and was determined to be exempt, as there are no human subject concerns due to the project only examining publicly available information via public databases (see Appendix C). The proposed timeline for project completion was June of 2021. There are limited budget requirements for this project, as the data is publicly available, and dissemination will be in presentation form.

Project Evaluation-Statistical Analysis

Data for this study was analyzed using IntellectusStatistics® software. Methods for statistical analysis included descriptive statistics, Pearson correlation analyses, Spearman correlation analyses, analysis of variance (ANOVA), and a two-tailed paired samples z-test.

Plan for Project Dissemination

Our project intervention plan produced a legislative educational paper and PowerPoint presentation that was disseminated to the MANA Board of Directors on April 10th, 2021 (see

Appendix D). This project was presented again on June 7th, 2021 to the Oakland University School of Nursing faculty and Oakland University-Beaumont Nurse Anesthesia class of 2022. These presentations provide an opportunity to educate CRNAs and students about the CAA profession and how the distribution of CAAs in Michigan impacts access to anesthesia care. The project results were also used to develop an informational legislative one-pager on CAA vs. CRNA practice that may be used to assist in lobbying efforts to prevent CAA licensure in Michigan (see Appendix E). Open-floor discussion followed the presentations to gain feedback on presentation information and to address any questions surrounding the findings of this DNP Project.

Project Implementation

The ARF database was used to collect data on Michigan counties, including population size, median household income, poverty levels, employment levels, and health insurance information. The RUCC database was used to classify Michigan counties as either rural, urban or metropolitan. Metropolitan counties were defined as: counties in metropolitan areas of one million population or more; counties in metropolitan areas of 250,000 to one million population; and counties in metropolitan areas of fewer than 250,000 population. Urban counties were defined as: a population of 20,000 or more, adjacent to a metropolitan area; a population of 20,000 or more, not adjacent to a metropolitan area; a population of 2,500 to 19,999, adjacent to a metropolitan area; and a population of 2,500 to 19,999, not adjacent to a metropolitan area. Rural counties were defined as: less than 2,500 population, adjacent to a metropolitan area; and less than 2,500 population, not adjacent to a metropolitan area.

The NPI database was used to identify where the various types of anesthesia providers are employed in Michigan via their specific identification number. The geographic locations of

anesthesia providers determined through the NPI database was compared to population density determined via the RUCC database to analyze if CAAs are located within rural, underserved areas of Michigan. The locations of the Critical Access Hospitals in Michigan were also examined to determine the most prevalent anesthesia provider in these facilities. Information was also gathered on the locations of CRNA independent hospitals in Michigan.

Results

There are a total of 21 CAAs in Michigan, determined via the NPI database. The majority of CAAs (19 out of 21) are working in metropolitan counties: Ingham County (one CAA); Kalamazoo County (one CAA); Kent County (16 CAAs); and Wayne County (one CAA). There is one CAA in Grand Traverse County, which is an urban county. Per the NPI database, there is one CAA in Osceola County, which is classified as rural. From this information, it can be determined the majority of CAAs in Michigan are working in metropolitan counties.

The average number of anesthesia providers per county by provider type was examined via descriptive statistics. Results revealed that there is an average 34.99 CRNAs per county in Michigan, compared to an average of 19.13 average MDAs per county in Michigan, and an average of 0.25 CAAs per county in Michigan. Descriptive statistics analyses are illustrated in Table 1.

Table 1

Descriptive Statistics of Anesthesia Providers in Michigan by Population Classification

Michigan Certified Registered Nurse Population Anesthetists (CRNAs)	CRNAs Average Average M n CRNA Number Ratio per of 10,000 CRNAs Population by County Type	Total 9,883,640 2,904 2.94 34.99 1,	Rural 197,470 7 0.35 0.50 Counties	Urban 1,618,498 231 1.43 5.37 1 Counties	
Anesthesiologists (MDAs)	MDAs n	1,588	1	112	1.475
	Average MDA Ratio per 10,000 Population	1.61	0.05	0.69	1.83
	Average Number of MDAs by County Type	19.13	0.07	2.60	56.73
Certified Anesthesiologist Assistants (CAAs)	CAAs n	21	1	1	19
	Average CAA Ratio per 10,000 Population	0.02	0.05	0.006	0.024
	Average Number of CAAs by County Type	0.25	0.07	0.02	0.73

The average number of anesthesia provider type by population classification was examined via descriptive statistics. Results revealed that there is a higher mean number of CRNAs present in rural populations when compared to both MDAs and CAAs (CRNA mean 0.50, SD = 0.94; MDA mean 0.07, SD = 0.27; CAA mean 0.07, SD = 0.27). CRNAs also had a higher mean number present in urban populations (5.37, SD = 8.30) when compared to both MDAs and CAAs (MDA mean 2.60, SD = 5.32; CAA mean 0.02, SD = 0.15).

Descriptive statistics were used to examine the number of anesthesia providers per 10,000 people by population classification. CRNAs were found to be the most prevalent provider in all 3 population classifications (rural, urban, and metropolitan). In rural populations, it was found that there are 0.35 CRNAs per 10,000 people compared to 0.05 MDAs and 0.05 CAAs respectively. CRNAs are 7 times more prevalent than MDAs per 10,000 people in Michigan rural counties.

An analysis of variance (ANOVA) was conducted to determine whether there were significant differences in the number of CAAs by population classification. An ANOVA was examined based on an alpha value of 0.05. The results of the ANOVA were not significant, F(2, 80) = 1.40, p = 0.252, indicating the differences in CAAs among the levels of population classification were all similar. Overall, the data reveals that CAAs do not have a greater presence in rural or underserved areas of Michigan.

A Spearman correlation analysis was conducted between the number of CAAs and population size. Cohen's standard was used to evaluate the strength of the relationship, where coefficients between 0.10 and 0.29 represent a small effect size, coefficients between 0.30 and 0.49 represent a moderate effect size, and coefficients above 0.50 indicate a large effect size

(Cohen, 1988). The result of the correlation was examined based on an alpha value of 0.05. A significant positive correlation was observed between CAAs and population size ($r_s = 0.29$, p = .009, 95% CI [0.07, 0.47]). The correlation coefficient between CAAs and population size was 0.29, indicating a small effect size. Overall, a weak, but significantly positive correlation was observed between CAAs and population size. As population size increases, CAA presence increases.

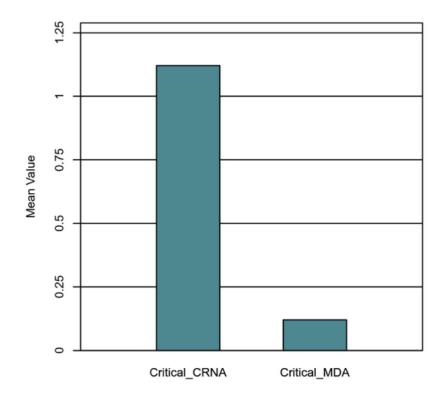
Data on CAHs in Michigan was also included in this study, as these hospitals were specifically designed to reduce the financial vulnerability of rural hospitals and improve access to healthcare by keeping essential services in rural communities. There are 38 CAHs in Michigan. Each of these 38 CAHs were contacted via telephone to collect anesthesia provider data. It was found that 31 out of the 38 CAHs in Michigan perform surgery. Anesthesia provider data was collected on 29 out of the 31 CAHs in Michigan that perform surgery, due to two hospitals being unwilling to share this data with the researchers. Data revealed that there is a significantly larger mean number of CRNAs present in CAHs when compared to the mean number of MDAs in CAHs in Michigan (3.88 vs. 0.42, respectively). No CAAs are present in any CAHs in Michigan.

A two-tailed paired samples z-test was conducted to examine whether the mean difference of CRNAs and MDAs in CAHs in Michigan was significantly different from zero. The result of the two-tailed paired samples z-test was significant based on an alpha value of 0.05, z = 4.53, p < .001, indicating the null hypothesis can be rejected. This finding suggests the difference in the mean of CRNAs in CAHs and the mean of MDAs in CAHs was significantly different from zero. The mean number of CRNAs in CAHs is significantly higher than the mean number of MDAs in CAHs in Michigan (1.12 vs. 0.12, respectively). This information is

illustrated in Figure 1. Certified Registered Nurse Anesthetists are nearly 10 times more likely to work in a CAH in Michigan when compared with MDAs. In addition, upon calling the CAHs, it was found that 22 of the 29 CAHs in Michigan where surgery is done and on which researchers were able to collect data have only CRNAs as anesthesia providers. No MDAs are present in these 22 CAHs.

Figure 1

The Means of CRNAs in CAHs and MDAs in CAHs



Data on CRNA independent hospitals was also collected. There are a total of 12 CRNA independent hospitals in Michigan. A CRNA independent hospital is defined as a hospital in which the CRNA provides anesthesia as the sole anesthesia provider; there are no MDAs present in these hospitals. The majority of CRNA independent hospitals in Michigan are located in urban

counties (seven hospitals). There is one CRNA independent hospital located in a rural county and there are four CRNA independent hospitals located in metropolitan counties. On examining the number of counties in Michigan with only CRNAs, it was found that 21 counties (25% of counties in Michigan) have only CRNAs as anesthesia providers. There are no MDAs with NPI numbers in these 21 counties.

A Pearson correlation was performed to compare the presence of MDAs with median household income and the presence of CRNAs with median household income. A Pearson correlation analysis was conducted among CRNAs and Median Household Income. Cohen's standard was used to evaluate the strength of the relationships, where coefficients between 0.10 and 0.29 represent a small effect size, coefficients between 0.30 and 0.49 represent a moderate effect size, and coefficients above 0.50 indicate a large effect size (Cohen, 1988). The result of the correlations was examined based on an alpha value of 0.05. A significant positive correlation was observed between CRNAs and median household income ($r_p = 0.42$, p < .001, 95% CI [0.23, 0.59]). The correlation coefficient between CRNAs and median household income was 0.42, indicating a moderate effect size. This correlation indicates that as household income increases, the number of CRNAs increases.

A Pearson correlation analysis was conducted among MDAs and median household income. Cohen's standard was used to evaluate the strength of the relationships, where coefficients between 0.10 and 0.29 represent a small effect size, coefficients between 0.30 and 0.49 represent a moderate effect size, and coefficients above 0.50 indicate a large effect size (Cohen, 1988). The result of the correlations was examined based on an alpha value of 0.05. A significant positive correlation was observed between MDAs and median household Income $(r_p = 0.46, p < .001, 95\% \text{ CI } [0.28, 0.62])$. The correlation coefficient between MDAs and

median household income was 0.46, indicating a moderate effect size. This correlation indicates that as MDAs increases, median household income tends to increase. As median household income increases, both MDA and CRNA presence increases, however MDA presence increases more strongly ($r_p = 0.46$ vs. 0.42, respectively, p < 0.001).

Discussion

Analysis of the results reveals that the majority of CAAs in Michigan are working in metropolitan counties and therefore, CAAs are not increasing accessibility to anesthesia care in rural or underserved areas of Michigan. Although per the NPI database there is one CAA in a rural county (Osceola County), there are no anesthesiologists registered with a NPI number here, so it is unclear if this is a true finding, as a CAA practicing without an anesthesiologist would be illegal in the state of Michigan. In addition, CAAs were found to be significantly positively correlated with increased population size. It was found that CRNAs are the most prevalent provider in any county and in all population classifications (rural, urban, and metropolitan). The average numbers of MDAs and CAAs in rural counties are mirrored. To increase CAA presence in rural areas, MDA presence must also increase, which ultimately increases anesthesia cost for patients.

CRNAs were also found to be nearly 10 times more likely than MDAs to work in CAHs in Michigan. This finding is similar to findings in other studies. CRNAs are more likely found in locations where low-income, Medicaid, and uninsured patients reside (Liao et al., 2015). No CAAs work in any Michigan CAHs. Again, this data reveals that CAAs are not working in rural or underserved areas. Of the 29 CAHs that perform surgery and on which data was collected, 22 of these CAHs were CRNA only, with no MDA presence. The MSA asserts that CAAs can be

part of the answer to access to care in rural and underserved areas. If MDAs are not working in these 22 CAHs, CAAs cannot work there.

There are a total of 12 CRNA independent hospitals in Michigan; the majority of these hospitals are located in urban counties. This finding is similar to findings in Coomer et al. (2019). They found that CRNA-only models were most prevalent in rural locations, providing access to anesthesia services in these areas where they might not have otherwise been available. CRNAs are the sole anesthesia providers in 21 Michigan counties (25%). In some states, CRNAs are the sole independent providers in nearly 100% of rural hospitals (AANA, 2008).

Lastly, as median household income increases, it was found that both CRNA and MDA presence increases, however MDA presence increases more strongly. Therefore, MDAs are more positively correlated with higher median household income than CRNAs. This finding is also similar to a finding in Liao et al. (2015). They found that when examining the presence of anesthesia provider type by median household income and county, 64% of anesthesiologists resided in counties where the median household income was in the top 75th percentile, whereas only 42% of CRNAs were present in the same income percentile.

Barriers

Potential barriers to the implementation of this project included a lack of published data on CAAs in Michigan and the CAA profession in general. There are not many CAAs in the United States and thus there is a paucity of literature related to the profession. The second barrier was the inaccessibility to collect more information on MDAs through the American Medical Association Physician Masterfile which was not available to the researchers.

Unintended Consequences

A positive unintended consequence of conducting this workforce study was the timing of the results occurring nearly simultaneously with the advent of a bill put forward by the MSA calling for the licensure of CAAs in the state. The data collected for this study and presented to the MANA Board will assist CRNAs in educating legislators and dispelling the misinformation put forward by the MSA stating that CAAs are the answer to meeting the anesthesia needs of rural and underserved areas.

Implications for Practice and Career Development

The data from this study refutes the claims put forth by the MSA that licensing CAAs in Michigan would answer the need for more anesthesia providers in rural and underserved areas. Certified Anesthesiologist Assistants cannot work without MDAs; and, MDAs nor CAAs are working in these areas with the greatest need. These findings only bolster the position of MANA calling for the removal of barriers to practice for CRNAs in the state of Michigan.

Analysis of the data supports changing Michigan's outdated anesthesia model by removing the requirement for physician supervision of CRNAs which will better serve Michigan residents, especially those in underserved communities. According to Becker's Hospital CFO Report (2020), nearly one in five Americans live in rural areas and these residents depend on their local hospital for care. Over the past 10 years, 133 of these rural hospitals in the United States have closed due to issues such as revenue pressure, complex patient populations, and attracting and retaining providers. Attracting and retaining providers is a key component of rural hospital closure. It is more difficult in these rural areas to recruit and maintain full-time healthcare providers, which leads to lack of access to care for patients and loss of revenue for hospitals. As rural hospitals close, residents are more likely to delay or forego care altogether.

The removal of CRNA physician supervision requirements in Michigan will assist in keeping Michigan's rural hospitals open by allowing them the flexibility to safely meet patient needs and lower the cost of safe, high-quality anesthesia for patients. The passing of HB 4359 and the removal of Michigan CRNA physician supervision requirements would align Michigan's anesthesia model with 41 other states and the District of Columbia. Policy makers must be educated on the benefits of CRNA independent anesthesia care, especially in underserved communities, which includes greater accessibility, lower costs, and the provision of safe, high-quality anesthesia. It is also crucial that policy makers understand that CAAs are not working in rural or underserved areas of Michigan and therefore, do not answer the need for these communities.

Contribution Of Project in Achieving DNP Essentials

This project meets many of the Essentials of Doctoral Education for Advanced Nursing Practice. Essential I (Scientific Underpinnings for Practice) was met through the use of theories to develop this project, such as Kingdon's Multiple-Streams Conceptual Framework. Essential II (Organizational and Systems Leadership for Quality Improvement and Systems Thinking) encompasses the development of healthcare delivery models to eliminate health disparities, promote patient safety, and to assess the impact of practice policies on meeting the health needs of patients. This project met Essential II by analyzing the impact of various anesthesia providers and anesthesia delivery models on anesthesia cost, patient safety, and access to anesthesia services in underserved areas of Michigan.

Essential III (Clinical Scholarship and Analytical Methods) was met during this project as we used clinical scholarship to develop and evaluate this project. Analytical methods were used to appraise existing literature and evaluate outcomes. The findings of this project were used to

develop PowerPoint presentations, a one-pager, and an evidence-based practice paper that may be used to influence future anesthesia practice guidelines. Essential IV (Information Systems/Technology and Patient Care Technology) was met through the use of public databases to gather information on anesthesia providers within Michigan. Essential V (Health Care Policy for Advocacy in Health Care) describes how commitment to policy development and political activism are critical to creating a healthcare system that meets the needs of its patients. Essential V was met in this project as the data collected will be used to influence current healthcare policy in Michigan, to educate legislators on how the CAA profession is not answering the need for anesthesia services in rural areas of Michigan, and to advocate for CRNA full scope of practice.

Essential VI (Interprofessional Collaboration for Improving Patient and Population Health Outcomes) describes the use of communication and collaboration in the development of practice models, guidelines, and standards of care. It also encompasses interprofessional leadership in the analysis of practice and policy issues. Essential VI was met during this project as it led MANA in working towards resolving a policy issue. Essential VIII (Advanced Nursing Practice) was also met. This project used analytical methods to evaluate the associations among practice, organizational and policy issues related to Michigan anesthesia practice.

Recommendations and Limitations

A limitation of this workforce study was the need to rely on the NPI database as the sole source for data on anesthesiologist employment locations due to inaccessibility to the American Medical Association Physician Masterfile. Another limitation of the study is that the correlation analyses cannot capture or determine those populations or providers that may cross county borders for employment or care. Lastly, the researchers were only able to obtain data on 29 of

the 31 CAHs in Michigan that perform surgery, as two of these hospitals were unwillingly to share anesthesia provider data.

More research is needed comparing the quality of care, safety, and patient outcomes for CRNAs vs. MDAs vs. CAAs.

Conclusion

In rural and underserved areas of Michigan, the use of CAAs compared to the use of CRNAs does not provide increased access to high quality cost-effective anesthesia services. There are only 21 CAAs employed in Michigan, with the majority working in highly populated, metropolitan areas. Results of our data analysis revealed that CRNAs are the most prevalent provider in all population classifications, including the rural and underserved areas of Michigan. Certified Anesthesiologist Assistants can only practice where MDAs are on-site and available for direct supervision. According to the AANA (2008), "CAAs are educated solely to support and serve as an assistant to an anesthesiologist, and they cannot work unless an anesthesiologist is onsite". If MDAs are not present in these rural and underserved areas, CAAs cannot assist in answering the need for these areas of Michigan, as it would be illegal for them to practice without an MDA. The motivation of anesthesiologists to promote CAA utilization may be driven by a political agenda to protect their own profession. As CRNAs are currently advocating for more independent practice, MDAs strive to maintain the more lucrative ACT model. Eliminating scope of practice restrictions for CRNAs will be key to containing anesthesia costs and increasing accessibility of anesthesia services for Michigan hospitals and residents.

References

- American Association of Nurse Anesthetists. (2017). Anesthesiologist assistant myths vs. reality.

 Retrieved from https://www.aana.com/states/state-association-advocacyresources/anesthesiologist-assistants-tool-kit
- American Association of Nurse Anesthetists (n.d.). Certified registered nurse anesthetists at a glance. Retrieved from
 - https://www.aana.com/search?keyword=CRNAs%20at%20a%20glance
- American Association of Nurse Anesthetists. (2008). Reality check: the truth behind the distortions. Retrieved from https://www.aana.com/docs/default-source/sga-my-aana-web-documents-(members-only)/03realitycheck08.pdf?sfvrsn=4bef48b1 4
- American Psychological Association. (2009). *Publication manual of the American Psychological Association* (6th ed.). Washington, DC: Author. ISBN-13: 9781433805615
- American Society of Anesthesiologists (2019). Statement of the anesthesia care team committee of origin: Anesthesia care team. Retrieved from https://www.asahq.org/whensecondscount/anesthesia-101/anesthesia-care-team/
- Beauchamp, C., Hranchook, A., Jones, A., McClanahan, M., Purcell, F., & Stone, S. (2019). I hear certified physician anesthesiologist assistants (CAAs) may be joining my anesthesia practice. *Michigan CRNA Playbook on CAAs*.
- CMS Manual System (2017). Medicare claims processing. Retrieved from https://www.cms.gov/Regulations-and-Guidance/Guidance/Transmittals/2017Downloads/R3747CP.pdf

Coomer, N. M., Beadles, C., Chew, R. Mills, A., Gillen, E. & Quraishi, J. A. (2019). Anesthesia staffing models and geographic prevalence post-medicare CRNA/physician exemption policy. *Nursing Economics*, *37*(2), 86-91.

- Disparity. (2019). *Dictionary.com*. Retrieved from https://www.dictionary.com/browse/disparity?s=t
- Dussault, G., & Franceschini, C. M. (2006). Not enough there, too many here: Understanding geographic imbalances in the distribution of health workforce. *Human Resources for Health 4*(12). doi: 10.1186/1478-4491-4-12
- Ellison, Ayla. (2020). 16 rural hospital closures in 2020. Becker's Hospital CFO Report.

 Retrieved from https://www.beckershospitalreview.com/finance/16-rural-hospital-closures-in-2020.html
- Geographic. (2019). *Dictionary.com*. Retrieved from https://www.dictionary.com/browse/geographic?s=ts
- Hogan, P., Seifert, R., Moore, C., & Simonson, B. (2010). Cost effectiveness analysis of anesthesia providers. *Nursing Economic\$*, 28(3), 159-169.
- Kusi-Ampofo, O., Church, J., Conteh, C., & Heinmiller, B. T. (2015). Resistance and change: A multiple streams approach to understanding health policy making in Ghana. *Journal of Health Politics, Policy & Law, 40*(1), 195-219. doi: 10.1215/03616878-2854711
- Lewin Group. (2016). Update of cost effectiveness of anesthesia providers. *Healthcare and human services policy, research, and consulting- with real world perspective.*
- Lewis, S. R., Nicholson, A., Smith, A. F., & Alderson, P. (2014). Physician anesthetists versus non-physician providers of anesthesia for surgical patients. *Cochrane Database of Systematic Reviews*, (7), 1-75.

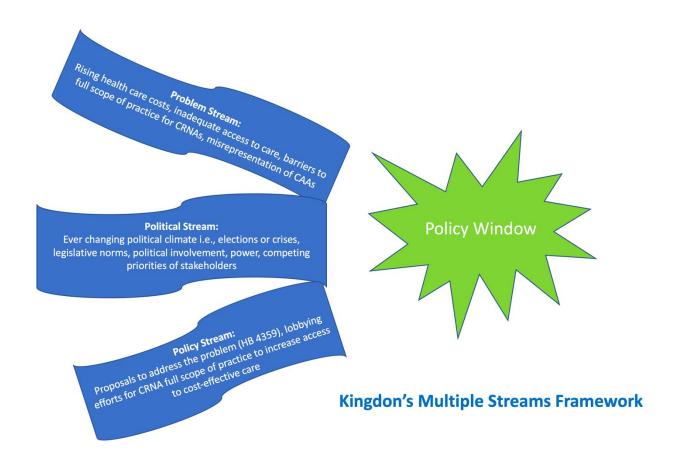
Liao, J. C., Quraishi, J. A., & Jordan, L. M. (2015). Geographical imbalance of anesthesia providers and its impact on the uninsured and vulnerable populations. *Nursing Economics*, 33(5), 263-270.

- Medicare. (2018). Physician compare. Retrieved from http://Medicare.gov
- Melnyk, B. M., & Fineout-Overholt, E. (2015). Evidence-based practice in nursing and healthcare: A guide to best practice (Third edition). Philadelphia: Wolters Kluwer Health.
- Merriam-Webster online. (2019) Retrieved from https://www.merriam-webster.com/dictionary/
- Negrusa, B., Hogan, P., Warner, T. J., Schroeder, C., & Pang, B. (2016). Scope of practice laws and anesthesia complications: no measurable impact of certified registered nurse anesthetist expanded scope of practice on anesthesia-related complications. *Medical Care*, *54* (10), 913-92.
- O'Neill, A. N. (2017). Anesthesia policies- increasing costs with no improvement in value. *Journal of Healthcare Communications* 2(66). doi: 10.4172/2472-1654.100107
- Plagenhoef, S. J. (2008). Anesthesiologist assistants vs. nurse anesthetists: What are the differences? *ASA Monitor* 72, 18-19.
- Salaries. (2019). Salary.com. Retrieved from https://www.salary.com/research/salary.
- U.S. Centers for Medicare and Medicaid Services. (2019). National plan and provider enumeration system NPI registry. Retrieved from http://npiregistry.cms.hhs.gov
- United States Department of Agriculture, Economic Research Service. (2013). Rural-urban continuum codes [codes and classification]. Washington, DC. Retrieved from ers.usda.gov

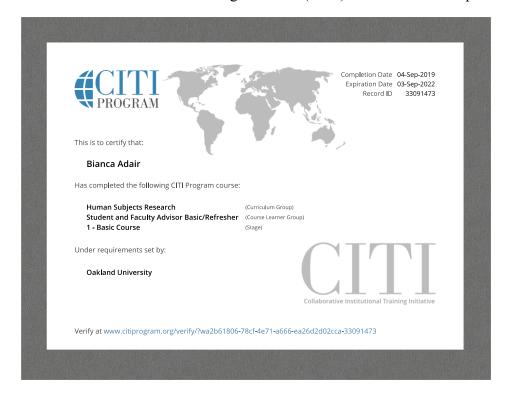
United States/State of Michigan v. Traverse Anesthesia Associates, 1:18-cv-1416 (W.D. Mich. 2018).

Appendices

Appendix A: Kingdon's Multiple-Streams Conceptual Framework



Appendix B: Collaborative Institutional Training Initiative (CITI) Certification Completion





Appendix C: Administration Area Resource File (ARF)

				,		Description of the second seco						,	,	
Alcona County	10942	9 Hural Population	0	0	o	39735	0.195	0.402	0.09	0.24	0	0	0	
Alger County	9601	7 Urban Population	0	_	0	46007	0.126	0.419	0.08	0.21	_		0	
Allegan County	111408	4 Urban Population	0	4	0	59883	0.107	0.628	0.05	0.2	-	N	0	
Alpena County	29598	7 Urban Population	0	6	9	41991	0.153	0.558	0.06	0.29	0	0	0	
Antrim County	23580	9 Rural Population	0	0	0	52589	0.083	0.533	0.08	0.23	0	0	0	
Arenac County	15899	8 Rural Population	0	0	0	40769	0.159	0.498	0.08	0.28	0	0	0	
Baraga County	8860	9 Rural Population	0	_	0	42444	0.154	0.413	0.08	0.25	_	_	0	
Barry County	59173	2 Metropolitan Population	0	N	0	61016	0.085	0.617	0.05	0.18		ω	_	
Bay County	107771	3 Metropolitan Population	0	33	14	48005	0.156	0.585	0.06	0.25	0	0	0	
Benzie County	17525	9 Rural Population	0	0	0	56639	0.103	0.563	0.07	0.23	0	0	0	
Berrien County	156813	3 Metropolitan Population	0	18	13	49135	0.153	0.614	0.07	0.27	0	0	0	
Branch County	45248	6 Urban Population	0	On		50536	0.145	0.57	0.08	0.27	0	0	0	
Calhoun County	136146	3 Metropolitan Population	0	34	9	47426	0.173	0.59	0.06	0.29	0	0	0	
Cass County	52293	2 Metropolitan Population	0	N	0	53571	0.112	0.605	0.07	0.24		ω	0	
Charlevoix County	25949	7 Urban Population	0	5	0	53207	0.106	0.592	0.06	0.2	_	7	_	
Cheboygan County	26152	7 Urban Population	0	0	0	46161	0.134	0.526	0.08	0.29	0	0	0	
Chippewa County	38520	7 Urban Population	0	7	-	44483	0.171	0.527	0.09	0.22	0	0	0	
Clare County	30926	6 Urban Population	0	cn	0	37369	0.206	0.48	0.08	0.34	0	0	0	
Clinton County	75382	2 Metropolitan Population	0	73	59	67482	0.075	0.63	0.05	0.13		N	0	
Crawford County	14074	7 Urban Population	0	ω	22	47443	0.136	0.491	0.07	0.3	0	0	0	
Delta County	37069	5 Urban Population	0	4	1	46490	0.124	0.553	0.06	0.26		a	22	
Dickinson County	26168	7 Urban Population	0	10	з	48966	0.108	0.558	0.06	0.22	0	0	0	
Eaton County	107759	2 Metropolitan Population	0	9	4	62474	0.093	0.629	0.06	0.17	N	==	ю	
Emmet County	32694	7 Urban Population	0	8	10	54055	0.083	0.638	0.08	0.19	0	0	0	
Genesee County	425790	2 Metropolitan Population	0	177	31	47006	0.188	0.576	0.07	0.33	0	0	0	
Gladwin County	25692	6 Urban Population	0	_	0	43290	0.156	0.447	0.08	0.27	0	0	0	
Gogebic County	16427	7 Urban Population	0	9	0	38798	0.175	0.476	0.08	0.28	1	9	0	
Grand Traverse County	86986	5 Urban Population	_	47	31	61485	0.095	0.645	0.06	0.19	0	0	0	
Gratiot County	42476	6 Urban Population	0	4	7	44991	0.162	0.509	0.06	0.25	0	0	0	
Hillsdale County	46688	6 Urban Population	0	7	_	48392	0.135	0.545	0.07	0.26	0	0	0	
Houghton County	36628	5 Urban Population	0	=	Ch	42852	0.19	0.545	0.07	0.23	1	ы		
Huron County	33118	7 Urban Population	0	cn	1	46320	0.126	0.563	0.07	0.23	23	7	0	
Ingham County	280895	2 Metropolitan Population	_	79	2	50940	0.181	0.637	0.06	0.24	0	0	0	
lonia County	63905	4 Urban Population	0	13	_	54343	0.099	0.589	0.06	0.21		4	0	
osco County	25887	7 Urban Population	0	ch	N	42102	0.151	0.466	0.08	0.31	0	0	0	
Iron County	11817	7 Urban Population	0	2	0	38918	0.142	0.487	0.07	0.28		2	0	
sabella County	70311	4 Urban Population	0	_	0	44408	0.234	0.615	0.08	0.19	0	0	0	
Jackson County	160248	3 Metropolitan Population	0	58	20	51431	0.137	0.566	0.06	0.25	0	0	0	
Kalamazoo County	250331	2 Metropolitan Population	1	120	53	54431	0.144	0.664	0.06	0.22	0	0	0	
Kalkaska County	17153	7 Urban Population	0	0	0	46004	0.141	0.55	0.08	0.3	0	0	0	
Kent County	602622	2 Metropolitan Population	-	106	164	60351	0.113	0.689	0.06	0.22	0	0	0	
Keweenaw County	2156	9 Rural Population	0	0	0	49779	0.12	0.485	0.07	0.19	0	0	0	
Jake County		2												

Wexford County	Wayne County	Washtenaw County	Van Buren County	Tuscola County	Shiawassee County	Schoolcraft County	Sanilac County	St. Joseph County	St. Clair County	Saginaw County	Roscommon County	Presque Isle County	Ottawa County	Otsego County	Oscoda County	Osceola County	Ontonagon County	Ogemaw County	Oceana County	Oakland County	Newaygo County	Muskegon County	Montmorency County	Montcalm County	Monroe County	Missaukee County	Midland County	Menominee County	Mecosta County	Mason County	Marquette County	Manistee County	Macomb County	Mackinac County	Luce County	Livingston County	Lenawee County	Leelanau County	Lapeer County
32/35	1820584	344791	76258	55729	70648	8485	43114	61295	163040	200169	24449	13376	263801	24164	8640	23528	6780	21699	26570	1202362	48460	172188	9765	63342	152021	14849	83629	24029	42798	28705	67077	24733	840978	11113	6631	180967	99892	21708	88319
/ Urban Population		2 Metropolitan Population	2 Metropolitan Population	6 Urban Population	4 Urban Population	7 Urban Population	6 Urban Population	4 Urban Population	Metropolitan Population	3 Metropolitan Population	7 Urban Population	7 Urban Population	2 Metropolitan Population	7 Urban Population	9 Rural Population	9 Rural Population	9 Rural Population	9 Rural Population	6 Urban Population	1 Metropolitan Population	6 Urban Population	3 Metropolitan Population	9 Rural Population	2 Metropolitan Population	3 Metropolitan Population	9 Rural Population	3 Metropolitan Population	7 Urban Population	6 Urban Population	7 Urban Population	5 Urban Population	7 Urban Population	1 Metropolitan Population	7 Urban Population	7 Urban Population	1 Metropolitan Population	4 Urban Population	9 Rural Population	 Metropolitan Population
0	_	0	0	0	0	0	0	0	0	0	0	0	0	0	0	_	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
64	232	337	80	_	4	_	2	3	61	89	0	0	10	7	0	12	_	ω	4	999	22	22	0	6	20	0	27	0	s	8	32	4	125	_	2	9	2	0	=
4	73	378	0	_	4	0	0	ω	9	21	0	0	15	ch	0	0	0	_	0	459	0	33	0	ω	7	0	11	0	2	0	12	_	32	0	0	1	Ch	0	N
44166	45321	69434	52351	47694	54742	40747	45277	50117	55240	46919	40302	46439	67468	52645	40255	42689	38906	40150	46217	76387	46724	30737	42305	47000	61514	44766	59271	45508	44460	49663	50771	47172	60466	46507	42255	80897	53972	63831	58952
0.131 0.57		0.15	0.153 0.61	0.127 0.561	0.108 0.601	0.132 0.457	0.159 0.57	0.136 0.621	0.138 0.605	0.17 0.571	0.171 0.413	0.142 0.464	0.068 0.687	0.114 0.581	0.171 0.468	0.176 0.519	0.141 0.418	0.159 0.478	0.155 0.552	0.082 0.661	0.156 0.548	0.318 0.584	0.182 0.407	0.143 0.561	0.1 0.609	0.129 0.556	0.113 0.601	0.124 0.589	0.184 0.553	0.121 0.567	0.141 0.568	0.131 0.49	0.11 0.635	0.134 0.548	0.207 0.411	0.05 0.659	0.104 0.584	0.07 0.556	0.101 0.583
	99 0.07			0.06	0.06	0.08	0.07		0.06	0.06		0.08	0.05			0.08			0.09	0.05		0.06	0.07	0.07	0.05	0.08	0.05	99 0.07		0.06		0.08	0.06	0.11	0.08	0.04		0.09	33 0.06
0.32	0.39	0.15	0.3	0.28	0.24	0.27	0.25	0.29	0.24	0.3	0.31	0.25	0.13	0.28	0.32	0.3	0.23	0.33	0.31	0.15	0.3	0.32	0.26	0.27	0.19	0.28	0.2	0.22	0.24	0.26	0.2	0.26	0.22	0.21	0.28	0.11	0.22	0.12	0.21
	0	0		N	0		6	0	0	0	0	0			0	0	_	0	1		1	0	0	0	0	0	0	0	0	0	1	0	0	1	1	0	1	0	0
	Ĭ	Ī	Ĭ			ĺ		Ĭ	Ĭ	Ĭ	Ĭ		Ī	Ĭ		Ť				Ī	ĺ						_			Ť			Ť				Ī	_	
0	0	0	0	ω	0	_	4	0	0	0	0	0	0	0	0	0	_	0	N	0	Ф	0	0	0	0	0	0	0	0	0	ch	0	0	ω	2	0	(Jh	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	_	0	0	0	0	0	22	0	0
U	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	_	0	_	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Appendix D: Rural Urban Continuum Codes Database (2013)

FIPS	State	County_Name		RUCC_2013	Description
01003	MI	Alcona County	10,942		Nonmetro - Completely rural or less than 2,500 urban population, not adjacent to a metro are
01005	MI	Alger County	9,601		Nonmetro - Urban population of 2,500 to 19,999, not adjacent to a metro area
01007	MI	Allegan County	111,408		Nonmetro - Urban population of 20,000 or more, adjacent to a metro area
01009	MI	Alpena County	29,598		Nonmetro - Urban population of 2,500 to 19,999, not adjacent to a metro area
01011	MI	Antrim County	23,580		Nonmetro - Completely rural or less than 2,500 urban population, not adjacent to a metro an
01013	MI	Arenac County	15,899	8	Nonmetro - Completely rural or less than 2,500 urban population, adjacent to a metro area
01015	MI	Baraga County	8,860		Nonmetro - Completely rural or less than 2,500 urban population, not adjacent to a metro are
01017	MI	Barry County	59,173	2	Metro - Counties in metro areas of 250,000 to 1 million population
01019	MI	Bay County	107,771	3	Metro - Counties in metro areas of fewer than 250,000 population
01021	MI	Benzie County	17,525	9	Nonmetro - Completely rural or less than 2,500 urban population, not adjacent to a metro are
01023	MI	Berrien County	156,813	3	Metro - Counties in metro areas of fewer than 250,000 population
01025	MI	Branch County	45,248	6	Nonmetro - Urban population of 2,500 to 19,999, adjacent to a metro area
01027	MI	Calhoun County	136,146		Metro - Counties in metro areas of fewer than 250,000 population
01029	MI	Cass County	52,293		Metro - Counties in metro areas of 250,000 to 1 million population
01031	MI	Charlevoix County	25,949		Nonmetro - Urban population of 2,500 to 19,999, not adjacent to a metro area
01033	MI	Cheboygan County	26,152		Nonmetro - Urban population of 2,500 to 19,999, not adjacent to a metro area
01035	MI	Chippewa County	38,520		Nonmetro - Urban population of 2,500 to 19,999, not adjacent to a metro area
01037	MI	Clare County	30,926		Nonmetro - Urban population of 2,500 to 19,999, adjacent to a metro area
01039	MI	Clinton County	75,382		Metro - Counties in metro areas of 250,000 to 1 million population
01041	MI	Crawford County	14,074		Nonmetro - Urban population of 2,500 to 19,999, not adjacent to a metro area
	MI				
01043		Delta County	37,069		Nonmetro - Urban population of 20,000 or more, not adjacent to a metro area
01045	MI	Dickinson County	26,168		Nonmetro - Urban population of 2,500 to 19,999, not adjacent to a metro area
01047	MI	Eaton County	107,759		Metro - Counties in metro areas of 250,000 to 1 million population
01049	MI	Emmet County	32,694		Nonmetro - Urban population of 2,500 to 19,999, not adjacent to a metro area
01051	MI	Genesee County	425,790		Metro - Counties in metro areas of 250,000 to 1 million population
01053	MI	Gladwin County	25,692		Nonmetro - Urban population of 2,500 to 19,999, adjacent to a metro area
01055	MI	Gogebic County	16,427		Nonmetro - Urban population of 2,500 to 19,999, not adjacent to a metro area
01057	MI	Grand Traverse County	86,986		Nonmetro - Urban population of 20,000 or more, not adjacent to a metro area
01059	MI	Gratiot County	42,476		Nonmetro - Urban population of 2,500 to 19,999, adjacent to a metro area
01061	MI	Hillsdale County	46,688	6	Nonmetro - Urban population of 2,500 to 19,999, adjacent to a metro area
01063	MI	Houghton County	36,628	5	Nonmetro - Urban population of 20,000 or more, not adjacent to a metro area
01065	MI	Huron County	33,118	7	Nonmetro - Urban population of 2,500 to 19,999, not adjacent to a metro area
01067	MI	Ingham County	280,895		Metro - Counties in metro areas of 250,000 to 1 million population
01069	MI	Ionia County	63,905		Nonmetro - Urban population of 20,000 or more, adjacent to a metro area
01071	MI	losco County	25,887		Nonmetro - Urban population of 2,500 to 19,999, not adjacent to a metro area
01073	MI	Iron County	11,817		Nonmetro - Urban population of 2,500 to 19,999, not adjacent to a metro area
01075	MI	Isabella County	70,311		Nonmetro - Urban population of 20,000 or more, adjacent to a metro area
01077	MI	Jackson County	160,248		Metro - Counties in metro areas of fewer than 250,000 population
	MI				
01079		Kalamazoo County	250,331		Metro - Counties in metro areas of 250,000 to 1 million population
01081	MI	Kalkaska County	17,153		Nonmetro - Urban population of 2,500 to 19,999, not adjacent to a metro area
01083	MI	Kent County	602,622		Metro - Counties in metro areas of 250,000 to 1 million population
01085	MI	Keweenaw County	2,156		Nonmetro - Completely rural or less than 2,500 urban population, not adjacent to a metro are
01087	MI	Lake County	11,539		Nonmetro - Completely rural or less than 2,500 urban population, not adjacent to a metro are
01089	MI	Lapeer County	88,319		Metro - Counties in metro areas of 1 million population or more
01091	MI	Leelanau County	21,708		Nonmetro - Completely rural or less than 2,500 urban population, not adjacent to a metro are
01093	MI	Lenawee County	99,892	4	Nonmetro - Urban population of 20,000 or more, adjacent to a metro area
01095	MI	Livingston County	180,967	1	Metro - Counties in metro areas of 1 million population or more
01097	MI	Luce County	6,631	7	Nonmetro - Urban population of 2,500 to 19,999, not adjacent to a metro area
01099	MI	Mackinac County	11,113	7	Nonmetro - Urban population of 2,500 to 19,999, not adjacent to a metro area
01101	MI	Macomb County	840,978	1	Metro - Counties in metro areas of 1 million population or more
01103	MI	Manistee County	24,733	7	Nonmetro - Urban population of 2,500 to 19,999, not adjacent to a metro area
01105	MI	Marquette County	67,077		Nonmetro - Urban population of 20,000 or more, not adjacent to a metro area
01107	MI	Mason County	28,705		Nonmetro - Urban population of 2,500 to 19,999, not adjacent to a metro area
01109	MI	Mecosta County	42,798		Nonmetro - Urban population of 2,500 to 19,999, adjacent to a metro area
01111	MI	Menominee County	24,029		Nonmetro - Urban population of 2,500 to 19,999, not adjacent to a metro area
01113	MI	Midland County	83,629		Metro - Counties in metro areas of fewer than 250,000 population
01115	MI	Missaukee County	14,849		Nonmetro - Completely rural or less than 2,500 urban population, not adjacent to a metro are
01117	MI	Monroe County	152,021		Metro - Counties in metro areas of fewer than 250,000 population
01117	MI	Montcalm County	63,342		Metro - Counties in metro areas of 250,000 to 1 million population
01119	MI		9,765		Nonmetro - Completely rural or less than 2,500 urban population, not adjacent to a metro are
		Montmorency County			
01123	MI	Muskegon County	172,188		Metro - Counties in metro areas of fewer than 250,000 population
01125	MI	Newaygo County	48,460		Nonmetro - Urban population of 2,500 to 19,999, adjacent to a metro area
01127	MI	Oakland County	1,202,362		Metro - Counties in metro areas of 1 million population or more
01129	MI	Oceana County	26,570		Nonmetro - Urban population of 2,500 to 19,999, adjacent to a metro area
01131	MI	Ogemaw County	21,699		Nonmetro - Completely rural or less than 2,500 urban population, not adjacent to a metro are
01133	MI	Ontonagon County	6,780		Nonmetro - Completely rural or less than 2,500 urban population, not adjacent to a metro are
02013	MI	Osceola County	23,528		Nonmetro - Completely rural or less than 2,500 urban population, not adjacent to a metro are
02016	MI	Oscoda County	8,640	9	Nonmetro - Completely rural or less than 2,500 urban population, not adjacent to a metro are
02020	MI	Otsego County	24,164	7	Nonmetro - Urban population of 2,500 to 19,999, not adjacent to a metro area
02050	MI	Ottawa County	263,801		Metro - Counties in metro areas of 250,000 to 1 million population
02060	MI	Presque Isle County	13,376		Nonmetro - Urban population of 2,500 to 19,999, not adjacent to a metro area
02068	MI	Roscommon County	24,449		Nonmetro - Urban population of 2,500 to 19,999, not adjacent to a metro area
02070	MI	Saginaw County	200,169		Metro - Counties in metro areas of fewer than 250,000 population
02090	MI	St. Clair County	163,040		Metro - Counties in metro areas of 1 million population or more
02100	MI	St. Joseph County	61,295		Nonmetro - Urban population of 20,000 or more, adjacent to a metro area
02100	MI	Sanilac County	43,114		Nonmetro - Urban population of 2,500 to 19,999, adjacent to a metro area
	MI				Nonmetro - Orban population of 2,500 to 19,999, adjacent to a metro area Nonmetro - Urban population of 2,500 to 19,999, not adjacent to a metro area
02110		Schoolcraft County	8,485		
02122	MI	Shiawassee County	70,648		Nonmetro - Urban population of 20,000 or more, adjacent to a metro area
02130	MI	Tuscola County	55,729		Nonmetro - Urban population of 2,500 to 19,999, adjacent to a metro area
	MI	Van Buren County	76,258		Metro - Counties in metro areas of 250,000 to 1 million population
02150					
02150 02164 02170	MI MI	Washtenaw County Wayne County	344,791 1,820,584		Metro - Counties in metro areas of 250,000 to 1 million population Metro - Counties in metro areas of 1 million population or more

Appendix E: IRB Approval Letter



Institutional Review Board

June 9, 2020

Protocol #: IRB-FY2020-78

Research Team: Bianca Adair Anne Hranchook

The following study, "Anesthesia Providers and Geographical Disparities: A Work Study", has been has been determined to be No Human Subjects Research according to federal regulations.

The IRB decision is based on the following:

This is research on publicly available data.

Data collection sources to be used include the publicly available:

- Administration Area Resource File (ARF)
- Rural Urban Continuum Codes (RUCC)
- National Provider Identifier (NPI).

Please retain a copy of this correspondence for your records.

If you have any questions, please contact the IRB staff.

Thank you.

The Oakland University IRB

Appendix F: MANA Board of Directors PowerPoint Presentation

GEOGRAPHICAL DISPARITIES AND DISBURSEMENT OF MICHIGAN ANESTHESIA PROVIDERS:

A WORK STUDY

Bianca Adair, BSN, SRNA and Sarah Czarnowczan, BSN, SRNA

DNP Project Chair: Anne Hranchook, DNP, CRNA

Oakland University

Winter 2021

OBJECTIVES

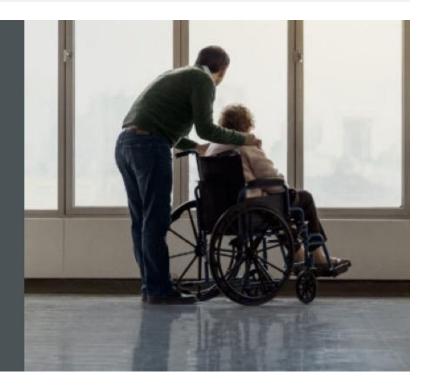
- Upon completion of this DNP presentation, the learner will be able to:
 - Differentiate between the three different types of anesthesia providers present in Michigan and their roles.
 - Describe the population that most AAs are currently serving in Michigan.
 - Analyze if the MSA assertions that AAs increase access to needed anesthesia services in underserved areas of Michigan are true.

INTRODUCTION

- Increase demand in health services in the United States
- One in five Americans live in rural areas and depend on their local hospital for care
 - According to a 2018 Government Accountability Office report:
- 64 rural hospitals closed between 2013 2017, which is twice the number
 of closures in the preceding five-year period

WHY ARE RURAL HOSPITALS CLOSING?

- Revenue pressure
- A complex patient population
- Attracting and retaining providers



MICHIGAN'S OUTDATED ANESTHESIA MODEL

Changing Michigan's outdated anesthesia model will give hospitals and health care facilities the flexibility needed to:

- Safely meet patient needs in underserved rural and urban communities
 - Help lower costs and out-of-pocket expenses for safe anesthesia
- Align Michigan's anesthesia model with 41 other states (and the District of Columbia)

CRNAS ARE THE ANSWER

- Since 2012, intensive efforts to remove barriers to practice for CRNAs
- Michigan:
 - One of only 9 states requiring physician supervision of CRNAs in medical or nursing board statutes or regulations
- Michigan Society of Anesthesiologists (MSA) and other physician groups (Michigan State Medical Society) have strongly opposed allowing CRNAs to practice to the full extent of their education and licensure.

CRNAS ARE THE ANSWER

- CRNAs are some of the highest-educated medical professionals
- With bipartisan House Bill 4359, Michigan has the opportunity to do what 41 other states (and the District of Columbia) have done to improve access to safe anesthetic care.

JUNE 2010 LEWIN GROUP STUDY

The study concluded:

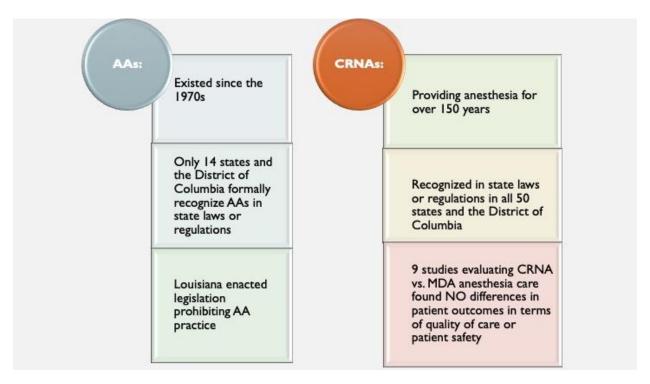
- The most cost-effective delivery model is CRNAs practicing independently
 - · CRNAs acting independently are the lower cost to the private payer
- As the demand for health care continues to grow, increasing the number of CRNAs, and permitting them to practice in the most efficient delivery model, will be a key to containing costs while maintaining quality care

THE FUTURE OF NURSING: LEADING CHANGE, ADVANCING HEALTH

- In its 2010 report, the Institute of Medicine (IOM) called on states to eliminate "outdated regulations and organizational and cultural barriers that limit the ability of nurses... to practice to the full extent of their education, training, and competence."
- Despite this call on the part of the IOM, laws that regulate APRN practice continue to limit practice
- Executive Order 13890 (President Trump) Protecting and Improving Medicare for Nation's Seniors

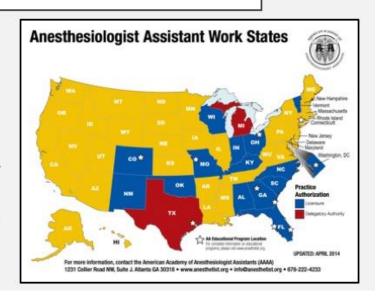


- In Michigan, there are 3 types of anesthesia providers:
 - Certified Registered Nurse Anesthetists (CRNAs)
 - Anesthesiologists (MDAs)
 - Anesthesiologist Assistants (AAs)



ASA & MSA OPPOSITION

- For economic reasons, the American Society of Anesthesiologists (ASA) and the Michigan Society of Anesthesiologists (MSA) has strongly opposed allowing CRNAs to practice to the full extent of their education and licensure.
- In keeping with the national agenda of the ASA and in response to legislation put forth by MANA, the MSA continues to provide misinformation on the role of AAs and their ability to assist in improving access to care for Michigan residents.



PURPOSE OF WORKFORCE STUDY

PICOT:

In rural and underserved areas of Michigan, does the use of AAs in comparison to the use of CRNAs provide increased access to high quality cost-effective anesthesia services?

This analysis will be used to identify and assess where AAs are working in the state of Michigan and whether they are located in geographic locations where:

- A) anesthesiologists are working
- B) where economic conditions are associated with rural populations in underserved areas

COST OVERVIEW

Median CRNA Salary: \$166,540
Median MDA Salary: \$420,284
Median AA Salary: \$158,383

CRNA Independent Practice

 \$2 million for 12 CRNAs

CRNA in an ACT (3:1 Ratio)

\$3.68 million

AAs under medical direction (2:1 Ratio)

 \$4.52 million for 12 MDAs and 6 AAs

(AANA, 2017; Hogan, Seifer, Moore, & Simonson, 2010)

METHODS

Data Collection Sources:

- Administration Area Resource File (ARF)
- Rural Urban Continuum Codes (RUCC)
- National Provider Identifier Database

Critical Access Hospitals

CRNA Independent Hospitals

METHODS

Statistical Analysis:

- Descriptive Statistics
- Pearson Correlation Analysis
- Spearman Correlation Analysis
- Analysis of Variance
- Two Tailed Paired Samples z-Test

RUCC CLASSIFICATION FOR MICHIGAN COUNTIES

RURAL COUNTY:

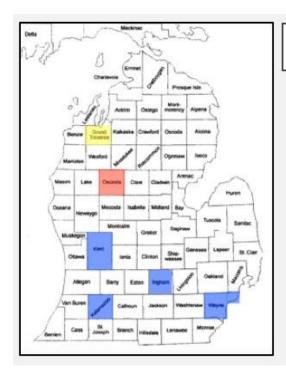
- Less than 2,500 population, not adjacent to metro area
- Less than 2,500 population, adjacent to metro area

URBAN COUNTY:

- Population of 2,500 to 19,999, not adjacent to metro area
- Population of 2,500 to 19,999, adjacent to metro area
- Urban population of 20,000 or more, not adjacent to metro area
- Urban population of 20,000 or more, adjacent to metro area

METROPOLITAN COUNTY:

- Counties in metro areas of fewer than 250,000 population
- Counties in metro areas of 250,000 to 1 million population
- Counties in metro areas of I million population or more



AA LOCATION IN MICHIGAN BY COUNTY

19 AAs

· Metropolitan Areas:

- Ingham County: One AA
- Kalamazoo County: One AA
- Kent County: 16 AAs
- Wayne County: One AA

IAA

Urban Area:

Grand Traverse County: One AA

LAA

· Rural Area:

Osceola County: One AA?

AVERAGE NUMBER OF ANESTHESIA PROVIDERS PER COUNTY BY PROVIDER TYPE:

· CRNA:

34.99 average CRNAs per county in Michigan

· MDA:

19.13 average MDAs per county in Michigan

· AA:

• 0.25 average AAs per county in Michigan

MEAN # OF ANESTHESIA PROVIDER TYPE BY POPULATION CLASSIFICATION

Population Classification	Mean # of CRNA	Mean # of MDA	Mean # of AA
Rural Population	0.50	0.07	0.07
Urban Population	5.37	2.60	0.02
Metropolitan Population	102.54	56.73	0.73

- Higher mean number of CRNAs present in Michigan rural counties when compared to both mean numbers of MDAs and AAs in rural counties
- Higher mean number of CRNAs present in Michigan urban counties when compared to both mean numbers of MDAs and AAs in urban counties

OF ANESTHESIA PROVIDERS PER 10,000 PEOPLE BY POPULATION CLASSIFICATION

Population Classification	# of CRNAs / 10,000 people	# of MDAs / 10,000 people	# of AAs / 10,000 people
Rural Population	0.35 CRNAs per 10,000	0.05 MDAs per 10,000	0.05 AAs per 10,000
Urban Population	1.43 CRNAs per 10,000	0.692 MDAs per 10,000	0.0062 AAs per 10,000 people
Metropolitan Population	3.30 CRNAs per 10,000	1.83 MDAs per 10,000	0.024 AAs per 10,000

 CRNAs are 7 times more prevalent than MDAs per 10,000 people in Michigan rural counties

ANOVA: ANESTHESIOLOGIST ASSISTANTS & POPULATION CLASSIFICATION

- The ANOVA was examined based on an alpha value of 0.05.
- The results of the ANOVA were not significant, p = .252.
- The differences in AAs among the levels of Population Classification were all similar.

AAs do NOT have a greater presence in rural/urban or underserved areas of Michigan

ANESTHESIOLOGIST ASSISTANTS & POPULATION SIZE

- Spearman Correlation:
 - The result of the correlation was examined based on an alpha value of 0.05.
 - A weak, but significant positive correlation was observed between AAs and Population Size $(r_s = 0.29, p = .009)$
 - AAs are significantly positively correlated with increased population size in Michigan counties.

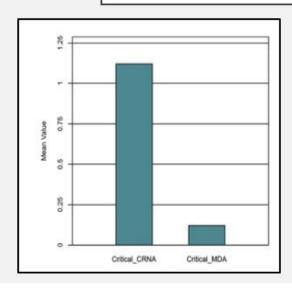
CRITICAL ACCESS HOSPITALS

	Average Number of CRNAs	Average Number of MDAs
Critical Access Hospitals	3.88	0.42

Critical Access
Hospitals:
designed to reduce
the financial
vulnerability of rural
hospitals and improve
access to healthcare
by keeping essential
services in rural
communities

 No AAs are present in Critical Access Hospitals in Michigan.

CRITICAL ACCESS HOSPITALS

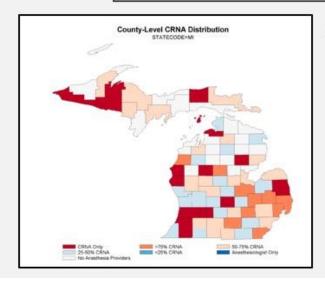


- Two Tailed Paired Samples z-Test:
 - The result of the two-tailed paired samples z-test was significant based on an alpha value of 0.05.
 - p < .001
 - The average number of CRNAs present in Critical Access Hospitals is significantly higher than the average number of MDAs present in Critical Access Hospitals (1.12 vs. 0.12, respectively).

CRITICAL ACCESS HOSPITALS

- Total of 38 Critical Access Hospitals in Michigan:
 - 31 Critical Access Hospitals do surgery. We were able to obtain data on 29 of these Critical Access Hospitals.
 - 22 out of the 29 Critical Access Hospitals in Michigan where surgery is done and on which we were able to collect data are <u>CRNA ONLY</u>.

CRNA INDEPENDENT HOSPITALS



- 12 <u>CRNA Independent Hospitals in</u> Michigan:
 - The majority of CRNA Independent Hospitals are located in Urban counties

• Rural: I Hospital

Urban: 7 Hospitals

• Metro: 4 Hospitals

OF COUNTIES WITH ONLY CRNAS

•21 counties (25%) have only CRNAs

(no MDAs with NPI numbers in these counties)

ANESTHESIA PROVIDER & MEDIAN HOUSEHOLD INCOME

MDAs are more positively correlated with higher median household income than CRNAs

 $(r_p = 0.46 \text{ vs. } 0.42, \text{ respectively, p} < 0.001).$

SUMMARY

- Our Michigan anesthesia workforce distribution analysis reveals that:
 - MDA workforce distribution is more highly associated with:
 - I) Increased population
 - 2) Increased median household income
 - AA workforce distribution, like MDAs, is:
 - · I) more highly associated with increased population
 - 2) AAs are NOT working in rural and underserved areas

SUMMARY

- Population statistics calculated for MDAs and AAs are exactly the same
 - · AAs are working in highly populated, metropolitan areas
 - MDAs proposal that AAs are the answer for rural and underserved areas in Michigan proves to be INACCURATE

SUMMARY

- The most prevalent providers in rural, urban, and underserved populations are CRNAs
- Our data supports CRNAs as the most costeffective and accessible anesthesia provider within rural and underserved areas in Michigan

AAs cannot work without the direct supervision of an anesthesiologist.

If anesthesiologists are not present in these underserved, rural, or urban areas, how can they claim that AAs will grant greater accessibility to anesthesia care?

THEY CAN'T.

LIMITATIONS

- Reliance on NPI database for healthcare provider employment locations, due to inaccessibility to American Medical Association Physician Masterfile.
- One limitation of these correlation analyses is that they cannot capture or determine those populations or providers that may cross county borders for care or work respectively.
- Only able to obtain data on 29 of the 31 Critical Access Hospitals in Michigan.
- Future research:
 - Focusing on patient outcomes in relation to CRNA vs. MDA vs. AA anesthesia care.

ONE-PAGER



REFERENCES

- American Association of Nurse Anesthetists. (2017). Anesthesiologist assistant myths vs. reality. Retrieved from https://www.aana.com/states/state-association-advocacy-resources/anesthesiologist-assistants-tool-kit
- American Association of Nurse Anesthetists (n.d.). Certified registered nurse anesthetists at a glance. Retrieved from https://www.aana.com/search?keyword=CRNAs%20at%20glance
- American Association of Nurse Anesthetists. (2008). Reality check: the truth behind the distortions. Retrieved from https://www.aana.com/docs/default-source/sga-my-aana-web-documents-(members only)/03realitycheck08.pdf?sfvrsn=4bef48b1_4
- American Psychological Association. (2009). Publication manual of the American Psychological Association (6th ed.). Washington, DC:Author. ISBN-13: 9781433805615
- Beauchamp, C., Hranchook, A., Jones, A., McClanahan, M., Purcell, F., & Stone, S. (2019). I hear certified physician anesthesiologist assistants (CAAs) may be joining my anesthesia practice. *Michigan CRNA Playbook on CAAs*.
- Coomer, N. M., Beadles, C., Chew, R. Mills, A., Gillen, E. & Quraishi, J.A. (2019). Anesthesia staffing models and geographic prevalence post-medicare CRNA/physician exemption policy. Nursing Economics, 37(2), 86-91.
- Disparity. (2019). Dictionary.com. Retrieved from https://www.dictionary.com/browse/disparity?s=t
- Dussault, G., & Franceschini, C. M. (2006). Not enough there, too many here: Understanding geographic imbalances in the distribution of health workforce. Human Resources for Health 4(12). doi: 10.1186/1478-4491-4-12

REFERENCES

- Geographic. (2019). Dictionary.com. Retrieved from https://www.dictionary.com/browse/geographic?s=ts
- Hogan, P., Seifert, R., Moore, C., & Simonson, B. (2010). Cost effectiveness analysis of anesthesia providers. Nursing Economic\$, 28(3), 159-169.
- Kusi-Ampofo, O., Church, J., Conteh, C., & Heinmiller, B.T. (2015). Resistance and change: A multiple streams approach to understanding health policy making in Ghana. Journal of Health Politics, Policy & Law, 40(1), 195-219. doi: 10.1215/03616878-2854711
- Lewin Group. (2016). Update of cost effectiveness of anesthesia providers. Healthcare and human services policy, research, and consulting- with real world perspective.
- Lewis, S. R., Nicholson, A., Smith, A. F., & Alderson, P. (2014). Physician anesthetists versus non-physician providers of anesthesia for surgical patients. Cochrane Database of Systematic Reviews, (7), 1-75.
- Liao, J. C., Quraishi, J.A., & Jordan, L. M. (2015). Geographical imbalance of anesthesia providers and its impact on the uninsured and vulnerable populations. Nursing Economics, 33(5), 263-270.
- Medicare. (2018). Physician compare. Retrieved from http://Medicare.gov
- Melnyk, B. M., & Fineout-Overholt, E. (2015). Evidence-based practice in nursing and healthcare: A guide to best practice (Third edition). Philadelphia: Wolters Kluwer Health.
- Merriam-Webster online. (2019) Retrieved from https://www.merriam-webster.com/dictionary/
- Negrusa, B., Hogan, P., Warner, T. J., Schroeder, C., & Pang, B. (2016). Scope of practice laws and anesthesia complications: no measurable impact
 of certified registered nurse anesthetist expanded scope of practice on anesthesia-related complications. Medical Care, 54 (10), 91392.

REFERENCES

- O'Neill, A. N. (2017). Anesthesia policies- increasing costs with no improvement in value.
- Journal of Healthcare Communications 2(66). doi: 10.4172/2472-1654.100107
- Plagenhoef, S. J. (2008). Anesthesiologist assistants vs. nurse anesthetists: What are the differences? ASA Monitor 72, 18-19.
- Salaries. (2019). Salary.com. Retrieved from https://www.salary.com/research/salary.
- U.S. Centers for Medicare and Medicaid Services. (2019). National plan and provider enumeration system NPI registry. Retrieved from http://npiregistry.cms.hhs.gov
- United States Department of Agriculture. (2013). Rural-urban continuum code. Retrieved from ers.usda.gov
- United States/State of Michigan v.Traverse Anesthesia Associates, 1:18-cv-1416 (W.D. Mich. 2018).

Appendix G: Legislative One-Pager



CRNAS ARE THE MOST PREVALENT PROVIDER IN RURAL & UNDERSERVED AREAS OF MICHIGAN

ABOUT AAs:

- AAs are NOT licensed to practice in Michigan and thus there are very few in the state.
- Although AAs have existed since the 1970s, only 14 states and the District of Columbia have formally recognized AAs in state laws or regulations.
- Louisiana has actually enacted legislation prohibiting AA practice.
- In contrast, every state authorizes CRNAs to provide anesthesia care.
 Nurse anesthetists are board-certified, highly qualified, and explicitly recognized in state laws or regulations in all 50 states, and the District of Columbia.

AAS DON'T ANSWER THE NEED:

- In keeping with the national agenda of the ASA and in response to legislation put forth by MANA, the Michigan Society of Anesthesiologists continues to provide misinformation on the role of AAs and their ability to assist in improving access to care for Michigan.
- AAs are not licensed to practice in Michigan, thus there are very few in the state.
- AAs function under medical direction by an anesthesiologist, meaning they cannot work without being directed by an anesthesiologist.
- In comparison, CRNAs are trained to be autonomous providers who are not required to work with or under the supervision of an anesthesiologist, offering increased access to anesthesia services and greater costeffectiveness.

PROVIDER PRESENCE:

- Of the 21 AAs in Michgan, 19 of them are located in metropolitan areas, therefore they are not increasing access to care in underserved areas.
 - NO AAS are present in rural or underserved areas
 - CRNAs are the most prevalent and costeffective providers in rural and underserved areas

CRITICAL ACCESS HOPSITALS:

- CRNAs are over 9 times more likely to be in Critical Access Hospitals than MDAs
- NO AAs are present in Crtical Access Hospitals in MIchigan
- 22 out of the 29 Critical Access Hospitals in Michigan are <u>CRNA</u> <u>ONLY PRACTICES - NO</u> <u>MDAs and thus NO AAs</u>

Fast Facts

COST:

- CRNA Independent Practice: \$2 Million for 12 CRNAs
- CRNA in an ACT (3:1 Ratio): \$3.68 Million
- AAs Under Medical
 Direction (2:1 Ratio):
 4.52 million for 12
 MDAs and 6 AAs
- Costs incurred by the medically directed model are by far the highest and most inefficient

SOCIOECONOMIC FACTORS:

- AAs and MDAs are correlated with <u>higher</u> median household income than CRNAs
- AAs cannot work without the direct supervision of an MDA. If MDAs are not present in these underserved or rural areas, how can they claim that AAs will grant greater accessibility to anesthesia services in these areas?

FOR MORE INFORMATION, CONTACT:

BIANCA ADAIR, Student Registered Nurse Anesthetist | Biancaadair@oakland.edu SARAH CZARNOWCZAN, Student Registered Nurse Anesthetist | Czarnowczan@oakland.edu