

Maternal mortality: Where are We Now and Policy Strategies Moving Forward

Zachary David Travis

Master of Public Health, California Baptist University, 2021

Thesis Submitted in Partial Fulfilment
of the Requirements for the Degree of
Master of Public Health

California Baptist University

August 2021

© 2021

Zachary David Travis

The College of Health Science
California Baptist University
Riverside, California

This is to certify that the Master's Thesis of
Zachary David Travis
has met the thesis requirements
for the degree of
Master of Public Health

Approved by:

Marshare Penny

Dr. Marshare Penny, DrPH
Clinical Professor
Committee Chair

Ashley Parks

Dr. Ashley Parks, DrPH
Associate Professor
Committee Member

Sangmin Kim

Dr. Sangmin Kim, Ed.D.
Professor
Committee Member

Abstract

Maternal mortality continues to be a major issue in the United States (U.S.). This thesis aimed to review years prior in the U.S. that had expanded Medicaid and determine if there was a significant decrease in maternal mortality rates compared to the years after Medicaid expansion. Data from the National Centers for Health Statistics (NCHS) from 2007-2019 was utilized, and maternal mortality across race/ethnicity was also analyzed utilizing the Mann-Whitney U Test. Though there was not a significant difference, this analysis confirmed the disproportionately high maternal mortality rates of Black, Hispanic, and American Indian/Alaskan Native women when compared to white women. Moreover, this thesis pointed to the fact that addressing maternal care and mortality in the U.S. cannot be met by only expanding access to care, as seen by the Patient Protection and Affordable Care Act. Because of the complexity of this problem, swift policy action is warranted in regards to Medicaid expansion, more comprehensive policies with data and access to care, and ultimately addressing the social determinants of health and upstream issues that are aiding in the high maternal mortality. As health services researchers and clinicians continue to conduct research in this area, this thesis suggests that future analyses should include multiple variables in order to paint a more cohesive picture.

Keywords: maternal mortality, health disparities, Medicaid expansion, social determinants of health, health policy

Acknowledgments

There are many who helped me along the way on this journey, and I would like to take a moment to thank them. To my thesis committee, without your guidance, faith, and commitment to my success, I simply would not have made it. Dr. Marshare Penny, you have been instrumental to my success as a graduate student at California Baptist University and as a professional. As another person of color, who I deeply value and look up to, thank you. Dr. Ashley Parks, your depth of knowledge, refreshing and progressive views on health policy and administration, and genuine kindness has inspired me to be a better practitioner and to continue to grow academically. Dr. Sangmin Kim, at the beginning of the COVID-19 pandemic you were the first professor my cohort had online. Your support and overall care for us as students navigating through an unfamiliar environment will never be forgotten.

To my cohort, thank you to each and every one of you for these past two years. We challenged one another, asked difficult questions, embraced our differences, and overall committed to making our communities healthier.

To the Randall Lewis Health and Policy Fellowship and the entire Build Healthy Places Network team, you have all made me a better public health professional, person, and world citizen. I am forever grateful for the lessons I have learned from each of you and the opportunities you have given me.

To my friends, family, and my parents, sister, and nephew, I am forever grateful for your patience, understanding, love, and support. I am who I am because of you.

Finally, to all my Black brothers and sisters, it is in our hands to fight for equality and to have the audacity to hope that America will be better. Never lose hope. Black Lives Matter.

Table of Contents

List of Tables	ii
List of Figures.....	iii
Introduction.....	4
Overview of the Literature	4
<i>Mortality Rates among Women</i>	5
<i>Racial/Ethnic Health Disparities in Maternal Mortality</i>	7
<i>Affordable Care Act and Medicaid Expansion</i>	8
<i>Social Determinants of Health</i>	9
<i>U.S. Addressing Maternal Mortality Rates</i>	9
Purpose of the Study	10
Research Questions	10
Hypotheses	11
Method	12
Design 12	
Procedures and Data	12
Independent and Dependent Variables	13
Data Analysis	13
Results	14
Major Findings	14
<i>Pregnancy-Related Mortality Pre- vs. Post-Medicaid Expansion</i>	14
Discussion	16
Summary of Major Findings	16
Implications for Public Health Practice and Policy	17
Study Limitations	19
Future Recommendations	20
Conclusion	21
References	22
Appendix A: Tables	29
Appendix B: Figures	30

List of Tables

Table 1. Pregnancy-Related Mortality Pre- vs. Post-Medicaid Expansion.....	29
--	----

List of Figures

Figure 1. Pre and Post Medicaid Expansion Pregnancy-Related Mortality (per 100,000 live births)	30
Figure 2. Pre- and Post-Medicaid Expansion Pregnancy-Related Mortality by Race/Ethnicity (per 100,000 live births).....	30

Introduction

Overview of the Literature

For many decades in the United States (U.S.), the tracking, monitoring, and reporting of mortality rates has been a common practice. Specifically, the U.S. has monitored and tracked maternal mortality rates, which provide critical data on how well the U.S. medical care system is providing care for some of the most vulnerable residents (Mokdad et al., 2018). More startling, but in line with the systemic racism that continues to plague the U.S., is the fact that there are pervasive health inequities across race and ethnic groups (Okonkwo et al., 2020; Woolf 2019), crippling many facets of the American healthcare system. These inequities in the American system means that Black women die at a disproportionate rate compared to their white counterpart. Herein, this paper will discuss maternal mortality, Medicaid expansion and access, and policies that should be implemented if the U.S. intends to address the issues around maternal mortality and the devastating toll it is taking on the Black community.

Maternity care in the U.S. covers medical services for women during pregnancy, delivery, and postpartum (Hirshberg & Srinivas, 2017). Access to high quality maternity care is critical for maternal health and positive birth outcomes, especially when nearly four million births take place in the U.S. each year (Martin et al., 2019). Every year in the U.S., more than 700 women die due to complications related to both pregnancy and childbirth (Hoyert & Miniño, 2020), and 50,000 women suffer from severe maternal morbidity due to labor and delivery (LD) (BUSCRPMD, 2018). Preventing maternal and infant death in the U.S. continues to be a pressing, yet complicated, matter to address for all fifty states (Singh, 2021). Lawmakers recognize that there are human, societal, and financial costs of maternal mortality and continue to seek to address these problems. Maternal mortality review committees around the U.S. have

concluded that at least 60% of maternal deaths are indeed preventable (CDC, 2019). Renewed conversations around social determinants of health (SDOH) and health equity have begun to capture academia and have been highlighted in medicine, public health, and public policy, as SDOH contribute to the risk of adverse pregnancy outcomes in mothers. As stated by Amjad et al. (2018), African American race, rural residence, inadequate education, and low SES are markers for poor pregnancy outcomes in mothers. Policy strategies are also needed to address the underlying causal pathways to inequalities in adolescent pregnancy outcomes, which Amjad et al., (2018) has alluded to.

Though addressing SDOH is often discussed, providing access to care has not only been a critical topic in health care, but significant steps have also been made. The Patient Protection and Affordable Care Act's (PPACA) major goal is to substantially reduce the number of uninsured by providing affordable coverage options through Medicaid and the health insurance marketplace (Daw et al., 2021). In 2014, states began to adopt Medicaid expansion, which covers low-income mothers and infants. Some states declined to expand and, still, in 2021 have not done so. As published by the Center on Budget and Policy Priorities, Miller et al. (2019) found that from 2014-2017 premature deaths of at least 19,000 adults from the age of 55-64 were prevented due to the ACA's expansion of Medicaid to low-income adults. As the federal government looks to decrease maternal mortality, what does Medicaid expansion mean for pregnant women?

Mortality Rates among Women

Maternal mortality is a critical health indicator in the United States (U.S.), which are utilized to assess and examine the effectiveness of our medical care system and overall health of our society (Collier & Molina, 2019). The U.S. Department of Health and Human Services (US

DHHS), Centers of Disease Control and Prevention (CDC), National Center for Health Statistics' (NCHS), and the National Vital Statistics System (NVSS) defines maternal mortality as the death of women while pregnant or within 42 days of being pregnant, from any cause related to or aggravated by pregnancy or its management, but not from accidental or incidental causes (CDC, 2019). The U.S. reports maternal deaths as a maternal mortality ratio (MMR), which is the number of deaths during a given time period per 100,000 individuals.

Although there have been improvements in prenatal care and a dramatic decline in maternal mortality in the United States (U.S.) during the 20th century, rates appear to have increased during the early 21st century, as women continue to die from pregnancy related complications (Callaghan, 2012). Between 2000 and 2014, maternal mortality in the U.S. more than doubled, from 9.8 to 21.5 maternal deaths per 100,000 live births (Lu, 2018). In 2014, among 31 countries in the Organization for Economic Cooperation and Development reporting maternal mortality data, the U.S. ranked 30th, ahead of only Mexico. The U.S. has also experienced an increase in maternal morbidity over the last decade (Wang et al., 2020).

Many of the maternal deaths and adverse outcomes could be avoided with better access to quality maternal care, especially in rural America (Elgendy et al., 2021). From 2001-2015, 31% of deaths happened during pregnancy, 36% of deaths happened at delivery or in the week after, and 33% happened one week to one year postpartum (CDC, 2019). In that same time frame, heart disease and strokes caused 34% of those deaths overall, and hemorrhaging and amniotic fluid embolism was responsible for most deaths at delivery (CDC, 2019). In the week after delivery, hemorrhaging, high blood pressure, and infection were the leading causes of death, and cardiomyopathy is the leading cause of death one week to one year after delivery (CDC, 2019). More than 2 million women of childbearing age live in what are known as maternity care deserts

(i.e., counties with no hospital offering obstetric care, birth center, or obstetric provider) (MacDorman et al., 2016). In 2017, almost 150,000 infants were born in maternity care deserts, and evidence shows that being born in a hospital without neonatal intensive care units puts very low birthweight and very preterm infants at increased risk of neonatal or in-hospital deaths (Kozhimannil et al., 2019). Maternal and child health outcomes are linked, which paints a worrying picture that has both state and federal authorities attempting to find policy solutions to address this crisis.

Racial/Ethnic Health Disparities in Maternal Mortality

Disparities in maternal mortality are often related to racial, socioeconomic, and geographic factors (de Graaf et al., 2013). Examples of racial/ethnic disparities have been thoroughly described in most medical disciplines (Somer et al., 2017). One of the earliest reports of racial/ethnic disparities in modern obstetrics was published in 1946, which described the efforts to improve discrepancies in obstetric outcomes between Black and white women in Alabama (Somer et al., 2017). As previously noted, literature points to an increase in maternal mortality, with evidence pointing to a significant proportion of that rise attributed to deaths among women of color (MacDorman et al., 2016; Moaddab et al., 2016). A large number of studies have also reported individual-level indicators of socioeconomic position in relation to maternal outcomes; of those studies, the majority suggest that the lack of insurance among Blacks and Hispanics, as well as those of lower education among the same groups, are significantly associated with the risk of maternal mortality and morbidity (Wang et al., 2020).

In 2017, the World Health Organization (WHO) reported that the U.S. was one of two countries to report a significant increase in its maternal mortality ratio since 2000 (Owens et al., 2019). In terms of the maternal death ratio across race/ethnicity, in 2017 the maternal death ratio

for Black women (37.1 per 100,000 pregnancies) was 2.5 times the ratio for white women (14.7) and three times the ratio for Hispanic women (11.8) (Crear-Perry et al., 2021).

As the United States and the rest of the world still grapples with the COVID-19 pandemic, society has begun to realize that the pandemic has unmasked the great inequities that still exist in the U.S. healthcare system. One of the most disturbing aspects of the COVID-19 pandemic in the U.S. is the disproportionate harm that the pandemic has caused to historically marginalized groups, with Black, Hispanic, and Asian people having substantially higher rates of infection, hospitalization, and death compared with white people (CDC, 2019; Rubin-Miller et al., 2020). Data that is produced in the coming years will be critical in understanding the maternal health crisis and the affect the COVID-19 pandemic has had.

Affordable Care Act and Medicaid Expansion

The Patient Protection and Affordable Care Act (PPACA), previously known as the Patient Protection and Affordable Care ACT, was signed into law in 2010. A central goal of the Affordable Care Act (ACA) is to reduce the number of uninsured by providing a continuum of affordable coverage options through Medicaid and the Health Insurance Marketplaces (Obama, 2017). Moreover, the ACA expanded Medicaid coverage for most low-income adults to 138% of the Federal Poverty Level (FPL) (KFF, 2021).

All of the major components of the ACA took effect in 2014, with Medicaid expansion being optional for states after a Supreme Court Decision (National Federation of Independent Business v. Sebelius, 2012). Medicaid is available up to 138% of the FPL, with subsidies available for those between 138 and 400% of FPL. In non-expansion states, Medicaid is only available to those at a much lower income level (Miller & Wherry et al., 2019). Although the ACA has led to large coverage gains (31 million Americans have health coverage through the

ACA) (McMorrow, 2021), there are still many groups that are either at a high risk of being uninsured, lack access to care, or are still experiencing worse health outcomes.

Social Determinants of Health

In the U.S., there continues to be widespread interest in addressing the social determinants of health (SDOH) (where individuals live, work, play, and pray) as a way to directly improve health and reduce overall health care spending (Gottlieb et al., 2017). Racial disparities in maternal mortality rates reflect many factors arising from racism, including closely connected social determinants of health, such as income, social status, education, access to health care, housing, physical environment, social support, health behaviors, and culture (Collier & Molina, 2019; Marmot et al., 2012; Marmot et al., 2007; UNDP, 2020). More than a decade ago, WHO launched a commission on the SDOH to foster a global movement to address the conditions in which people are born, grow, love, work, and age (Barfield, 2021). Individuals are not able to control many upstream determinants of health; governance, policy, values, and cultural or societal norms shape who has access to healthcare and who does not (Crear-Perry et al., 2021). Developed in 2016 by Roach, the Restoring Our Own Through Transformation (ROOTT) theoretical framework elucidates the web of causation between structure and SDOH and wellness (Crear-Perry, 2021). The ROOTT framework identifies the social determinants of Black maternal health and how their viability to Black families has been dictated by the very structure of American society from the time of slavery.

U.S. Addressing Maternal Mortality Rates

The high U.S. maternal mortality has been a crucial issue that has needed to be addressed for many decades in this country. Though the leading cause of morbidity and mortality during pregnancy and the postpartum period is cardiovascular disease, there are no large scale

comprehensive national ongoing studies or new policies to address this issue (Grodzinsky et al., 2019). Although the troubling rise in maternal mortality in the U.S. pales in comparison with that found in sub-Saharan Africa and India, the U.S. is known for medical care in general, and obstetrical care in particular (King, 2012). Although maternal death is the tip of the iceberg, thousands more women suffer a near-miss, but survive only to deal with the lifelong medical consequences. As the U.S. tries to deal with this crisis, it is critical to remember that each maternal death is not an isolated event, but rather an event that permanently affects an ever-enlarging circle of society.

Purpose of the Study

The purpose of this study is to examine the maternal mortality rates in the United States before Medicaid expansion, compare the mean to see if there is a difference in mortality rates after Medicaid expansion, and determine if there is a difference across racial/ethnic groups. Also, the findings will be utilized to propose multiple policy strategies around Medicaid expansion and the need to address social determinants of health to combat high maternal mortality rates, as well as to bridge the gaps across race/ethnicity groups. Ultimately, the goal of this project is to inform the public of the continued high maternal mortality rates, the difference of those rates across race/ethnicity, and potential policy actions.

Research Questions

The research questions for this study include:

1. Overall, and separately, for racial/ethnic categories of white, Black, Hispanic, and American Indian or Alaska Native women, is there a difference in pregnancy-related mortality, comparing the periods before Medicaid expansion (2007-2015) and after Medicaid expansion (2016-2019) in the United States?

2. Were there differences in pregnancy-related mortality in the U.S. among Black women when compared to white, Hispanic, or American Indian or Alaska Native women before Medicaid expansion in the United States (2007-2015) and after Medicaid expansion in the United States (2016-2019)?

Hypotheses

H1: Overall, and separately, for racial/ethnic categories of white, Black, Hispanic, and American Indian and Alaska Native women, there is a significant difference in pregnancy-related mortality, comparing the periods before Medicaid expansion (2007-2015) and after Medicaid expansion (2016-2019) in the United States.

HA: Overall, and separately, for racial/ethnic categories of white, Black, Hispanic, and American Indian and Alaska Native women, there is no significant difference in pregnancy-related mortality, comparing the periods before Medicaid expansion (2007-2015) and after Medicaid expansion (2016-2019) in the United States.

H2: There were significant differences in pregnancy-related mortality in the U.S. among Black women when compared to white, Hispanic, or American Indian or Alaska Native women before Medicaid expansion in the United States (2007-2015) and after Medicaid expansion in the United States (2016-2019).

HA: There were no significant differences in pregnancy-related mortality in the U.S. among Black women when compared to white, Hispanic, or American Indian or Alaska Native women before Medicaid expansion in the United States (2007-2015) and after Medicaid expansion in the United States (2016-2019).

Method

Design

This study is a retrospective cross-sectional study. Aggregate race-specific data on pregnancy-related mortality in the United States during 2007-2019 were used to address the research questions. Analyses were performed in Stata version 15 (StataCorp, College Station, TX).

Procedures and Data

Data from the National Center for Health Statistics were collated for the years 2007-2019. Data on race-specific pregnancy-related death rates for these years were included where available. These national-level data are reported as a number of pregnancy-related deaths each year per 100,000 live births. The number of maternal deaths does not include all deaths occurring to pregnant or recently pregnant women, but only those deaths with the underlying cause of death assigned to *International Statistical Classification of Diseases, 10th Revision (ICD-10)* code numbers A34, O00–O95, and O98–O99. Maternal mortality rates are per 100,000 live births, based on data from the National Vital Statistics System natality file.

Pregnancy-related deaths do not include deaths that are incidental. Data on Medicaid expansion dates were obtained from the Kaiser Family Foundation (KFF, 2021). Furthermore, health care coverage under Medicaid expansion became effective on January 1, 2014. Most states that implemented Medicaid expansion during the study period did so before January 1, 2016. Therefore, for analysis, the study period was divided into two periods, including pre- (2007-2015) and post- (2016-2019) Medicaid expansion. Data were available for 2007-2016 (in 2-year periods) and separately for 2017, 2018, and 2019. Race-specific data were only available for 2007-2016 for the American Indian/Alaskan Native racial category.

Independent and Dependent Variables

The dependent variable was pregnancy-related mortality, and the independent variables were period (before vs. after Medicaid expansion) and race. Pregnancy-related mortality was measured as the number of deaths among women during pregnancy, during delivery, or within one year of delivery from pregnancy-related conditions and expressed as a rate per 100,000 live births. The dependent variable was continuous while the independent variables were nominal.

Data Analysis

The maternal mortality data were assessed for normality using the Shapiro-Wilk test. The null hypothesis for the Shapiro-Wilk test states that the data are normally distributed. Owing to a statistically significant Shapiro-Wilk test ($p < 0.001$), suggesting that the distribution of the data does not approximate a normal distribution, analyses were performed using nonparametric methods.

Median values of pregnancy-related mortality were reported during each time period separately for each race and overall. The data were assessed for changes in pregnancy-related mortality between the pre- and post-Medicaid expansion periods, separately for each race and overall. Comparisons of pregnancy-related mortality for research questions one and two were done using the Mann Whitney U test. To account for multiple comparisons, a Bonferroni correction was applied adjusting the threshold for statistical significance to 0.01 instead of 0.05, given there were five separate statistical tests performed across the same variable of race. All statistical analysis was performed in Stata SE version 15 (StataCorp, College Station, TX).

Results

Major Findings

Prior to Medicaid expansion (2007-2015), median pregnancy-related mortality in the U.S. was 17.2/100,000 live births (range 14.5-18). The pregnancy-related mortality (per 100,000 live births) varied by race, from 11.4 (range 10.4-12.8) among Hispanic women, 12.6 (range 11.5-13.5) among white women, 30.5 (range 26.9-38.4) among American Indian and Alaskan Native women, and 41.85 (range 35.6-44.3) among Black women.

Following Medicaid expansion (2016-2019), median pregnancy-related mortality in the U.S. was 17.4/100,000 live births (range 16.9-20.1). The pregnancy-related mortality (per 100,000 live births) varied by race and was higher among Black women (median 40.8, range 37.3-44), compared to Hispanic (median 11.8, range 11.6-12.6, $z = 1.96$, $p = 0.05$), white (median 14.9, range 13.2-17.9, $z = 1.96$, $p = 0.05$), and American Indian or Alaskan Native women (median 21.9, range 21.9-21.9, $z = -1.34$, $p = 0.18$), although these differences did not attain statistical significance.

According to data provided by the Kaiser Family Foundation (KFF, 2021), 12 states have not adopted Medicaid expansion (AL, FL, GA, KS, MS, NC, SC, SD, TN, TX, WI, and WY), and one state has expanded but not implemented (MO).

Pregnancy-Related Mortality Pre- vs. Post-Medicaid Expansion

Overall, pregnancy related mortality increased from 17.2 to 17.4/100,000 live births. This change was not statistically significant ($z=1.01$, $p = 0.315$). For white women, pregnancy-related mortality increased from 12.6 to 14.9/100,000 live births, but the difference was not statistically significant ($z = 1.77$, $p = 0.077$). Among Hispanic women, the pregnancy-related mortality increased from 11.4 to 11.8/100,000 live births. This increase did not attain statistical

significance ($z = 0.35, p = 0.724$). Among American Indian and Alaska Native women, the pregnancy-related mortality decreased from 30.5 to 21.9/100,000 live births but was not statistically significant ($z = -1.41, p = 0.157$). Among Black women, pregnancy related mortality decreased from 41.85 to 40.8/100,000 live births. Similarly, this decrease was not statistically significant ($z = -0.35, p = 0.724$). These data are presented in Table 1.

Discussion

Summary of Major Findings

High maternal mortality in the U.S. continues to be a problem. According to the most recent data, though the majority of states in the U.S. have expanded Medicaid, there are 17.4 deaths per 100,000. These deaths are not equal across race and ethnicity. Black women disproportionately share the highest burden of mortality at 40.8 deaths per 100,000. Though the U.S. expanded access to care under the ACA and Medicaid expansion, there still has not been a significant drop in maternal mortality, which points to the need to address maternal mortality beyond simply expansion and access.

Identifying the root causes of maternal mortality, eliminating the factors that may be contributing to the increase that the U.S. has seen over the last decade, and removing the disproportionate burden of loss among families of color are absolutely imperative for the future of this nation and the world (Crear-Perry, 2021). Beyond the moral obligation to solve this crisis, the immense economic cost of maternal morbidity and mortality should cause all Americans to desire swift action. Data suggests that the economic burden of maternal morbidity and mortality is billions of dollars per year (Moran et al., 2020). Even looking past the economic impact, the loss of human life in the 700+ women who suffer from pregnancy complications that result in death, and the more than 60,000 women suffer pregnancy-related complications that are near fatal, should move America to action (Ellison & Martin, 2017).

In order to address not only maternal mortality but also the disparities that exist (as highlighted throughout the COVID-19 Pandemic), comprehensive policies must come from the federal government down. The Biden/Harris administration has taken note of the high maternal mortality rate and raised the alarm around the disparities that exist in these deaths.

Implications for Public Health Practice and Policy

In order to address the maternal mortality crisis, numerous policy actions are needed. Though the depth and breadth of those actions cannot be fully covered here, the following policies centered around data, paid family leave, and changes to health coverage would have an immediate impact in maternal health.

Each state in the United States faces unique circumstances and challenges that may be leading to not only high maternal mortality rates but also the disparities seen across race/ethnicity. In order for practitioners and policymakers to form real solutions, they must be armed with the appropriate data. Though at the federal level the CDC has partnered with the CDC Foundation and the Association of Maternal and Child Health Programs since 2016, to truly improve maternal mortality data collection, more policies need to be enacted.

Currently, the maternal mortality data that is collected, stored, and shared in the U.S. by several federal, state, and local sources, include the CDC, state health departments, and private health care systems (Mayer et al., 2019). At the federal level, the CDC uses the Pregnancy Mortality Surveillance System (PMSS) to collect and code data around pregnancy related deaths. Although, this system seems straightforward, there are problems around jurisdiction reporting deaths, since data must first be completed at the state level and then moves onto the federal level, and the confidential nature of data use and dissemination (Racine et al., 2021), which does not allow for proper analysis of the collection of the data (Burgansky et al., 2019).

It is critical that key maternal health variables are standardized and aggregated at the national level to ensure that necessary and effective efforts are used to combat maternal deaths and the disparities that exist across race/ethnicity. Therefore, all U.S. states must be equipped with maternal mortality review committees. In order for these committees to operate, federal

funds need to be made available to specifically support these committees. States, like California, who have maternal mortality review committees, have been able to examine mortality data and identify the most frequent causes of deaths. After 5 years of implementing a maternal review committee, the West Coast health system, Providence St. Joseph, delivered 67,000 babies in 2018 and reported zero maternal deaths (Main, 2018). Despite the increase in maternal mortality and exacerbation of disparities, only 29 of the 50 states currently have maternal mortality review committees (Main, 2018). States that have taken steps forward around proper data collection, storage, and use can be utilized as models for other states. For example, in California, maternal mortality rates declined by nearly 60% between 2006 and 2013 (ACOG, 2021). The California Department of Public Health and the California Maternal Quality Care Collaborative focused on research gathered from the California Pregnancy-Associated Mortality Review (CA-PAMR), the development of improvement toolkits based on the CA-PAMR findings, and the creation of a maternal data center that is utilized by 90% of California's hospitals.

Beyond data, addressing the deeply rooted causes of maternal health and maternal health disparities, the U.S. must address more upstream issues centered on the structural and social determinants of maternal health, in particular, paid family leave and health insurance coverage.

Paid family leave is considered a public health crisis in the U.S. context (Tully et al., 2017). Numerous studies have shown that time off after birth to recover and transition without having concerns about money is critical to maternal health (Nandi et al., 2018). Though the 1993 Family Medical and Leave Act provides for unpaid leave, almost half of the U.S. workers are not able to take unpaid leave, and many cannot afford any time off without pay (Bailey et al., 2017). The Organization for Economic Cooperation and Development (OECD) states that the (1) paid

parental leave has improved women's economic outcomes, and (2) access to paid parental leave appears to reduce mortality (2019).

Health insurance coverage and scope also is critically important to assuring that there are optimal maternal health outcomes. Though the data presented herein does not demonstrate a significant difference in pre- and post-expansion maternal mortality deaths, most of the maternal mortality occurs in the postpartum period (Creanga et al., 2017). Therefore, it is imperative that women have the care and education to recognize concerning symptoms following discharge (Tully et al., 2017). Extending Medicaid through at least 12 months (currently at 12 weeks following childbirth) would ensure that there is a continuation of care and services (Kumar et al., 2021). The expansion of the Medicaid coverage also means that there would be an increased need for medical support during this time. Therefore, holistic women's health practitioners, such as doulas, community health workers, and midwives, could be utilized as comprehensive support to decrease the added burden on other health care workers (Zeni, 2019). In most states where Black women give birth, they do not have access to nurse midwives who are integrated into the perinatal health care system (Vedam et al., 2019).

As noted and supported in this thesis, health insurance coverage is important but is not the sole driving factory of maternal mortality. Even with improvements across the U.S. in Medicaid coverage, health disparities continue to persist. In order to move toward greater equity, the U.S. must put forward policies around data, paid family leave, and expansion of Medicaid benefits.

Study Limitations

Multiple study limitations exist but point to areas of future study. First, a critical study limitation is the data that is available through the CDC. Currently, data is only present through

2019, with some access limitation, and the criteria for the reporting of maternal mortality (state-by-state reporting varies and training is not consistent) has changed at multiple points in time. With the data available, there are also missing data for certain race and ethnic groups. Race-specific data were only available for 2007-2016 for the American Indian/Alaskan Native racial category. Though this study serves as an exploratory study, the lack of data and lack of continuity of data hinders the policy recommendations made therein. Furthermore, the NCHS' NVSS suspended its publication of maternal mortality data in 2007. Since then, literature around the data emerged, detailing common errors in state-level maternal mortality data collection and reporting. Because of this, NCHS released an updated methodology for coding maternal deaths and applied it to 2018 maternal mortality data, but they did not release it until January 2020. Additionally, errors in maternal mortality data begin with inaccurate information on death certificates. The cause-of-death section of the death certificate is used to assign International Classification of Disease (ICD) codes, which contain a list of codes specific to pregnancy.

Future studies and analysis need to look at multiple variables and the relationships that each one may have on maternal mortality to better direct policy recommendations and to have a more complete analysis. Maternal mortality rates fluctuate from year to year because of the relatively small number of these events, and possibly also due to issues associated with the reporting of maternal deaths on death certificates.

Future Recommendations

Because of the limited scope of this study, as well as the desire to ensure that the maternal mortality crisis is addressed in the most complete way, several future studies are recommended following this thesis. First, beyond looking at Medicaid expansion vs. non-Medicaid expansion, including other variables that are driving the social determinants of health

would be beneficial. Adding mortality rate across education, age, income, and status of health along with comparison of pre- and post-Medicaid expansion mortality numbers and running a multivariate analysis to determine the interaction of each variable. Secondly, a more complete comparison race/ethnic groups (Office of Management and Budget (OMB) has White, Black or African American, American Indian or Alaska Native, Asian, Native Hawaiian or Other Pacific Islander, and Hispanic/Latino or Not Hispanic/Latino) to one another across multiple time points including during the COVID-19 pandemic.

Conclusion

As this paper alluded to, medical care is not health care, and inequities in access to care and around the social determinants have a devastating toll on women, which partially lead to some of the highest maternal mortality rates across developed nations.

As the COVID-19 pandemic continues to steal both domestic and international headlines, the U.S. cannot forget about the staggering number of maternal infant deaths that occur in the U.S. each year, and the existent vast inequities that are driving these deaths. The U.S. has been monitoring this issue for decades now, and though some initial progress was made over the last three decades, deaths still continue to climb.

Clear policy actions can be taken that address education, access, and health care in the United States. This multifaceted issue does not stem from one problem, but racism and classism have also exacerbated the issue. Multiple organizations, and even the Biden/Harris administration, have voiced their concerns and demonstrated their desires to take tangible steps to address this crisis. If the U.S. is truly concerned about ensuring not only equitable care but also care that is blind to race, addressing the maternal infant mortality crisis should be the first step in better representing what access to health care truly looks like in a developed country.

References

- The American College of Obstetricians and Gynecologists (ACOG). (2021). *ACOG District II Safe Motherhood Initiative (SMI)*. [https:// www.acog.org/About-ACOG/ACOG-Districts/District-II/Safe-Motherhood-Initiative?IsMobileSet=false](https://www.acog.org/About-ACOG/ACOG-Districts/District-II/Safe-Motherhood-Initiative?IsMobileSet=false).
- Amjad, S., MacDonald, I., Chambers, T., Osornio-Vargas, A., Chandra, S., Voaklander, D., & Ospina, M. B. (2019). Social determinants of health and adverse maternal and birth outcomes in adolescent pregnancies: A systematic review and meta-analysis. *Paediatric and Perinatal Epidemiology*, 33(1), 88-99.
- Bailey, Z. D., Krieger, N., Agénor, M., Graves, J., Linos, N., & Bassett, M. T. (2017). Structural racism and health inequities in the USA: Evidence and interventions. *The Lancet*, 389(10077), 1453-1463.
- Barfield, W. D. (2021, March). Social disadvantage and its effect on maternal and newborn health. *Seminars in Perinatology*, 45(4), 151407.
<https://doi.org/10.1016/j.semperi.2021.151407>
- Building U.S. Capacity to Review and Prevent Maternal Deaths (BUSCRPMD). (2018). Report from nine maternal mortality review committees. *Maternal Mortality Review Information Application (MMRIA)*. http://reviewtoaction.org/Report_from_Nine_MMRCs
- Burgansky, A., Clare, C. A., Bullock, K., Morrissey, M. B., Popova, I. V., & Morrissey, M. B. Q. (2019). Framing the public health problem of maternal morbidity and mortality: A social justice and moral imperative. *Health Law Journal*, 24(1), 27-33.
- Callaghan, W. M.(2012, February). Overview of maternal mortality in the United States. *Seminars in Perinatology*, 36(1), 2-6.

- Centers for Disease Control and Prevention (CDC). (2019). *Maternal mortality rates in the United States, 2019*. U.S. Department of Health and Human Services.
<https://www.cdc.gov/nchs/data/hestat/maternal-mortality-2021/maternal-mortality-2021.htm>
- Collier, Y. A., & Molina, R. L. (2019). Maternal mortality in the United States: Updates on trends, causes, and solutions. *Neoreviews*, *20*(10), e561-e574.
- Creanga, A. A., Syverson, C., Seed, K., & Callaghan, W. M. (2017). Pregnancy-related mortality in the United States, 2011–2013. *Obstetrics and Gynecology*, *130*(2), 366-373.
- Crear-Perry, J., Correa-de-Araujo, R., Lewis Johnson, T., McLemore, M. R., Neilson, E., & Wallace, M. (2021). Social and structural determinants of health inequities in maternal health. *Journal of Women's Health*, *30*(2), 230-235.
- Daw, J. R., Eckert, E., Allen, H. L., & Underhill, K. (2021). Extending postpartum Medicaid: State and federal policy options during and after COVID-19. *Journal of Health Politics, Policy and Law*, *46*(3), 505–526.
- de Graaf, J. P., Steegers, E. A., & Bonsel, G. J. (2013). Inequalities in perinatal and maternal health. *Current Opinion in Obstetrics and Gynecology*, *25*(2), 98-108.
- Elgendy, I. Y., Bukhari, S., Barakat, A. F., Pepine, C. J., Lindley, K. J., Miller, E. C., & American College of Cardiology Cardiovascular Disease in Women Committee. (2021). Maternal stroke: A call for action. *Circulation*, *143*(7), 727–738.
- Ellison, K., & Martin, N. (2017, December 22). Maternal mortality in the U.S.—Nearly dying in childbirth: Why preventable complications are growing in U.S. *NPR*.
<https://www.npr.org/2017/12/22/572298802/nearly-dying-in-childbirth-why-preventable-complications-are-growing-in-u-s>

- Gottlieb, L., Ackerman, S., Wing, H., & Manchanda, R. (2017). Understanding Medicaid managed care investments in members' social determinants of health. *Population Health Management, 20*(4), 302-308.
- Grodzinsky, A., Florio, K., Spertus, J. A., Daming, T., Schmidt, L., Lee, J., Rader, V., Nelson, L., Gray, R., White, D., Swearingen, K. & Magalski, A. (2019). Maternal mortality in the United States and the HOPE registry. *Current Treatment Options in Cardiovascular Medicine, 21*(9), 1-6.
- Hirshberg, A., & Srinivas, S. K. (2017, October). Epidemiology of maternal morbidity and mortality. *Seminars in Perinatology, 41*(6), 332-337.
- Hoyert, D. L., & Miniño, A. M. (2020). Maternal mortality in the United States: Changes in coding, publication, and data release, 2018. *National Vital Statistics Reports, 69*(2), 1–18.
- Kaiser Family Foundation (KFF). (2021). *Status of state action on the Medicaid expansion decision*. <https://www.kff.org/health-reform/state-indicator/state-activity-around-expanding-medicaid-under-the-affordable-care-act/?currentTimeframe=0&sortModel=%7B%22collId%22:%22Location%22,%22sort%22:%22asc%22%7D>
- King, J. C. (2012, February). Maternal mortality in the United States- Why is it important and what are we doing about it?. *Seminars in Perinatology, 36*(1), 14-18.
- Kozhimannil, K. B., Interrante, J. D., Corbett, A., Heppner, S., Burges, J., & Henning-Smith, C. (2019). Rural focus and representation in state maternal mortality review committees: Review of policy and legislation. *Women's Health Issues: Official Publication of the Jacobs Institute of Women's Health, 29*(5), 357–363.
<https://doi.org/10.1016/j.whi.2019.07.001>

- Kumar, N. R., Borders, A., & Simon, M. A. (2021). Postpartum Medicaid extension to address racial inequity in maternal mortality. *American Journal of Public Health, 111*(2), 202–204.
- Lu, M. C. (2018). Reducing maternal mortality in the United States. *JAMA, 320*(12), 1237-1238.
- MacDorman, M. F., Declercq, E., Cabral, H., & Morton, C. (2016). Recent increases in the US maternal mortality rate: Disentangling trends from measurement issues. *Obstetrics & Gynecology, 128*(3), 447-455.
- Main, E. K. (2018). Reducing maternal mortality and severe maternal morbidity through state-based quality improvement initiatives. *Clinical Obstetrics and Gynecology, 61*(2), 319-331.
- Marmot, M., Allen, J., Bell, R., Bloomer, E., & Goldblatt, P. (2012). WHO European review of social determinants of health and the health divide. *The Lancet, 380*(9846), 1011-1029.
- Marmot, M., & Commission on Social Determinants of Health. (2007). Achieving health equity: From root causes to fair outcomes. *The Lancet, 370*(9593), 1153-1163.
- Martin, J. A., Hamilton, B. E., Osterman, M. J., & Driscoll, A. K. (2019). Births: Final data for 2018. *National Vital Statistics Reports, 68*(13), 1–47.
- Mayer, R., Dingwall, A., Simon-Thomas, J., Sheikhnureldin, A., & Lewis, K. (2019, February 4). The United States maternal mortality rate will continue to increase without access to data. *Health Affairs Blog*.
<https://www.healthaffairs.org/doi/10.1377/hblog20190130.92512/full/>
- McMorrow, S. (2021). Stabilizing and strengthening the Affordable Care Act: Opportunities for a new administration. *Journal of Health Politics, Policy and Law, 46*(4), 549–562.
<https://doi.org/10.1215/03616878-8970753>

- Miller, S., Johnson, N., & Wherry, L. R. (2019). *Medicaid and mortality: New evidence from linked survey and administrative data* (NBER Working Paper No.26081). National Bureau of Economic Research. <http://www-personal.umich.edu/~mille/ACAMortality.pdf>
- Miller, S., & Wherry, L. R. (2019, May). Four years later: Insurance coverage and access to care continue to diverge between ACA Medicaid expansion and non-expansion states. *AEA Papers and Proceedings*, 109, 327-333.
- Moaddab, A., Dildy, G. A., Brown, H. L., Bateni, Z. H., Belfort, M. A., Sangi-Haghpeykar, H., & Clark, S. L. (2016). Health care disparity and state-specific pregnancy-related mortality in the United States, 2005–2014. *Obstetrics & Gynecology*, 128(4), 869-875.
- Mokdad, A. H., Ballestros, K., Echko, M., Glenn, S., Olsen, H. E., Mullany, E., Lee, A., Khan, A. R., Ahmadi, A., Ferrari, A. J., Kasaeian, A., Werdecker, A., Carter, A., Zipkin, B., Sartorius, B., Serdar, B., Sykes, B. L., Troeger, C., Fitzmaurice, C. & U.S. Burden of Disease Collaborators. (2018). The state of US health, 1990-2016: Burden of diseases, injuries, and risk factors among US states. *JAMA*, 319(14), 1444-1472.
- Moran, P. S., Wuytack, F., Turner, M., Normand, C., Brown, S., Begley, C., & Daly, D. (2020). Economic burden of maternal morbidity—A systematic review of cost-of-illness studies. *PloS One*, 15(1).
- Nandi, A., Jahagirdar, D., Dimitris, M. C., Labrecque, J. A., Strumpf, E. C., Kaufman, J. S., Vincent, I., Atabay, E., Harper, S., Earle, A., & Heymann, S. J. (2018). The impact of parental and medical leave policies on socioeconomic and health outcomes in OECD countries: A systematic review of the empirical literature. *The Milbank Quarterly*, 96(3), 434-471.

- National Federation of Independent Business v. Sebelius, 567 U.S. (2012).
- Obama, B. H. (2017). Repealing the ACA without a replacement—The risks to American health care. *Obstetrical & Gynecological Survey*, 72(5), 263-264.
- Organization for Economic Co-operation and Development (OECD). (2019). *SIGI 2019 Global Report: Transforming challenges into opportunities*. OECD Publishing.
- Okonkwo, N. E., Aguwa, U. T., Jang, M., Barré, I. A., Page, K. R., Sullivan, P. S., Beyrer, C. & Baral, S. (2020). COVID-19 and the US response: Accelerating health inequities. *BMJ Evidence-Based Medicine*, 26(4), 176–179. Owens, D. C., & Fett, S. M. (2019). Black maternal and infant health: Historical legacies of slavery. *American Journal of Public Health*, 109(10), 1342-1345.
- Racine, J. L., Gillespie, K., Hartke, K., Wautlet, C., & Antony, K. M. (2021). Barriers to self-disclosing level of maternal care: What are Wisconsin hospitals worried about?. *WMJ: Official Publication of the State Medical Society of Wisconsin*, 120(1), 45-50.
- Roach, J. (2016). *ROOTT's theoretical framework of the web of causation between structural and social determinants of health and wellness*. Restoring Our Own Through Transformation (ROOTT). <https://www.roottrj.org/policy-advocacy>.
- Rubin-Miller, L., Alban, C., Artiga, S., & Sullivan, S.. (2020, September 16). *COVID-19 racial disparities in testing, infection, hospitalization, and death: Analysis of Epic data*. KFF. <https://www.kff.org/coronavirus-covid-19/issue-brief/covid-19-racial-disparities-testing-infection-hospitalization-death-analysis-epic-patient-data/>
- Singh, G. K. (2021). Trends and social inequalities in maternal mortality in the United States, 1969-2018. *International Journal of Maternal and Child Health and AIDS*, 10(1), 29-42.

- Somer, S. J. H., Sinkey, R. G., & Bryant, A. S. (2017, August). Epidemiology of racial/ethnic disparities in severe maternal morbidity and mortality. *Seminars in Perinatology*, *41*(5) 258-265.
- Tully, K. P., Stuebe, A. M., & Verbiest, S. B. (2017). The fourth trimester: A critical transition period with unmet maternal health needs. *American Journal of Obstetrics and Gynecology*, *217*(1), 37-41.
- United Nations Development Programme (UNDP). (2020). *A social determinants approach to maternal health: Roles for development actors*.
<https://www.undp.org/publications/social-determinants-approach-maternal-health>
- Vedam, S., Stoll, K., Taiwo, T. K., Rubashkin, N., Cheyney, M., Strauss, N., McLemore, M., Cadena, M., Nethery, E., Rushton, E., Schummers, L., Declercq, E., & the GVtM-US Steering Council. (2019). The giving voice to mothers study: Inequity and mistreatment during pregnancy and childbirth in the United States. *Reproductive Health*, *16*(1), 1-18.
- Wang, E., Glazer, K. B., Howell, E. A., & Janevic, T. M. (2020). Social determinants of pregnancy-related mortality and morbidity in the United States: A systematic review. *Obstetrics & Gynecology*, *135*(4), 896-915.
- Woolf, S. H. (2019). Necessary but not sufficient: Why health care alone cannot improve population health and reduce health inequities. *Annals of Family Medicine*, *17*(3), 196–199. <https://doi.org/10.1370/afm.2395>
- Zeni, M. B. (2019). *Principles of epidemiology for advanced nursing practice: A population health perspective*. Jones & Bartlett Learning.

Appendix A: Tables

Table 1.

Results of Mann-Whitney Test Examining Pregnancy-Related Mortality Pre- vs. Post-Medicaid Expansion (n=6739)

Race	Pre- Medicaid Rate	Post-Medicaid Rate	P-Value
Black	41.85	40.8	0.724
White	30.5	14.9	0.077
Hispanic	11.4	11.8	0.724
AIAN	30.5	21.9	0.157
All	17.2	17.4	0.315

* Note: Rates are per 100,000 live births; Bonferroni correction of .01 applied

Appendix B: Figures

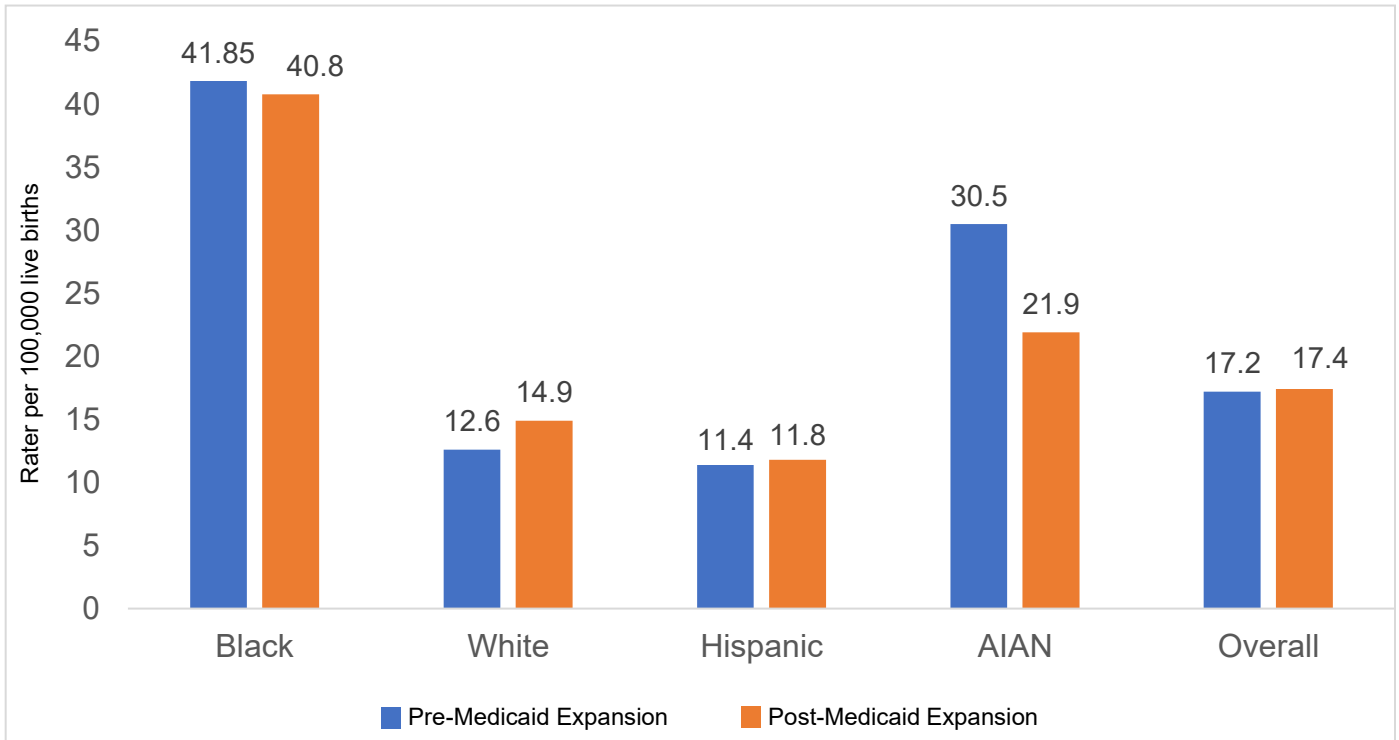
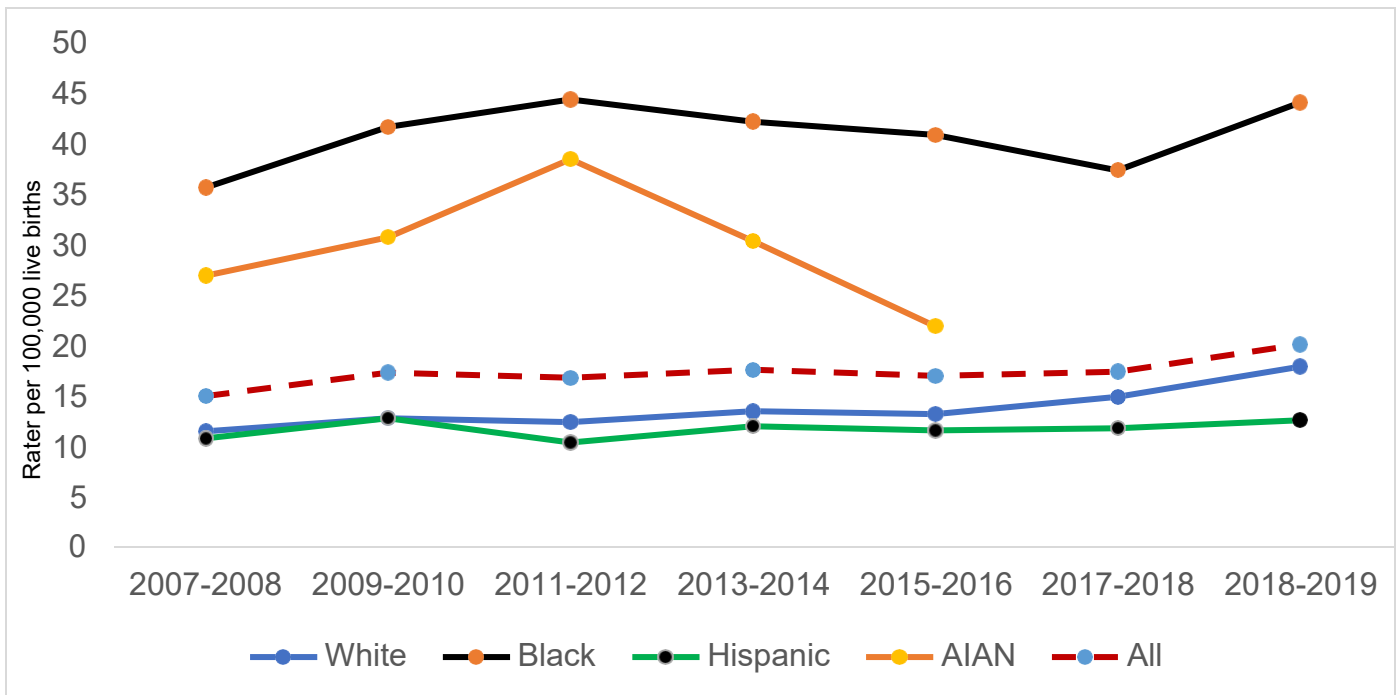


Figure 1. Pre and Post Medicaid Expansion Pregnancy-Related Mortality (per 100,000 live births)



*Figure 2. Pre- and Post-Medicaid Expansion Pregnancy-Related Mortality by Race/Ethnicity (per 100,000 live births) *Note: Data for AIAN unavailable after last data point*