Spring 5-10-2023

A Case Study of California's Maternal Health Landscape and Recommendations for Mississippi

Kinley Miller
University of Mississippi

A CASE STUDY OF CALIFORNIA'S MATERNAL HEALTH LANDSCAPE AND RECOMMENDATIONS FOR MISSISSIPPI

By
Kinley Miller

A thesis submitted to the faculty of The University of Mississippi in partial fulfillment of the requirements of the Sally McDonnell Barksdale Honors College.

Oxford
2023

Approved by

Advisor: Professor Melissa Bass

Reader: Professor Anne Cafer

Reader: Professor Molly Pasco-Pranger

ACKNOWLEDGEMENTS

This thesis is a product of not only my own work, but all of the support I have received over the past few years. First and foremost, thank you Dr. Melissa Bass for your guidance and constant patience throughout this process. Thank you for stepping in as my advisor and helping to further shape my research question and methodology. Thank you Dr. Nidhi Vij Mali for inspiring me to research maternal health and guiding me through an exploration of maternal health research. Thank you to Dr. Cafer and Dr. Pasco-Pranger for serving on my committee and committing your time and energy to reviewing my paper. Thank you to the Trent Lott Leadership Institute and the Public Policy Leadership Department for accepting me during my second year here at the University of Mississippi and allowing me to explore my passion for public policy. Thank you to the Sally McDonnell Barksdale Honors College for encouraging academic curiosity from its students. Without this project, I likely would have never gained the fervor for maternal health policy that I now hold. Finally, thank you to my friends and family who have supported me throughout this process, encouraged me to pursue research primarily for the benefit of others, and provided a shoulder to lean on when needed.

ABSTRACT

KINLEY JORDAN MILLER: A Case Study of California's Maternal Health Landscape
(Under the direction of Melissa Bass)

This paper is a case study of California's maternal health landscape, reflecting its exceptional approach to the maternal health crisis. I review several policies: the creation of the Maternal Quality Care Collaborative, the Maternal Data Center, and the Maternal Mortality Review Committee, maternal health toolkits, Medicaid expansion, extended postpartum Medicaid coverage, paid family leave, C-Section Honor Roll, and maternal mental health measures. The case study suggests that all of these policies in conjunction with one another correlates with a decrease maternal mortality. California's proactive approach and ability to mobilize public and private entities are key attributors to its success in reducing maternal mortality. I offer suggestions for Mississippi to improve its own maternal healthcare including expanding Medicaid, extending postpartum Medicaid coverage, either expanding its Perinatal Quality Care Collaborative to focus more attention on maternal health or creating a Maternal Quality Care Collaborative, and partnering with neighboring states to create a Maternal Data Center. These entities should focus on creating toolkits to address the most pressing maternal health issues. More broadly, Mississippi legislators should take a more proactive stance when it comes to maternal health policy.

CONTENTS

LIST OF ABBREVIATIONS

CDC Centers for Disease Control and Prevention

CMQCC California Maternal Quality Care Collaborative

CVD Cardiovascular disease

MDC Maternal Data Center

CA-PAMR California Pregnancy Associated Mortality Review

FPL Federal Poverty Line

MOMS European Concerted Action on Mothers' Mortality and Severe Morbidity

PFL Paid Family Leave

PMSS Pregnancy Mortality Surveillance System

PPCE Postpartum Care Extension

PRAMS Pregnancy Risk Assessment and Monitoring System

Chapter 1: Introduction

Maternal health is an important indicator of the wellbeing of a nation. The maternal mortality rate of a nation is widely-considered to be an indicator of the healthcare system as a whole as well as the health and socioeconomic development of a society (Sajedinejad et al., 2015). Additionally, the health of mothers shapes the health of future generations. The United States as a whole fall short when compared to other developed nations in terms of maternal mortality rate, with one exception: California. Mississippi rests on the other end of the spectrum.

California has implemented numerous policies to aid maternal health. Some of these policies are not directly targeted at maternal health such as Medicaid expansion and paid family leave. Others specifically target maternal health including the postpartum Medicaid expansion, and the creation of a Maternal Qualitative Care Collaborative, Maternal Data Center, and the Maternal Death Review Committee. The three aforementioned entities helped to create maternal health toolkits which directly aid health care providers and promote best practices in obstetrics. Other policies have shaped maternal health policy in the state as well including the C-section honor roll and mental health measures. I have explored all of these policies, their inception, methods, goals, barriers, and outcomes.

A review of the existing literature reveals the leading causes of maternal death and how maternal health varies around the globe. Additionally, it highlights the importance of insurance coverage which is reflected in California's expansive Medicaid provisions. It found aspects of Europe's maternal health landscape which are not often present in the United States, such as expansive midwifery care, paid family leave, and home-based postpartum care. The review shows a gap in the literature on policies that exist in the United States, and also show that even California can learn from some aspects of Europe's maternal health landscape.

This research is a single case study of California's maternal health policies using primary and secondary data. California has more exhaustive maternal health protections that were implemented earlier than its counterparts and consequently has better overall maternal health, as indicated by their significantly lower maternal mortality and morbidity. For this reason, California is a unique case, the study of which will provide valuable policy recommendations for other states. This research aims to answer the question of how these policies have affected the state of maternal health in California and if the policies are effective independently or need to be implemented in conjunction with other policies in order to be effective. The specific policies analyzed are the creation of the California Pregnancy-Associated Mortality Review (CPAMR) and actions linked to its findings, the creation of the California Maternal Quality Care Collaborative (CMQCC), the Maternal Data Center, creation of Quality Improvement Toolkits and Learning Collaboratives, the extension of postpartum Medicaid coverage to one full year postpartum, and other related policies.

This analysis uses multiple academic articles and journalistic sources to gain insight on the specific policies. Additionally, I use data from the Maternal Mortality Review Committee to show changes in maternal mortality over time. I use a grounded theory approach as I have built my own categories of criteria to analyze the data. These criteria include cost of implementation, barriers to and feasibility of implementation, changes in maternal mortality and morbidity rates, and effectiveness in reducing maternal mortality and/or maternal morbidity.

Through my case study I identify some key aspects of California's approach to maternal health that other states can learn from. They have addressed this crisis far sooner than any other state and continue to implement policy signaling a "the job's not done yet" attitude. Additionally, California has linked entities from numerous sectors, taking a statewide approach. The healthcare

system and state government have not been alone in California's maternal health journey. Other states, and Mississippi in particular, can learn from these approaches.

I develop specific policy recommendations for Mississippi. I chose to focus on Mississippi primarily because it is my home state. Many of my friends and family members have or will give birth in Mississippi, and they, as much as any woman, deserve to give birth safely. Currently, that is not the case for Mississippi mothers. As of 2023, the maternal mortality rate in Mississippi was 36 deaths per 100,000 live births, higher than the 2021 rate and higher than the U.S. rate by 3 percentage points. For black women, the rates are much higher (Ganucheau, 2023). My hope is that my policy recommendations will make Mississippi a safer place to give birth. These policies include expanding Medicaid and expanding postpartum coverage to one year. I encourage Mississippi to create a Maternal Quality Care Collaborative or expand its existing Perinatal Quality Care Collaborative to provide adequate attention to mothers independent of their infants. These potential collaboratives should follow California's lead on developing toolkits for the most pressing maternal health issues such as hemorrhage. A longer-term goal to collaborate with neighboring states to develop an expansive maternal data center that helps to inform quality care efforts in the future.

This study addresses the need for action against maternal mortality and morbidity in Mississippi and the United States as a whole. By making maternal care more accessible through insurance expansions and improving the quality of care in health care facilities, women in Mississippi can get pregnant, give birth, and handle the postpartum period more safely. The health of women in Mississippi deserves to be a conversation among policymakers for its own sake, not only for infants or families. Thus, Mississippi and other states should begin by adopting the proactive and enduring approach that has benefitted California.

Chapter 2: Background

Maternal health is an important indicator of overall wellbeing of societies, and the U.S. falls short compared to other developed nations. Throughout this section, I will cover important background information including relevant definitions, the state of maternal health in the U.S., the state of maternal health in the rest of the world and the policy differences between nations. This chapter will provide a better understanding of the concepts that underlie maternal health.

Definitions

The Centers for Disease Control and Prevention (CDC, 2003) defines maternal death as the "death of a woman while pregnant or within 42 days of the termination of pregnancy, irrespective of the duration and site of pregnancy, from any cause related to or aggravated by the pregnancy or its management, but not from accidental or incidental causes". A pregnancy-related death is the "death of a woman while pregnant or within one year of the end of pregnancy from any cause related to or aggravated by pregnancy". Maternal morbidity includes "any short or long-term health problems that result from being pregnant and giving birth", while maternal mortality refers to the "death of a woman from complications of pregnancy or within 6 weeks after the pregnancy ends".

The State of Maternal Health in the U.S.

The state of maternal health in the U.S. is concerning compared to other developed nations. According to the CDC (2020), in 2020 the U.S. had a maternal mortality rate of 23.8 per 100,000 live births in 2020. This rate is higher than that of 2019 (20.1/100,000 live births). One study found that, in 2018, the U.S. had a maternal death rate more than double that of most other high-income countries including France, Canada, the United Kingdom, Australia, Switzerland, Sweden, Germany, the Netherlands, Norway, and New Zealand (Tikkanen et al., 2018) There are

stark racial disparities with non-Hispanic black women being 2.9 times more like to experience maternal mortality than non-Hispanic white women. Mortality rates of non-Hispanic Black and Hispanic women increased significantly between 2019 and 2020. (CDC, 2020) It is important to note that because the maternal mortality rate counts the number of maternal deaths per 100,000 live births, this metric does not consider women who died from pregnancy-related causes before labor or women who died during or after a still-birth. Thus, the actual number of women who die each year from pregnancy-related causes is likely higher than the maternal mortality rate.

U.S. Maternal Health Policy

According to U.S. federal law, all states must provide Medicaid coverage for all pregnancy-related services to pregnant women with incomes up to 138% of the federal poverty line and cover them to 60 days postpartum. States can extend both eligibility limits and postpartum coverage, which many states have done. Twenty-five states have acted to extend postpartum coverage. States who have expanded Medicaid must cover all preventive care measures recommended by the U.S. Preventive Services Task Force.

A significant percentage of US births are covered by Medicaid (43%). Currently, women enrolled in Medicaid through pregnancy eligibility are only ensured coverage for 60 days postpartum. One study found that 21.9% of mothers who had prenatal coverage became uninsured two to six months postpartum (Johnston et al., 2021). This loss of coverage is largely due to the generous nature of pregnancy-eligibility coverage compared to eligibility for other adults. For this reason, women who receive coverage because of pregnancy eligibility often lose coverage once the coverage period ends. (Kaiser Family Foundation, 2022)(Kaiser Family Foundation, 2022).

The U.S. has 12 maternal care providers (midwives or ob-gyns) per 1,000 live births, the lowest of nine European countries and Canada, and there are only 4 midwives per 1,000 live births (Tikkanen et al., 2020). The low number of midwives contributes to the insufficient number of maternal care providers more so than the number of ob-gyns. One reason for the lack of midwife care in the US is differing state laws that disincentivize midwife care and strictly limits midwives' allowed scope of care. Only 11 states currently reimburse care provided by direct-entry midwives, midwives who have been credentialed without first becoming certified nurses. In addition, many states do not require private insurance plans to cover midwife-provided services. (Kozhimannil et al., 2015).

Maternal Deaths in the U.S.

Comparatively, the US has a much higher incidence of pregnancy-related deaths than other developed nations (Tikkanen et al, 2020). Pregnancy-related deaths occur throughout the prenatal, birth, and postpartum period, with approximately 24% occurring during pregnancy, 34% on the day or within a week of delivery, 19% between 7-42 days postpartum, and 24% between 42-365 days postpartum (CDC, 2019). In some states, the incidence of postpartum death was even higher. According to their Maternal Mortality and Morbidity Task Force, over half of all maternal deaths in Texas (56%) and West Virginia (62%) occurred more than 60 days postpartum (Eckert, 2020).

Maternal deaths occur for numerous reasons and a significant portion of them are considered preventable. The leading cause of death between 2016-2018 was "other cardiovascular conditions" (16.2%), followed by infection or sepsis (13.9%), cardiomyopathy (12.5%), hemorrhage, thrombotic pulmonary or other embolisms, cerebrovascular accidents, hypertensive disorders of pregnancy, amniotic fluid embolism, and anesthesia complications

(CDC, 2022). The most common causes of death during pregnancy at the time of birth are heart conditions. The most common cause of death during the postpartum period are mental health conditions including substance use and suicide (Declercq & Zephyrin, 2020). Further, the CDC found that nearly two-thirds of pregnancy-related deaths were preventable (CDC, 20220)

State of Maternal Health in Europe

Countries in Europe have significantly lower maternal mortality ratios than the U.S. The average maternal mortality ratio in the European Union is eight deaths per 100,000 live births. Countries such as Poland, Greece, Finland, and Sweden have a maternal mortality rate of between three and four deaths per 100,000 live births. As of 2017, Latvia had the highest mortality rate in Europe: 19 deaths per 100,000 live births. This is considerably lower than the U.S. state with the highest maternal mortality rate, Louisiana with 58.1 deaths per 100,000 live births (Roser & Ritchie, n.d.). Maternal health is complex and affected by various factors, but a few have been found to contribute to Europe's relatively better maternal health outcomes, including promised paid maternity leave, more extensive use of midwifery, and more extensive postpartum care including home visits (Tikkanen et al., 2020).

Despite European countries' lower maternal mortality rates in European countries, racial and ethnic disparities are present. Between 2018 and 2020 in the UK and Ireland, women from Black ethnic backgrounds were 3.7 times more likely to experience maternal death, and women from Asian ethnic backgrounds were 1.8 times more likely (MBRRACE-UK, 2022).

Global Context – Developing Nations

While the U.S. has a high maternal mortality rate than its high-income counterparts, it is important to note that the U.S.'s maternal mortality rate is significantly lower than developing nations' rates. According to the World Health Organization, 94% of all maternal deaths occur in

low and lower-middle-income nations. Approximately 86% of all maternal deaths occur in countries in Sub-Saharan Africa and South Asia. Ethiopia, for example, has a maternal mortality rate of 412 deaths per 100,000 live births (USAID, n.d.). Despite their high maternal mortality ratios, low-income countries lowered their maternal mortality ratio by just under 50% between 2000 and 2017. (World Health Organization, 2019)

Recommended Policies for Optimal Maternal Health

In 2018, the American College of Obstetrics and Gynecology (2018) compiled a list of policy recommendations to maximize maternal health. The recommendations largely emphasize the importance of the "fourth trimester" and providing extensive care well after labor and delivery. This includes ongoing care in the postpartum period, a developed postpartum plan pre-birth regarding the transition to parenthood and future reproductive desires, contact with a health care provider within the first three weeks postpartum, individualized care, and well-rounded care including physical, social, and psychological assessment. In addition, care for women with complicated pregnancies, high-risk characteristics such as gestational diabetes or hypertensive disorders, and other chronic conditions should especially receive postpartum care

Maternal health in the U.S. lags behind that of other developed nations. However, this maternal health crisis is taken in the first-world context as developing nations have maternal mortality rates that are significantly higher than the U.S. U.S. This chapter identifies gaps in Medicaid coverage and a lack of midwives as issues within the U.S. maternal healthcare landscape. Further, attention to the postpartum period and high-risk pregnancies is crucial to the wellbeing of mothers.

Chapter 3: Literature Review

The medical causes, external factors, and nature of maternal death have been heavily explored in the literature. In this section, I will describe several studies that cover the specific medical conditions that directly cause maternal death, as well as when they occur during the pregnancy process. In addition, I will explore European policies that contribute to these countries' lower rates of maternal death. These policies include widely accessible insurance coverage, use of midwifery, paid maternity leave, and home-based postnatal care.

Causes of Maternal Mortality

In a 2003 study, Alexander et al., studied 15 European countries to determine maternal mortality rate, maternal mortality by age, cause of death, and delivery method. The study found that between ages 25 and 40, the risk of maternal mortality increases significantly. The leading causes of death were embolism, hemorrhage, and pregnancy-induced hypertension, with both sepsis and first-trimester deaths significant contributors as well. Finally, mothers who had a Cesarean delivery were four times more likely to experience maternal death than mothers who delivered vaginally. This research shows important factors that correlate with maternal mortality.

A 2019 study by Lega et al. looked at the characteristics of women who died by suicide in the year postpartum. Sixty-seven maternal suicides were observed. In most cases, the women had a history of psychiatric problems. Researchers found that continuity of care across primary, mental health, and maternal care was vital in the prevention of these deaths. These findings indicate that insurance coverage is an important factor not only in the physical health of women but also in their mental health, and can play a role in preventing maternal suicides (Lega et al., 2019).

A narrative review by Ahn et al. (2020) highlights the leading causes of and factors that contribute to maternal death and morbidity in the US. In addition, the paper identifies some mechanisms to improve maternal health outcomes. Using data from the CDC's Pregnancy Mortality Surveillance System (PMSS), the national surveillance system used to track risk factors and causes of pregnancy-related deaths, researchers identified cardiovascular conditions, noncardiovascular medical conditions, and infection as leading causes of pregnancy-related death. More than half of all pregnancy-related deaths occurred in the postpartum period, and approximately 12% of deaths occurred after 43 days postpartum. Indicators of severe maternal morbidity included blood transfusion; disseminated, intravascular coagulation; hysterectomy; acute renal failure; and adult respiratory distress syndrome. The authors separated factors contributing to adverse maternal health outcomes into three categories: patient-level, community-level, and health system-level factors. Patient-level factors include increases in maternal age, obesity, pre-existing chronic conditions, and Cesarean deliveries. Substance abuse and mental health conditions are also important factors in maternal health. Racial disparities are also significant with Black women and Native women having significantly higher pregnancy-related mortality ratios. Community-level factors include a lack of access to clinical care, stable housing, and adequate transportation options. Women in rural communities were more likely to experience maternal mortality and mortality during childbirth. Health system factors include a lack of standard approaches to emergency obstetric care and proper attention to the full life course of women, specifically in the postpartum period. This review offers insight into the nature of maternal death and morbidity in the US and allows for further examination into how to address different levels of contributing factors to maternal mortality and morbidity.

A study by Trost et al. published in 2021 researched pregnancy-related mental health deaths between 2008-2017 using data from 14 US Maternal Mortality Review Committees. The states included Arizona, Colorado, Delaware, Florida, Georgia, Hawaii, Illinois, Louisiana, Mississippi, North Carolina, Ohio, South Carolina, Tennessee, and Utah. Researchers found that of 421 total pregnancy-related deaths, mental health conditions were a leading cause, with 11% of all deaths having a mental health condition as an underlying cause. All pregnancy-related mental health deaths were determined to be preventable, 63% of which occurred between 43 and 365 days postpartum. 68% of all maternal deaths with an identifiable cause of death were found to be preventable. Of all pregnancy-related deaths, 63% were in women covered by Medicaid at the time of delivery, despite 43% of U.S. deliveries being covered by Medicaid. This study offers insight into the nature of late maternal deaths and suggests that many, especially mental health deaths, are preventable. Further, it shows that women with Medicaid coverage are disproportionately affected by maternal mortality.

A study by Sliwa et al. (2018) looked at the effects of postpartum care on women with cardiovascular disease (CVD), a leading cause of maternal mortality. The study looked at 269 women with CVD, and divided them into two groups: one receiving treatment from a "dedicated cardiac-obstetric team" and the other receiving additional services including an early follow-up visit between 2-6 weeks postpartum and care from a "dedicated CVD specialist clinic". Of the group without additional care, nine patients died within 12 months postpartum, while only one patient died from the additional care group. These findings suggest extensive postpartum coverage can play a significant role in the prevention of maternal mortality, especially among populations with conditions such as cardiovascular disease.

European Countries

A study by Maruthappu et al. (2014) researched the association between government healthcare spending and maternal mortality in countries within the European Union. The researchers looked at 24 EU countries including Finland, Greece, and Poland, three countries with some of the lowest maternal mortality rates in the world (three maternal deaths per 100,000 live births). The study found that with an annual 1% decrease in government healthcare spending, there was a significant increase in maternal mortality. In the first year of reduced spending, maternal mortality increased by 10.6%. A year following the reduction, the association remained. The association remained when researchers considered "economic, infrastructure, healthcare resources, total fertility rates, out-of-pocket expenditure, and private health spending indicators". While maternal mortality is a complex issue, affected by many social factors such as poor education, poor nutrition, and poverty, this research suggests that government spending is an important factor in maternal health and reductions in such should not be implemented without mechanisms to counter the reduced spending with highly efficient systems of care.

A study by Wildman et al., (2004) looked at 290 obstetric deaths occurring between 1992 and 1995 in 11 European countries. Researchers used data from the European Concerted Action on Mothers' Mortality and Severe Morbidity (MOMS) to look at the timing and cause of death, obstetric care offered, and whether or not the death was pregnancy-related. Researchers found clear patterns in the cause and timing of death and age of mothers and maternal mortality ratios. More specifically, hemorrhaging as a cause of death was significantly more common in countries with higher maternal mortality ratios. Likewise, countries with lower maternal mortality rates had fewer deaths among women over the age of 35. This research suggests that even within European countries, health systems across borders differ in their ability to respond to obstetric

emergencies such as hemorrhages. It also shows what areas of care countries with higher mortality rates can improve

A study by Topcu et al., (2022) researched prenatal care in 24 European countries, using an online questionnaire comprising 37 multiple-choice and open-ended questions. Researchers found that most countries used medical practitioners to deliver prenatal care, while seven countries used midwives, either independently or in conjunction with doctors. Low-risk women in Denmark, Estonia, Finland, France, Ireland, Norway, Spain, and the UK received their prenatal care primarily from midwives, while low-risk women in most other countries had mixed midwife-doctor care. High-risk women in most countries had joint care from midwives and doctors or doctors alone. Most countries had a public health care system, though Italy, Latvia, Malta, and Romania had a dual public-private system, and Austria and Germany had a predominantly private health care system in which mothers relied either on personal funding or private insurance. In all countries with a public system, with the exception of Kyrgyzstan, minority women were able to obtain care with ease. In 15 countries with a large private healthcare sector, minority women were similarly easily able to obtain care. Most countries provide between six to ten outpatient visits for low-risk women. Finally, researchers also found that every country included in the study had a routine national antenatal care service that complies with international standards. This study offers insight into the European antenatal care system and how differences in care do not directly result in discrepancies in the quality of care. It is also important to note that the frequency of midwife care and the ease at which minority women are able to obtain care differs significantly from the US.

The Role of Insurance

In 2020, the Urban Institute (2020) conducted a study on the barriers to healthcare during the postpartum period in the US and the specific health conditions that these barriers affect. The Institute used data from the National Health Interview Survey (NIHS) from the years 2015-2018, looking at women ages 19-44 who did not have insurance at the time of the survey. The NIHS data was supplemented with data from the Pregnancy Risk Assessment and Monitoring System (PRAMS) from the years 2015-2017. The study analyzes the points at which postpartum women had or did not have insurance coverage, concerns about paying for medical care, unmet health needs due to costs, and whether postpartum women had some source of care other than the emergency department. The study found that approximately 11.5% of new mothers were uninsured, 65.3% of those women residing in the South. Approximately 23.2% of these uninsured new mothers reported having at least one unmet need (either medical care, prescription medicine, or mental health care), due to cost. Over half (52.1%) of these uninsured women reported being "very worried" about paying for health care. Nearly half of the mothers reported a loss of coverage due to losing Medicaid eligibility. Finally, the study assessed the health conditions of women who became uninsured following pregnancy. In the pre-pregnancy period, 30.6% of women were obese and 10.4% had depression; in the prenatal period, 18.5% of women had diabetes or hypertension and 12.5% had depression. Nearly 20% of women experienced postpartum depression. In addition, 32.3% of mothers had a Cesarean-section delivery. Each of these conditions indicates a need for ongoing care following birth, despite their lack of coverage. This study is relevant to my research because it indicates that a significant number of new mothers who need medical care following birth do not receive it due to a lack of insurance coverage. This is especially important because a significant number of maternal deaths occur during the postpartum period.

A systematic review by Gray et al., (2018) analyzed 22 peer-reviewed studies from the last 21 years regarding continuity of care in any type of medical care (general or specialized). Nine of the studies regarded general medicine, three regarded specialists, and 10 looked at continuity within any kind of medicine. Eighteen of the 22 studies showed a strong correlation between continuity of care and lower mortality rates. While these studies did not pertain directly to maternal health, the results suggest that continuity of care is broadly significant in health care, and thus suggest that it is likely significant in maternal health.

A study by Ela et al., (2022) observed the effects of insurance churn among postpartum Texas women covered by Medicaid at the time of delivery. The researchers used data from the Texas Postpartum Contraception Study, which administered surveys to 1,700 women who gave birth between 2014 and 2016 at six points in time: after delivery and at three, six, 12, 18, and 24 months postpartum. Ela et al.'s study excluded women who were uninsured at the time of delivery, and found that 76% of women were uninsured at three months postpartum, and 88% of women lacked coverage at some point between delivery and 12 months postpartum. 17% of women reported having "fair or poor" health at three months postpartum. The study also collected open-ended health responses which suggest that a significant portion of women have health concerns. Of 445 open-ended responses 118 described ongoing conditions, 122 described undiagnosed problems, 36 described reproductive health concerns, 27 described acute conditions, 22 described mental health concerns, 20 described pregnancy-related concerns, and 166 described weight and lifestyle concerns. This study shows that while many women lose coverage during the postpartum period, they still have health needs and concerns, and a loss of insurance coverage can create barriers to addressing such needs.

According to a 2022 study by Gordon et al., postpartum Medicaid is positively correlated with continuity of coverage during the postpartum period. The study looked at women in Colorado between 2014-2019 who were eligible for low-income Medicaid and women who had no Medicaid eligibility. Researchers found that women with Medicaid coverage on average had 1.5 more months of coverage than women without it. Likewise, women with coverage had a 12-percentage point increase in the probability of continuity of coverage during the first year postpartum. (Gordon et al., 2022)

Paid Maternity leave

In a 2015 systematic review, Aitken et al., analyzed seven studies regarding the effect of paid maternity leave on maternal health. The studies included data from Australia, the United States, Sweden, Canada, and Lebanon. Some of the studies analyzed health on an individual level, while others used a policy-level comparison. Three individual-level studies concerned mental health and found a positive relationship between paid maternity leave and mental health. The two individual-level studies regarding physical health and paid maternity leave also found a positive association between the two. One of the studies found that with each additional week of leave, women were 4% less likely to report poor physical well-being. The studies with policy-level comparisons, found no significant correlation between maternity leave and better mental health or life satisfaction. U.S. mothers reported greater life satisfaction with no guaranteed maternity leave than did mothers in Sweden with 52 weeks of paid leave. Likewise, another study found no correlation between general health and paid maternity leave.

Midwifery

In a 2016 study, Sandall et al., researched trends in midwifery-led care models versus care models that did not integrate midwifery. Researchers used a systematic review method,

looking at 15 studies in total, including 17,674 women in Australia, Canada, Ireland, and the UK. Researchers found that women in systems with midwife-led care were less likely to experience preterm birth and more likely to experience spontaneous vaginal birth. Likewise, these women were 16% less likely to experience fetal loss or neonatal death. There were no statistically significant differences in the likelihood of hemorrhage, antenatal hospitalization, and low infant birth weight. This research suggests that midwifery can be an important part of maternal health.

Home-Based Postnatal Care

MacArthur et al., (2002) researched the effects of community-based postnatal care on women's mental and physical health. The study included 2064 women from the West Midlands region of the UK and used a questionnaire to obtain data. The intervention group had care led by midwives for three months. Researchers found that women in the intervention group had significantly better mental health and similar physical health to women in the control group. This research suggests that, although physical health was not significantly improved by extended, home-based care, it could still benefit women as mental health deaths are a significant portion of all maternal deaths.

This chapter identifies embolism, hemorrhage, and pregnancy-induced hypertension are all leading causes of maternal death. I also explore literature relevant to the maternal health policies in Europe including midwife care, paid-maternity leave, and home-based postnatal care. Finally, I explore the role of insurance and how gaps in coverage affect mothers' health.

Chapter 4: Case Study

California is an exception case of maternal health in the U.S. In 2006, the state noticed a rise in maternal mortality and acted to counter this rise. The first of these actions was the creation of the California Maternal Quality Care Collaborative which snowballed into numerous policies and entities that further improved maternal health including all of the policies outlined in this chapter. This snowball effect was due to the constant support given to the CMQCC and its ability to mobilize numerous actors including policymakers, non-profits, hospitals, and medical practitioners (Main et al., 2018). All of the policies in this chapter play a role in the reduced maternal mortality rate of California. However, the underlying reason for California's success is its proactive approach and a consistent, state-wide focus on maternal health. Not only did California implement maternal health measures early on, the state did not abandon its mothers. The state continues to pass policies that either improve the quality of maternal care or make it more accessible.

California Maternal Quality Care Collaborative – CMQCC (2006)

In 2006, California formed the Maternal Quality Care Collaborative, a public-private partnership to improve maternal health. This collaborative worked with the California Department of Public Health, uniting clinicians (obstetricians, nurses, midwives, and family practitioners), hospitals, and other relevant entities to address maternal health. In recent years, the collaborative has focused on severe maternal morbidity and Cesarean deliveries. Its broad developments that have shaped the maternal health landscape in California include "linking public health surveillance to action steps, mobilizing a broad set of public and private partners to work collaboratively, establishing a low-burden, rapid cycle data system to support improvement efforts, and implementing multi-partner, large-scale interventions that integrate clinical providers

with public health services" (Main et al., 2018). By 2017, 211 hospitals participated in the collaborative which included 95% of all deliveries in the state (Lockwood, 2019).

To join the CMQCC and the Maternal Data Center (described in detail in the next section), hospitals must reach out via email and await a response with information about membership. The CMQCC will then schedule a webinar presentation to educate interested individuals on the MDC's tools and features. If hospitals decide to opt in, they must designate a project administrator and sign a Participation Agreement outlining the CMQCC's commitment to comply with state and federal regulations around patient confidentiality and security. Once a member of the CMQCC, participants must upload Patient Discharge Data to the MDC either monthly or quarterly, and will receive rapid-cycle reports. The CMQCC will then conduct a one-and-a-half-hour webinar training to teach participants how to use the MDC metrics retrieval tool, at which point hospitals will be able to use the compiled data to shape improvement efforts (California MDC, n.d.).

Costs for hospitals to participate depend on the number of years of commitment, the number of participating sites in the hospital system, the percentage of Medi-Cal (the California division of Medicaid) maternity patients at the hospital, and the number of births at the hospital. Costs are shown in the table below (Membership Fees and FAQs, n.d.).

1-2 Site Hospitals

If your hospital is a single, stand-alone facility or in a network of 2 hospitals, your fees are:

Timeline	Fee per site per year
Year-to-year commitment on a site-by-site basis	$10,000
Two-year commitment	$8,000

Multi-hospital Systems

If your hospital is part of a system with >2 hospitals, your fees are:

	Fee per site per year		
Timeline	3-5 sites	6-15 sites	15+ sites
Year-to-year commitment on a site-by-site basis	$10,000	$10,000	$10,000
Two-year commitment across all *currently participating* sites in a system	$6,500	$6,000	$5,500

Currently participating sites are those hospitals in your system that were participating in a CMQCC QI Collaborative or the Maternal Data Center as of February 2016

Additional Discount Options

Members in Need Scholarship*	Fee per site per year
A. <1000 annual births **and** 70% or more Medi-Cal Patients	$2,000
B. 1000-3500 annual births **and** 80% or more Medi-Cal Patients	$5,000

The benefits of joining the collaborative include learning opportunities from on-call clinical coaches, data managers, and peer hospitals. The CMQCC provides participating hospitals support for the birth equity initiative, using race and ethnicity stratifications from the Maternal Data Center. The collaborative is currently working on a Birth Equity Implementation Guide. It provides continuing education opportunities that are accepted by the California Board of Registered Nursing to fulfill continuing education credits. Hospitals can seek support for meeting data reporting requirements of various entities within California. The collaborative also provides an online discussion platform called SHARE, where member hospitals can share policies, best practices, and ideas. It aims to create sustainable change most notably through the QI Academy: a year-long educational initiative focused on evidence-based quality improvement

techniques to enhance the long-term QI skills of the perinatal team. Additionally, members have access to community and members-only education webinars and resources. The CMQCC provides incentives, both financial and recognition-based, to encourage quality improvement (Hospital Membership, n.d.).

Maternal Data Center – MDC (2012)

The Maternal Data Center is a valuable benefit of participating in the CMQCC. It is an online tool that provides rapid data and performance metrics on maternal health and care in participating hospitals (California MDC, n.d.). As of 2018, 212 of the 240 hospitals in the California collaborative participate. The data center uses data from multiple sources less than 45 days old, creates linkages, and presents a range of measures for every hospital to shape improvement efforts. The center uses birth certificate and other data from the California Department of Public Health, hospitals discharge files for every birth at a participating hospital, and data from the California Office of Statewide Health Planning and Development. By using data hospitals already have to submit, the MDC imposes no extra burden on members hospitals. By doing this, California is able to reduce costs for chart reviews and allows for broader data to be collected. There is a one-time data submission cost to hospitals (Main et al., 2018). Recently, the MDC extended participation to hospitals in Washington and Oregon (California MDC, n.d.). It strives to create a user-friendly interface for participating hospitals to view their data and plays an important role in developing toolkits (Main et al., 2018).

The center creates at least 50 maternal performance standards and offers feedback to hospitals by conducting peer comparisons and creating progress trackers over periods of time through an online interface. This allows hospitals to see where they are lacking and how they can improve in the future (Burke, 2018). One particularly useful feature is the focus on measure

analysis, which helps hospitals understand why certain rates are elevated in the first place. The web portal also offers metrics based on race, ethnicity, and payer status, allowing hospitals to identify disparities based on these factors (Main et al., 2018). The interface has specific features for preeclampsia and hypertension since they are leading causes of maternal death (California MDC, n.d.). Other metrics include early elective deliveries, Cesarean sections for low-risk first births, antenatal steroids, episiotomies, severe maternal morbidities, unexpected newborn complications, and vaginal births after Cesarean section (California Maternal Data Center, n.d.). There is a one-time data submission cost to hospitals along with aforementioned costs of joining the CMQCC.

More specifically, the MDC provides data that allows hospitals to generate nationally endorsed perinatal quality metrics and provider-level quality metrics. Participating hospitals can see hospital performance state and region-wide to make quality comparisons. Hospitals can identify issues with their data quality that may impact the MDC's ability to produce accurate metrics. Finally, the MDC facilitates reporting requirements to various groups in California, creating an efficient means for different entities within the California healthcare system to share information (California MDC, n.d.). Most importantly, hospitals that use the MDC have better maternal health outcomes. One study found that hospitals participating in the MDC had a 12% reduction in severe complications among women with preeclampsia. Additionally, women who had experienced hemorrhage or had a blood transfusion had a 36% reduction in severe morbidity (CDC, 2015).

The MDC has created an effective system of data collection and analysis, and has aided in the creation of toolkits which have helped reduce maternal mortality and morbidity. While the

MDC does not act alone, its role in promoting quality improvement measures helps maternal health overall.

Maternal Death Review Committee (2006)

In 2006, the collaborative allocated funds to create the California Pregnancy-Associated Mortality Review to conduct case reviews of maternal deaths. This committee includes maternal, perinatal, and public health clinical experts to conduct the reviews, all of which aim to determine the demographics and cause of the deaths as well as any contributing factors and areas for improvement. Experts who serve on the committee specialize in obstetrics, maternal-fetal medicine, anesthesiology, neonatology, midwifery, labor and delivery, nursing, emergency medicine, and cardiology. Because the committee focuses both on confirming cause of death and quality improvement opportunities, it includes experts from both large obstetric units and generalists from small or medium-sized hospitals (Main, 2012). Members serve on a volunteer-basis, with reimbursement for travel only (Mitchell et al., 2014). Results of the reviews are entered into a database, and then the committee communicates the results to both public and clinical stakeholders to create action items (Main et al., 2018). The review committee is pivotal in creating toolkits targeting specific problem areas of maternal health such as hemorrhage, the leading cause of severe maternal morbidity and preventable maternal mortality in the U.S. (Burke, 2018).

One study aimed to communicate the methodology of the Pregnancy-Associated Mortality Review Committee and its effectiveness in using birth certificates, discharge files, and other public health records followed by additional reviews as a means of maternal health surveillance. The committee first uses birth certificates and discharge files to identify women who died within a year after the end of their pregnancies. An annual cohort of pregnancy-

associated death is usually between 170-200. Deaths are categorized either as O-codes (obstetric deaths) or non-O codes (non-obstetric deaths). They are also categorized by when, during or after pregnancy, the death occurred. All non-O code deaths are further screened using numerous records. If there is no sign of pregnancy-related causes, these non-O code deaths are excluded from further review. All deaths caused by motor vehicles, homicide, or suicide are excluded (Mitchell et al., 2014). Though suicide is a frequent cause of maternal death, it is excluded from review because the committee focuses on deaths that occur in the hospital or shortly after discharge. Members of the committee report that their system of case selection allows for a complete assessment necessary for true public health analyses. The major drawback of their methods is the time requirement. Given the delay in data accessibility, it can take up to three or four years before the review process can even start. Another drawback is that the process does not allow for the review of deaths that occur early in pregnancy. The committee justifies this because early pregnancy deaths are much less frequent (Main, 2012).

Once the committee has selected the cases for review, they use all available medical records including prenatal records, hospitalization records, outpatient and emergency department records, and medical transport documentation. All data is entered into a standardized form which creates a summary including medical history, diagnostic results, and key events (vital signs, medications, nursing, obstetric, anesthesia, and resuscitation care). Over several quarterly meetings that focus on 15 deaths each, committee members aim to determine the pregnancy-relatedness of the death, causes of death, risk factors and levels at prenatal and delivery care, contributing factors, preventability, and quality improvement opportunities (Mitchell et al., 2014). Not only do reviewers attempt to determine causal factors, but they also attempt to determine contributing factors such as underlying medical issues. Contributing factors also

include undesired pregnancy, lack of awareness of pregnancy warning signs, access to health care, language barriers, or other issues related to the woman or her family (Main, 2012).

Case abstracts are provided to each member of the committee with three members responsible for leading the discussion. This method is meant to prevent one or a few individuals from dominating the discussion. If a committee member was involved in the case, they are excluded from that case review; if the committee member's institution was involved in care but not the member directly, the member can sit in on discussion but not participate (Main, 2012).

In 2012, the California Maternal Death Review Committee published an article explaining the logic behind its review process. Before even starting the review process, the committee decided to view maternal mortality through three unique lenses: a public health lens which focuses on demographics and large-scale health issues, a medical lens which focuses on the specific diagnoses that led to the deaths, and a quality improvement lens which focuses on care improvement opportunities that will direct changes in the healthcare system. Public health professionals who collect and process demographic data satisfy the public health lens, while other experts satisfy the other two lenses. In determining preventability, the committee evaluates the overall "chance to alter the outcome" by determining if feasible, implementable actions, could have altered the chain of events, using the following levels: strong, good, some, or none (Main, 2012). Similar to the MDC, the Maternal Mortality Review Committee aids in assessing problem areas in maternal health so hospitals and the state of California can address them.

Toolkits (2006)

The Quality Care Collective began creating toolkits in 2006 and first disseminated them in 2009. The first toolkits were developed for obstetric hemorrhage, and preeclampsia, with the Obstetric Hemorrhage Toolkit disseminated to 30 hospitals in 2009, and the preeclampsia toolkit

to 25 hospitals the following year, along with a statewide lecture series. These toolkits include evidence-based practices, sample policies, mini-reviews of key topics, implementation recommendations, and an educational slide set. There are toolkits for cardiovascular disease, venous thromboembolism, and vaginal birth in an effort to reduce Cesarean sections. The Regional Perinatal Programs of California employs regional coordinators to distribute toolkits and provide support and technical assistance, known as quality collaboratives. In 2011, the California Department of Public Health released the 2002-2007 pregnancy-related death review which inspired the development of additional tool kits and quality collaboratives, some reaching up to 136 hospitals (Main et al., 2018).

The obstetric hemorrhage toolkit, for example, utilizes a "hemorrhage cart" which holds medications and supplies, protocols for major transfusion, drills, and training materials. Hospitals that implemented this toolkit saw a 21% decrease in maternal deaths from bleeding in the first year of implementation ("Maternal Mortality in the U.S.", 2017). It also calls for a postpartum hemorrhage risk assessment at the time of hospital admission, which categorizes patients as low, moderate, or high risk. This categorization helps determine the need for a blood type or antibody screening for low to moderate-risk patients and a blood type and cross-match for high-risk patients (Hussain et al., 2019).

One study looked at 99 hospitals that used the obstetric hemorrhage toolkit and 48 that did not over a 5-year period. Researchers found that participating hospitals saw a 20.8% reduction in severe maternal morbidity, compared to a 1.2% reduction in non-participating hospitals. Additionally, hospitals with a history of toolkit usage experience an even larger reduction (28.6%) (Amis, 2016). Another study found that hospitals using the pre-eclampsia toolkit showed more awareness of severe hypertension in pregnant women due to the debriefing

element of the toolkit. Similarly, the toolkit improved charting and coding methods, allowing for overall improvement in data collection for future improvement efforts on hypertensive disorders such as preeclampsia (Morton, 2014).

Yet another study researched the degree of implementation of toolkits for maternal hemorrhage and user experience in a 31-hospital quality improvement collaborative. Researchers conducted interviews with 22 implementation leaders, asking them to rank the 10 core recommendations of the toolkit on the basis of implementation degree and perceived usefulness. These recommendations included routine admission risk assessment, routine active management of the third stage of labor, quantitative blood loss measurement for vaginal and Cesarean births, adoption of a standardized hemorrhage protocol, training of medical staff on the use of intrauterine balloons and/or B-Lynch suture, deployment of hemorrhage carts, having systems in place for massive hemorrhage, hemorrhage debriefings, and hemorrhage drills (Lyndon, 2016).

Most interviewees (77%) reported that they had implemented all 10 recommendations and rated them as “very useful - critical to retain”. Two recommendations, routine active management of the third stage of labor and hemorrhage debriefings, were ranked as less useful and as having a lower degree of implementation. However, they were identified as “critical to retain” by 60% of respondents. One explanation for the lower rating for the routine active management of the third stage of labor is that most participants reported that this was already in place prior to the toolkits. Hemorrhage debriefings, on the other hand, were seen as useful but difficult to implement and sustain due to the workload and fast pace environment of a labor and delivery unit. Despite the drawbacks, overall respondents reviewed the toolkits and their effectiveness in improving their response to maternal hemorrhage positively (Lyndon, 2016).

A more recent study aimed to determine the cost-effectiveness of the hemorrhage toolkit. Researchers compared the outcomes and costs of 480,000 births in the state of California, including both short- and long-term costs associated with labor and delivery. The study found that the toolkit was cost-effective, as it reduced severe maternal morbidity, emergency hysterectomies, and maternal mortality, saving the state $9 million in averted costs (Wiesehan, 2023).

One barrier to implementation, according to Main, is inertia. Because these toolkits are new medical protocols, they can take a long time to be widely accepted. Other barriers may include cost and training. Further, some individual clinicians reject the notion of "cookbook medicine" or a simplification of lifesaving care (Maternal Mortality in the U.S. is Rising, 2017). Other barriers include local culture, local structure, the experience of implementers, degree of administrative support in terms of resources, personnel, and data collection, existing resources, clinician engagement, quality of communication, and hierarchical structures. Because of the significant role of nurses in implementation, physician buy-in has also been identified a potential barrier in some facilities due to the hierarchical relationship between nurses and physicians (Lyndon, 2016).

Overall, the different toolkits have helped reduce maternal morbidity and mortality and thus improve overall maternal health by establishing a standard basis of care in specific problem areas of maternal healthcare in California.

Expanding Medicaid (2011-2014)

One policy decision that is not unique to California but is significant to a state's healthcare system is the expansion of Medicaid. In 2014 California opted to expand Medicaid, meaning that nearly all residents with incomes up to 138% of the federal poverty line (FPL) are

eligible for Medicaid coverage. Pregnant women's eligibility increased from 200% to 213% of the FPL (Main et al., 2016). As a result, the number of uninsured women of reproductive age (15-44) decreased from 22% in 2013 to 8% in 2021. The incidence of disruptions in health insurance before, during, and after pregnancy also decreased. Expanding Medicaid alone has not been shown to improve maternal health, but it has increased healthcare coverage, making healthcare more accessible for mothers (Marchi, 2021).

Paid Maternity Leave (2003)

In 2004 California mandated paid family leave through the Family Temporary Disability Insurance Program. The policy is funded by a mandatory payroll tax ON employees (Cal & Kleiner, 2005). Mothers are eligible for benefits to bond with a new child, either a newborn, fostered, or adopted child. Mothers must be either part-time or full-time employees who pay into the State Disability Insurance program, earn a minimum of $300 in wages in a 12-month period, and have lost wages due to the need for time off. Beneficiaries receive approximately 60 to 70 percent of their pay and may be able to use vacation, sick, paid time off, or other leave benefits to meet 100% of their pay depending on the employer. Benefits are available for up to six weeks which was extended to eight weeks in 2019 and may be accepted at one time or over a 12-month period. To apply, mothers must submit the Paid Family Leave Form within 41 days of the date of leave (Employee Development Department, 2022). In 2016 California eliminated a seven-day waiting period for benefits and set a $50 weekly minimum (Nichols & Cohen, 2021).

Mothers have utilized this policy, as one study found that after its implementation there was an increase in maternity leave usage by 110-116%. The researchers also found that on average women took an additional three weeks of leave. The PFL program reduces unemployment among pregnant women and new mothers, which could have positive effects on

their insurance accessibility and ability to afford items important to their health (Slater et al., 2013).

Access to paid family leave has been shown to improve the mental health of new mothers. One study looked at 1652 new mothers in California, 726 before and 926 after California's paid family leave programs was passed, as well as 5727 new mothers from 35 other states as the control group. The pre-PFL California group and the comparison group showed nearly identical trends in mental health, while the posts-PFL California mothers had a non-statistically significant reduction in postpartum depression. Psychological distress, on the other hand, were significantly reduced, by 20.6%, after PFL program implementation (Doran et al., 2020). Another study found a similar reduction in new mothers' psychological distress after the policy's implementation (Lee et al., 2020).

The Paid Family Leave Program has provided new mothers a way to stay home from work. It has shown to have reduced stress during the postpartum period, which can have positive effects on overall maternal health.

C-Section "Honor Roll"

California identified excess Cesarean births for first-time mothers with low-risk pregnancies as a strain on maternal health and potentially leading to hemorrhage, transfusions, infection, and blood clots. Consequently, in 2018, the California Health and Human Services Agency and Cal Hospital Compare developed a C-section "honor roll" for hospitals that meet the Healthy People 2020 C-section goals. This honor roll is an online report highlighting such hospitals, acting as an incentive for hospitals to meet such goals. The Health People 2020 target for such births is 23.9%. The honor roll is made based on hospital discharge and birth certificate data. Between 2017 and 2018, the honor roll increased by 11 hospitals, from 111 to 122

(California Health and Human Services, n.d.). In 2022, 108 hospitals made the list. The C-section honor roll is a mechanism to applaud hospitals for improving maternal healthcare.

Maternal Mental Health Measures

In 2018, the governor of California signed into law three bills endorsed by 2020 Mom and Maternal Mental Health Now, two organizations which aim to improve maternal health outcomes, to address the issue of maternal mental health. It is the first comprehensive maternal mental health bill package in the United States. The package includes AB 3032 (Hospital Maternal Mental Health), AB 2193 (Maternal Mental Health Screening and Support), and AB 1893 (Maternal mental Health Federal Funding) ("CA Governor signs..", 2018).

AB 3032 went into effect on January 1, 2020, and requires hospitals to provide maternal mental health training to clinical staff who work with pregnant and postpartum women and to educate women and families about the signs and symptoms of maternal mental health disorders as well as local treatment options. AB 2193 went into effect on July 1, 2019, and requires obstetric providers (including OB/GYNs, nurse practitioners, physician assistants, nurse midwives, naturopathic doctors, and licensed midwives) to confirm a screening for maternal depression has occurred or to screen women directly, at least once during pregnancy or the postpartum period. Additionally, it requires public and private health plans and insurers to create maternal mental health programs that encourage quality and cost-effectiveness. AB 1893 went into effect on July 2018 and requires the state Department of Public health to apply for federal funding provided through the Bringing Postpartum Depression Out of the Shadows Act ("CA Governor signs..", 2018)

Each of these measures helps to improve maternal mental health care in the state of California. They make maternal mental health care a priority for hospitals and make care more accessible.

Post-Partum Medicaid Coverage Extension (PPCE)

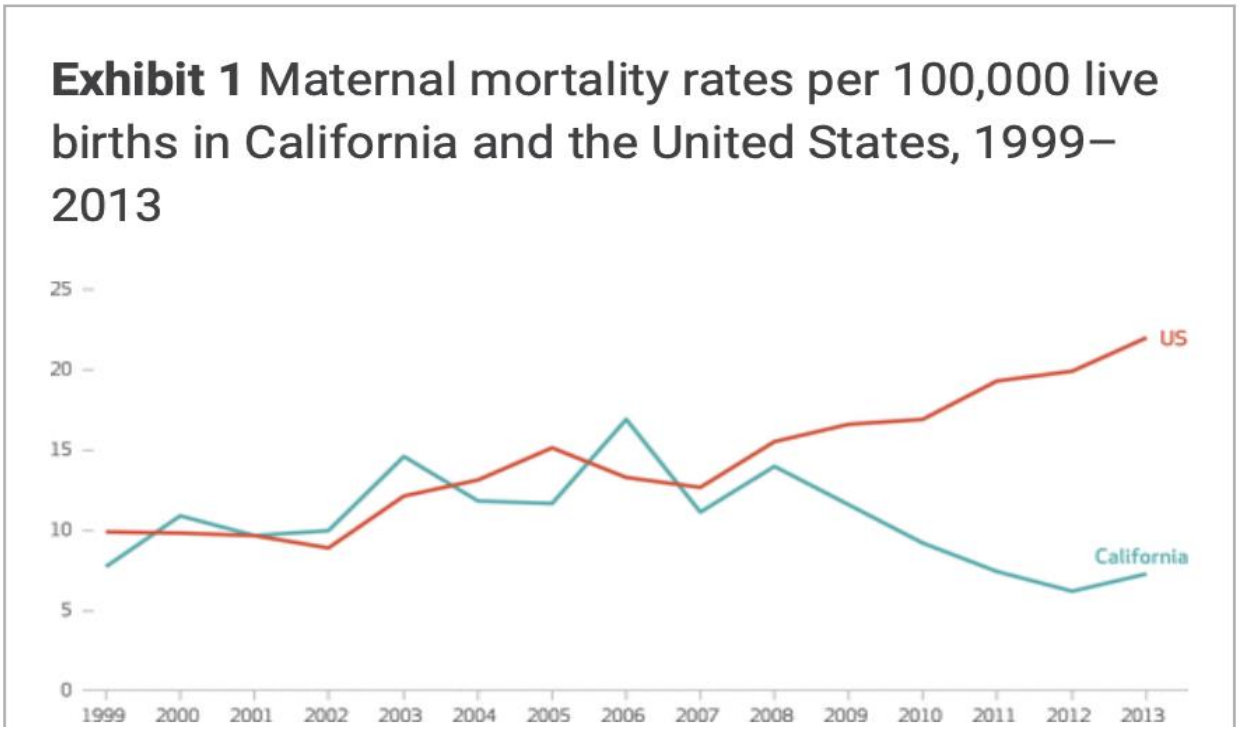
Through the American Rescue Plan Act, California extended postpartum Medicaid coverage from 60 days to one year postpartum. Coverage includes all medically necessary services through this one year regardless of citizenship status or income changes. Postpartum services covered include prescribed medications, laboratory services, radiology, tobacco cessation services, mental health services, substance use disorder services, and dental services (California Health & Human Services, n.d.). This extension offered an additional 57,000 women insurance coverage during the postpartum period (CMS, 2022).

One study looked at the implications of California's provisional postpartum care extension (PPCE) before the state fully implemented the extension. This provisional extension only applied to women with maternal mental health diagnoses. While non-PPCE-eligible women and PPCE-eligible women had similar rates of postpartum visit attendance, PPCE-eligible women were more likely to use mental health medication and postpartum counseling or treatment for mental well-being (Eliason & Gordon, 2022).

The postpartum extension is relatively new, so there is little research to show its effects on overall maternal health. However, researchers hypothesize that, similar to Medicaid expansion, it will increase insurance coverage and decrease insurance churn among new mothers. Thus, new mothers will have better continuity of care.

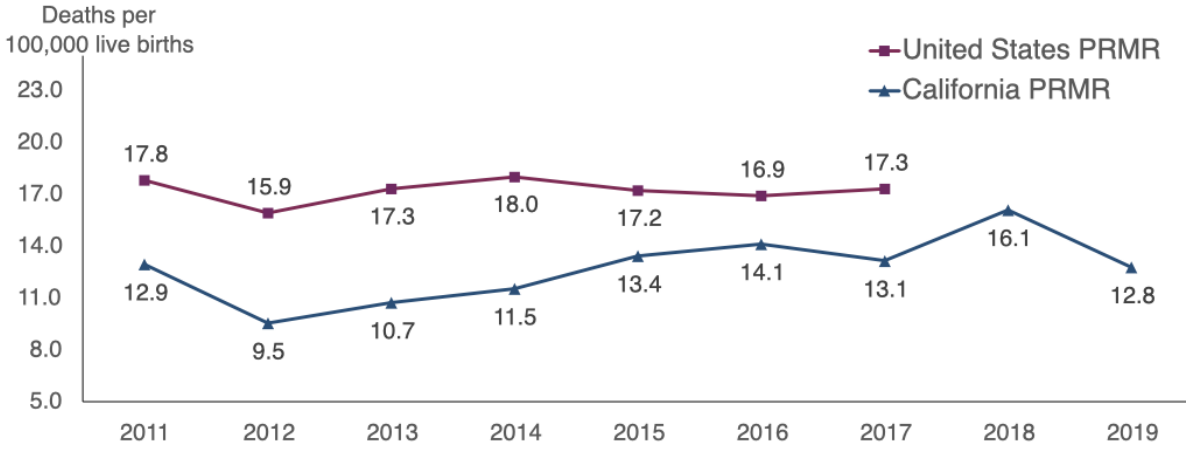
Changes in Maternal Mortality Rate

Overall, California's maternal mortality rate has declined significantly since 2000. The state's rate was cut nearly in half between 2005 and 2009, from 13.1 deaths per 100,000 live births to seven. Table 1 from HealthAffairs shows the maternal mortality rates in California and the United States between 1999 and 2013 (Main et al., 2018).



Additionally, the following table from the California Department of Public Health shows the pregnancy-related mortality rate in California compared to the United States between 2011 and 2019 (California Department of Public Health, n.d.).

Pregnancy-Related Mortality Ratio in U.S. and California, 2011-2019



While there is no evidence that any single policy has led to the decrease in California maternal death rates or has kept them lower than the country's rates, there is certainly a correlation between the implementation of California's various policies and the decrease in deaths per live births.

Chapter 5: Policy Recommendations for Mississippi

Overall, the most striking aspect of California's approach to maternal health is its early detection of and defense against increasing maternal mortality. The state launched the California Maternal Quality Care Collaborative in 2006, with other beneficial policies predating it such as paid family leave. Additionally, the state has continued to implement policies, such as the postpartum Medicaid extension, to continue to improve maternal health. Even though the state has significantly reduced its maternal mortality rate, its policy decisions indicate that it approaches maternal health with a "the job is not finished" attitude. In addition to early detection and prolonged commitment, California's ability to unite a wide range of actors to work together on the maternal health care system is notable. The state has involved both public and private facilities and organizations including insurance companies, review committees, governmental agencies, and non-profits. Each of these aspects of California's maternal health efforts are important to its success, and I recommend that Mississippi, or any state committed to improving its maternal health, should use these two principles as a framework to shaping policy.

As of January 2023, Mississippi's maternal mortality rate was 36 deaths per 100,000 live births, approximately three deaths higher than in 2021. Mississippi has the sixth-highest maternal mortality rate in the country and it appears to be getting worse, especially for black women. Black women's maternity mortality rate is nearly three times the maternal mortality rate for white women (Ganucheau, 2023). In a report released by the Center for Mississippi Health Policy in 2021, three in five maternal deaths were found to be preventable (Center for MS Health Policy, 2021). Clearly, Mississippi has a lot of work to do to improve its maternal health and can learn from California.

While Mississippi has not expanded Medicaid, the state has set the income limit for pregnant women higher than the federal minimum of 138% of the FPL. The current income limit for pregnancy eligibility is 199% of the FPL (Norris, 2023). In California, women can have an income up to 322% of the FPL. Even considering Mississippi's lower cost of living, Mississippi's limit is much lower and it might consider raising the limit to provide coverage for more women and to prevent insurance churn after the pregnancy and postpartum period. Mississippi could certainly benefit from expanding Medicaid all together to prevent insurance churn after women lose pregnancy eligibility. One source report that for a pregnant woman in a two-person household, the monthly income limit is $3,036. For two parents of one child to qualify, the monthly income limit for Medicaid is $498 ("Medicaid Eligibility in Mississippi", 2022). Thus, after women exceed the postpartum period, which is currently set at 60 days, they are unlikely to qualify for non-pregnancy eligibility, leaving them without public insurance coverage and likely unable to afford private insurance.

Fortunately, Mississippi has recently made efforts to expand the postpartum eligibility period from 60 days to 12 months postpartum through bipartisan Senate Bill 2212. Governor Tate Reeves refused to endorse the bill for over a year, but recently announced that he would support the bill. If he signs the bill into law, it will make Mississippi the last state to extend postpartum care to some extent (Pender, 2023). As mentioned above, even though Mississippi is on track to extend postpartum coverage, mothers are still likely to experience coverage loss in the second year of their child's life given the states' current monthly income limits. Expanding Medicaid overall would also address this for many low-income families and would benefit Mississippians in the rural areas of the state. Many of these rural pregnant women do not have access to clinics and other healthcare facilities due to a sheer lack of proximity and/or

transportation. By expanding Medicaid, the state will have the resources to create more clinics in lacking areas (Gim, 2021).

Mississippi should also consider creating a Maternal Quality Care Collaborative (MQCC) to help to mobilize private and public partners and use data from its already existing Maternal Mortality Review Committee to develop action items. Mississippi already has a Perinatal Quality Collaborative, MSPQC, the framework of which could be used to form an MQCC. Some of the initiatives of the MSPQC overlap with maternal care including support of vaginal births, addressing severe hypertension, and treating hemorrhage (MSPQC, 2022). However, having an entity that is focused on maternal health alone well before and well after the few weeks immediately before and after birth is essential to creating resources and recognizing opportunities for improvement for mothers in the state. Through the MSPQC the state focuses largely on improving birth outcomes for the infant rather than improving the health of the mother.

California's creation and implementation of toolkits is one of the clearest examples of maternal care improvement. Mississippi's leading cause of maternal death is cardiovascular conditions, for which California has developed a toolkit. Other California toolkits that reflect some of Mississippi's maternal health struggles include obstetric hemorrhage and embolism (Center for MS Health Policy, 2021). The development of these toolkits relies on some type of collaborative that uses data to identify what improvements are necessary and disseminates the tools to hospitals that are willing to participate. Thus, I recommend that Mississippi either expands its MSPQC to devote more attention specifically to maternal health or to develop its own Maternal Quality Care Collaborative. Either option should direct energy to creating toolkits that streamline maternal care responses to pressing conditions. Mississippi mothers could benefit

from toolkits regarding cardiovascular conditions, thrombotic pulmonary embolism, and preeclampsia most urgently (Center for MS Health Policy, 2021).

Mississippi has already created the Mississippi Maternal Mortality Review Committee which is a helpful resource to aid the identification of specific improvement opportunities. Currently, California is the only state that has developed its own Maternal Data Center, and has made it available to Washington and Oregon. The creation of an MDC requires a large investment, and, though it certainly has pay-outs because of their role in developing toolkits and other improvement measures, it may not be feasible for a state like Mississippi using only state funds. Consequently, I recommend that Mississippi work collaboratively with private partners and perhaps neighboring states such as Alabama and Louisiana, both of which have high maternal mortality rates, to create a tri-state MDC similar to California's. By following California's already streamlined model, perhaps Mississippi can create a two- or tri-state partnership that benefits mothers across state lines.

Overall, Mississippi should simply pay more attention to its pregnant women and new mothers. While all of the aforementioned policy recommendations have had positive effects on California's maternal health, they did not arise in a state that neglected to pay attention to a growing crisis. Mississippi has given very little attention to maternal health over the past decade, with only the creation of the Maternal Mortality Review Committee and the proposed postpartum coverage extension to show for it. Mississippi has been reactive at best when it comes to facing the maternal health crisis. A serious shift in focus among policymakers is necessary to develop and pass proactive, long-term policy that can be used to unite relevant actors, identify areas that need improvement, develop action items to target those areas, and maintain a position that prioritizes the health of Mississippi women.

Chapter 6: Conclusion

In this paper, I have identified numerous actions by California that have greatly improved its state of maternal health. Its maternal mortality and morbidity rates have decreased significantly over the past decade. The key feature in California's improvement is its proactive approach to reducing maternal mortality and morbidity. Through this approach, the state developed numerous policies that have mobilized many actors to create a state-wide maternal health coalition, committed to addressing a problem before it grows out of hand. Mississippi can learn from California's approach, so I have offered a list of policy recommendations.

This thesis is a resource to influence policymakers to make decisions that will benefit mothers and families particularly in Mississippi. Next steps for this project include communicating these findings to legislators to encourage them to pass laws that would directly benefit the state's mothers and families. This thesis could be turned into a simplified fact sheet that places its findings at the fingertips of Mississippi policymakers. It also would be a helpful resource to launch a maternal health campaign, consisting of maternal health forums, a social media campaign, and other women's rights events.

As noted, if the bill is signed into law, Mississippi will be the last state to extend postpartum coverage to one year. This policy should be on the radar of maternal health researchers. Observing how postpartum coverage extensions effect maternal health will provide valuable information on the role of insurance and postpartum deaths. These findings can continue to shape the maternal health landscape all over the country, and may help to support already existing research that shows that Medicaid expansion is imperative to a state's healthcare system and its residents' well-being.

Finally, future researchers should consider researching the plethora of infant-focused studies compared to mother-focused studies. Much of the research that I encountered, and much of the research used in this paper, was focused heavily on maternal health as an infant health crisis. Obviously if mothers are unhealthy then their babies suffer. Thus, the conversation on infant health is inseparable from maternal health. However, the amount of research that seemed to ignore the mother's health for the mother's sake is concerning. It likely contributes to the neglect of maternal health policy across the country. While infant health is certainly an area worthy of academic research and public policymaking, I encourage researchers to explore maternal health independent infant health because mothers' health is important independent of their infant, and more focused research undoubtedly will help to offer a better understanding of the maternal health crisis.

References

Ahn, R., Gonzalez, G., Anderson, B., Vladutiu, C., Fowler, E., Manning, L. (2020). *Initiatives to Reduce Maternal Mortality and Severe Materanl Morbidity in the United States: A Narrative Review. PubMed*. https://pubmed.ncbi.nlm.nih.gov/33253021/

Aitken, Z., Garrett, C., Hewitt, B., Keogh, L., Hocking, J., Kavanagh, A. (2015). *The Maternal Health Outcomes of Paid Maternity Leave: A Systemic Review. Social Science & Medicine.* https://www-sciencedirect-com.umiss.idm.oclc.org/science/article/pii/S0277953615000842?via%3Dihub

Alexander, S., Wildman, K., Zhang, W., Langer, M., Vutuc, C., & Lindmark, G. (2003). *Maternal Health Outcomes in Europe. Science Direct*. https://doi.org/10.1016/j.ejogrb.2003.09.008

Amis, D. (2016). The role of the childbirth educator in supporting vaginal birth and reducing primary cesareans: Highlights from the california maternal quality care collaborative toolkit. *The Journal of Perinatal Education, 25*(4), 208-214. https://doi.org/10.1891/1058-1243.25.4.208

Burke, C. (2018). California's maternal deaths nearly halved even as the U.S. rate went up. here's what they did. *FierceHealthcare (Online),*

CA governor signs comprehensive maternal mental health bill package: By signing sweeping maternal mental health legislation co-sponsored by 2020 mom and maternal mental health now, california governor jerry brown signals to the world that it's time to support moms. (2018,). *PR Newswire*

Cal, L. M., & Kleiner, B. H. (2005). California's Recent Paid Family Leave Law. *Equal Opportunities International, 24*(5/6), 65-78. https://doi.org/10.1108/02610150510788178

California Health and Human Services. "Smart Care California Announces Third Annual C-Section Honor Roll". https://www.chhs.ca.gov/blog/2018/10/23/smart-care-california-announces-third-annual-c-section-honor-roll/

California Department of Public Health. The California Pregnancy Mortality Surveillance System (CA-PMSS). https://www.cdph.ca.gov/Programs/CFH/DMCAH/Pages/CA-PMSS.aspx?TSPD_101_R0=087ed344cfab2000382205f64e671cbc286fe8f2ece4d23dacd6997df072746934ce7c563f7b7053085d5904ef1430003826819222175 88a85b26d6bc7e0d73fa8417c82386c7ec22247c607cd358b81a17346d590668bc6adcc59be1b4f2e37

"California Maternal Data Center". California Maternal Quality Care Collaborative. https://www.chcf.org/wp-content/uploads/2017/12/PDF-CalifMaternalDataCenterCMQCC.pdf

"California MDC". California Maternal Quality Care Collaborative. https://www.cmqcc.org/maternal-data-center/california-mdc.

Center for Mississippi Health Policy. (2021). "Postpartum Medicaid". *Center for Mississippi Health Policy*, https://mshealthpolicy.com/.

Centers for Disease Control. (2015) Perinatal Quality Collaborative Success Story. https://www.cdc.gov/reproductivehealth/maternalinfanthealth/pdf/perinatal-quality-collaborative-success-story-california-2015.pdf

Centers for Disease Control and Prevention. (2022, June 22). *Pregnancy mortality surveillance system*. Centers for Disease Control and Prevention. Retrieved October 11, 2022, from https://www.cdc.gov/reproductivehealth/maternal-mortality/pregnancy-mortality-surveillance-system.htm#about-pmss

Centers for Disease Control and Prevention. (2022, February 16). *Pregnancy-related deaths in the United States*. Centers for Disease Control and Prevention. Retrieved October 11, 2022, from https://www.cdc.gov/hearher/pregnancy-related-deaths/index.html

CMS (2022). HHS Applauds 12-Month Postpartum Expansion in California, Florida, Kentucky, and Oregon. https://www.cms.gov/newsroom/press-releases/hhs-applauds-12-month-postpartum-expansion-california-florida-kentucky-and-oregon

Doran, E. L., Bartel, A. P., Ruhm, C. J., & Waldfogel, J. (2020). California's paid family leave law improves maternal psychological health. *Social Science & Medicine (1982), 256*, 113003-1. https://doi.org/10.1016/j.socscimed.2020.113003

Eckert, E. (2020). *Preserving the Momentum to Extend Postpartum Medicaid coverage*. *Women's Health Issues*, *30*(6), 401–404. https://doi.org/10.1016/j.whi.2020.07.006

Ela, E. J., Vizcarra, E., Thaxton, L., & White, K. (2022). *Insurance Churn and Postpartum Health among Texas Women with Births Covered by Medicaid/Chip*. *Women's Health Issues*, *32*(2), 95–102. https://doi.org/10.1016/j.whi.2021.11.002

Eliason, E. L., & Gordon, S. H. (2022). Mental health and postpartum care in california: Implications from california's provisional postpartum care extension. *Women's Health Issues*, *32*(2), 122-129. https://doi.org/10.1016/j.whi.2021.11.009

Employment Development Department. “California Paid Family Leave”. https://edd.ca.gov/en/disability/paid-family-leave/.

Ganucheau, A. (2023, January 27). *Mississippi's Already Troubling Maternal Mortality Rate is Worsening*. Mississippi Today. Retrieved March 8, 2023, from https://mississippitoday.org/2023/01/26/maternal-mortality-rate-worsens/

Gim, E. (2021, December 1). *Here's what Mississippi won't tell the Supreme Court about women's well-being in the State*. Rewire News Group. Retrieved March 8, 2023, from https://rewirenewsgroup.com/2021/12/01/heres-what-mississippi-wont-tell-the-supreme-court-about-womens-well-being-in-the-state/

Gordon, S., Hoagland, A., Admon, L., & Daw, J. (2022). *Extended Postpartum Medicaid Eligibility is Associated with Improved Continuity of Coverage in the Postpartum Year*. *Health Affairs*. https://doi.org/10.1377/hlthaff.2021.00730

Gray, D., Sidaway-Lee, K., White, E., Thorne, A., Evans, P. (2017). *Continuity of Care with Doctors - A Matter of Life and Death? A Systematic Review of Continuity of Care and Mortality. PubMed*. https://pubmed.ncbi.nlm.nih.gov/29959146/

“Hospital Membership”. California Maternal Quality Care Collaborative. https://www.cmqcc.org/about-cmqcc/member-hospitals/hospital-membership

Hussain, S. A., Guarini, C. B., Blosser, C., & Poole, A. T. (2019). Obstetric hemorrhage outcomes by intrapartum risk stratification at a single tertiary care center. *Curēus (Palo Alto, CA), 11*(12), e6456-e6456. https://doi.org/10.7759/cureus.6456

Kaiser Family Foundation. (2022, October 6). *Medicaid postpartum coverage extension tracker*. KFF. Retrieved October 11, 2022, from https://www.kff.org/medicaid/issue-brief/medicaid-postpartum-coverage-extension-tracker/

Kozhimannil, K., Attanasio, L., Yang, Y., Avery, M., & Declercq, E. (2015). https://pubmed.ncbi.nlm.nih.gov/25874874/

Lee, B. C., Modrek, S., White, J. S., Batra, A., Collin, D. F., & Hamad, R. (2020). The effect of california's paid family leave policy on parent health: A quasi-experimental study. *Social Science & Medicine (1982), 251*, 112915-8. https://doi.org/10.1016/j.socscimed.2020.112915

Lega, I., Maraschini, A., D'Aloja, P., Andreozzi, S., Spettoli, D., Giangreco, M., Loghi, M., Donati, S., & the Regional Maternal Mortality Working Group. (2019). *Maternal Suicide in Italy. Archives of Women's Health.* https://link.springer.com/article/10.1007/s00737-019-00977-1

Lockwood, C. J. (2019). Preventing maternal mortality: Leveraging MMRCs in every state is the key to reducing rising rates of maternal mortality in the united states. *Contemporary ob/gyn*, *64*(1), 7.

Lyndon, A., & Cape, V. (2016). Maternal hemorrhage quality improvement collaborative lessons. *MCN, the American Journal of Maternal Child Nursing*, *41*(6), 363. https://doi.org/10.1097/NMC.0000000000000277

MacArthur, C., Winter, H. R., Bick, D. E., Knowles, H., Lilford, R., Henderson, C., Lancashire, R. J., Braunholtz, D. A., & Gee, H. (2002). *Effects of Redesigned Community Postnatal*

Care on Women's Health 4 Months after Birth: A Cluster Randomized Controlled Trial. The Lancet, *359*(9304), 378–385. https://doi.org/10.1016/s0140-6736(02)07596-7

Main, E. K., MD. (2012). Decisions required for operating a maternal mortality review committee: The california experience. *Seminars in Perinatology*, *36*(1), 37-41. https://doi.org/10.1053/j.semperi.2011.09.008

Main, E., Cape, V., Abreo, A., Vasher, J., & Carpenter, A. (2016;2017;). 50: Reduction of severe maternal morbidity from hemorrhage (SMM-HEM) using a state-wide perinatal collaborative. *American Journal of Obstetrics and Gynecology*, *216*(1), S37-S37. https://doi.org/10.1016/j.ajog.2016.11.935

Main, E. K., Markow, C., & Gould, J. (2018). Addressing maternal mortality and morbidity in california through public-private partnerships. *Health Affairs*, *37*(9), 1484-1493. https://doi.org/10.1377/hlthaff.2018.0463

Marchi, K. S., Dove, M. S., Heck, K. E., & Fan, C. (2021;2020;). The affordable care act and changes in Women's health insurance coverage before, during, and after pregnancy in california. *Public Health Reports (1974)*, *136*(1), 70-78. https://doi.org/10.1177/0033354920962798

Maruthappu, M., Ng, K., Williams, C., Atun, R., Agrawal, P., & Zeltner, T. (2014). *The Association Between Government Healthcare Spending and Maternal Mortality in the European Union, 1981-2010: A Retrospective Study. General Obstetrics.* https://obgyn.onlinelibrary.wiley.com/doi/pdfdirect/10.1111/1471-0528.13205

Maternal Mortality in the United States: A Primer. Commonwealth Fund. (2020, December 16). Retrieved October 11, 2022, from

https://www.commonwealthfund.org/publications/issue-brief-report/2020/dec/maternal-mortality-united-states-primer

"Maternal mortality in the US is Rising, and One State has Launched a 'toolkit' to Fight Back". (2017,). *American Health Line. First Look*

MBRRACE-UK. (2022). "Lessons learned to inform maternity care from the UK and Ireland Confidential Enquiries into Maternal Deaths and Morbidity 2018-20".https://www.npeu.ox.ac.uk/assets/downloads/mbrrace-uk/reports/maternal-report-2022/MBRRACE-UK_Maternal_MAIN_Report_2022_v10.pdf

"Medicaid Eligibility in Mississippi". (2022)." *Heart on Clipboard and Calculator*, https://www.medicaidscreener.com/guides/mississippi.

"Membership Fees and FAQs". California Maternal Quality Care Collaborative. https://www.cmqcc.org/sites/default/files/_/uploads/CMQCC%20Membership%20FAQs_10-7-16.pdf

Mitchell, C., Lawton, E., Morton, C., McCain, C., Holtby, S., & Main, E. (2014). California pregnancy-associated mortality review: Mixed methods approach for improved case identification, cause of death analyses and translation of findings.*Maternal and Child Health Journal, 18*(3), 518-526. https://doi.org/10.1007/s10995-013-1267-0

Morton, Christine & Peterson, Nancy. (2014). Improving Outcomes of Preeclampsia in California: From Review of Maternal Death to Quality Care Collaborative. https://hermes.lib.olemiss.edu/illiad/illiad.dll?Action=10&Form=75&Value=904339

MSPQC. (n.d.). Retrieved March 8, 2023, from https://www.mspqc.org/

Nichols, C. R., & Cohen, A. K. (2021). Preventing maternal mortality in the united states: Lessons from california and policy recommendations. *Journal of Public Health Policy, 42*(1), 127-144. https://doi.org/10.1057/s41271-020-00264-9

Norris, Louise. (2023). "ACA Medicaid Expansion in Mississippi [Updated 2023 Guide]." *Healthinsurance.org*, 1 Mar. 2023, https://www.healthinsurance.org/medicaid/mississippi/.

Pender, Geoff. "House Sends Extended Postpartum Medicaid Coverage to Governor." *Mississippi Today*, 8 Mar. 2023, https://mississippitoday.org/2023/03/07/postpartum-extension-medicaid-coverage-mississippi/.

Rossin-Slater, M., Ruhm, C. J., & Waldfogel, J. (2013). The effects of california's paid family leave program on mothers' leave-taking and subsequent labor market outcomes. *Journal of Policy Analysis and Management, 32*(2), 224-245. https://doi.org/10.1002/pam.21676

Sajedinejad, S., Majdzadeh, R., Vedadhir, A. A., Tabatabaei, M. G., & Mohammad, K. (2015, February 12). *Maternal mortality: A cross-sectional study in Global Health*. Globalization and health. Retrieved March 24, 2023, from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4353673/

Sandall, J., Soltani, H., Gates, S., Shennan, A., & Devane, D. (2016). *Midwife-led Continuity Models Versus other Models of Care for Childbearing Women.* Cochrane Library. https://doi.org/10.1002/14651858.CD004667.pub5

Sliwa, K., Azibani, F., Baard, J., Osman, A., Zühlke, L., Lachmann, A., Libhaber, E., Chin, A., Ntsekhe, M., Soma-Pillay, P., Johnson, M. R., Roos-Hesselink, J., & Anthony, J. (2018). *Reducing Late Maternal Death due to Cardiovascular Disease - A Pragmatic Pilot Study*. *International Journal of Cardiology*, *272*, 70–76. https://doi.org/10.1016/j.ijcard.2018.07.140

The Urban Institute. (2021). *Promoting Continuous Coverage During the Postpartum Period V4*. https://www.urban.org/sites/default/files/publication/104815/promoting-continuous-coverage-during-the-postpartum-period_0.pdf

Tikaneen, R., Gunja, M., FitzGerald, M., Zephyrin, L. *(2020, November 18). Maternal mortality and maternity care in the United States compared to 10 other developed countries*. Maternal Mortality Maternity Care US Compared 10 Other Countries. Commonwealth Fund. Retrieved May 23, 2022, from https://www.commonwealthfund.org/publications/issue-briefs/2020/nov/maternal-mortality-maternity-care-us-compared-10-countries

Topcu, G., Savona-Ventura, C., Ayres-de-Campos, D., Mukhopadhyay, S., Messinis, I., Mahmood, T., Cassar, O., Sultana, S. (2022). *Provision of Antenatal Care in Europe - A Scientific Study Commissioned by European Board and College of Obstetrics and Hynaecology. European Journal of Obstetric & Gynecology and Reproductive Biology*. https://doi.org/10.1016/j.ejogrb.2022.03.009

Trost, S. L., Beauregard, J. L., Smoots, A. N., Ko, J. Y., Haight, S. C., Moore Simas, T. A., Byatt, N., Madni, S. A., & Goodman, D. (2021). *Preventing Pregnancy-related Mental*

Health Deaths: Insights from 14 US Maternal Mortality Review Committees, *Health Affairs*, *40*(10), 1551–1559. https://doi.org/10.1377/hlthaff.2021.00615

Urban Institute. (2020, May 28). *Uninsured New Mothers' Health and Health Care Challenges Highlight the Benefits of Increasing Postpartum Medicaid Coverage*. https://www.urban.org/research/publication/uninsured-new-mothers-health-and-health-care-challenges-highlight-benefits-increasing-postpartum-medicaid-coverage

USAID. (n.d.) "Maternal, Neonatal, and Child Health." https://www.usaid.gov/ethiopia/global-health/maternal-neonatal-and-child-health

Wiesehan, Erik C. (2023). State Perinatal Quality Collaborative for Reducing Severe Maternal Morbidity From Hemorrhage: A Cost-Effectiveness Analysis. https://hermes.lib.olemiss.edu/illiad/illiad.dll?Action=10&Form=75&Value=904310

Wildman, K., Bouvier-Colle, M., & MOMS Group. (2004). *Maternal Mortality as an Indicator of Obstetric Care in Europe*. PubMed. https://pubmed.ncbi.nlm.nih.gov/14723755/