FROM EXCLUSION TO INCLUSION: INTEGRATING CERTIFIED PROFESSIONAL MIDWIVES FOR MATERNAL SURVIVAL

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From Exclusion to Inclusion: Integrating Certified Professional Midwives for Maternal Survival

A thesis submitted in partial fulfillment of the requirement for the degree of Master of Science in Public Health and Health Equity by Claire Gwyn.

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Abstract

Introduction

The United States ranks high among economically advanced countries in maternal mortality rates (MMR), especially in rural populations, underrepresented groups of color, and low-income-earning groups. The number of maternity care deserts (MCDs), or counties without obstetric providers, is growing across the country, hindering healthcare access. Certified Professional Midwives (CPMs) represent possible solutions, yet confront legal, financial, and systemic barriers.

Methodology

This study will look at accessibility and affordability of CPMs' community-based birth services within the US, with the potential of minimizing MMR through the Levesque Framework of access to healthcare services. Secondary data analysis was conducted using a multivariate linear regression model to analyze state-level data on the density of CPMs, midwife-attended births, MCD proportion, prenatal care access, Medicaid policies, and MMR; as well as a systematic approach to a literature review.

Results

Findings indicated that the MMR was higher in states with greater MCD ratios and reduced prenatal care access. An association exists between the MMR and prenatal care ($p < 0.001$) and the MCD prevalence ($p = 0.036$). CPM density did not show significant association with MMR. However, CPMs have higher rural availability, and their service characteristics may contribute to improved outcomes. Financial barriers to the pregnant person and state-level policies constrain utilization.

Discussion

Although CPM density was not associated with a significant change in MMR, the integration of midwives into accessible, culturally sensitive care models may positively affect MMR in underserved areas by promoting Medicaid coverage, regulation, and referral frameworks.

Key words: Certified Professional Midwives, maternity care deserts, maternal mortality

Word count: 11,967

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Abbreviations

ACA – Affordable Care Act

ACOG – American College of Obstetricians and Gynecologists

AIMM – The Access and Integration Maternity Care Mapping Study

ARAP – American Rescue Act Plan

CDC – Centers for Disease Control

CHIP – Children's Health Insurance Program

CPM – Certified Professional Midwife

CS – Cesarean Section

DC – Washington, District of Columbia

DF – Degrees of freedom

FBC – Freestanding Birth Center

FPL – Federal Poverty Level

HIC – High-income country

ICM – International Confederation of Midwives

LGBTQ – Lesbian, gay, bisexual, transgender, queer

LM – Licensed Midwife

LMIC – Low-middle income county

MCD – Maternity care desert

MH – Maternal health

MISS – Midwifery Integration Scoring System

MMC – Midwifery Model of Care

MMR – Maternal mortality rate

NDR – Neonatal death rate

PNC – Prenatal care

SBA – Skilled birth attendant

SD – Standard distribution

SDOH – Social determinants of health

SE – Standard Error

SRH – Sexual Reproductive Health

US – United States

VIF – Variance inflation factor

WHO – World Health Organization

Glossary

Certified Professional Midwife –"knowledgeable, skilled, and professional primary maternity care provider… trained and credentialed to offer expert care, education, counseling, and support to birthing people during the pregnancy, birth, and the postpartum periods. [Certified Professional Midwives] practice as autonomous health professionals working within a network of relationships with other care providers who can provide consultation and collaboration when needed. [Certified Professional Midwives] provide unique and critical access to normal, physiologic birth, profoundly benefiting birthing people and newborns. Although qualified to practice in any setting, they have particular training and expertise in providing care in home and freestanding birth centers, and own or work in over half of the birth centers in the United States today" [1].

Freestanding Birth Center – "[A freestanding] birth center is a healthcare facility for childbirth where care is provided in the midwifery and wellness model. The birth center is freestanding and not a hospital. [Freestanding] birth centers are an integrated part of the healthcare system and are guided by principles of prevention, sensitivity, safety, appropriate medical intervention, and cost-effectiveness"[2].

Health literacy – "..represents the personal knowledge and competencies that accumulate through daily activities, social interactions and across generations. Personal knowledge and competencies are mediated by the organizational structures and availability of resources that enable people to access, understand, appraise and use information and services in ways that promote and maintain good health and well-being for themselves and those around them" [3]

Maternity Care Desert – a county in the United States with no obstetric clinicians*, no freestanding birth centers (FBCs), and no hospitals with a labor unit, according to the March of Dimes [4].

Maternal Mortality – "death while pregnant or within 42 days of the end 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"[5].

Midwifery Model of Care – The Midwifery Model of Care is defined by the WHO as "models of care in which the main care providers for women and newborns, starting from pre-pregnancy and continuing all the way through the postnatal period, are educated, licensed, regulated midwives who autonomously provide and coordinate respectful, high-quality

* The term "obstetric clinicians" includes obstetrician-gynecologists, certified nurse-midwives, certified midwives, and family physicians who reported delivering babies (4).

care across their full scope of practice, using an approach that is aligned with the midwifery philosophy of care, which:

1. promotes a person-centered approach to care;
2. values the woman–midwife relationship and partnership;
3. optimizes physiological, biological, psychological, social and cultural processes; and
4. uses interventions only when indicated.

In midwifery models of care, midwives provide integrated care, addressing the needs of each individual woman and newborn, within functional and enabling health systems, equipped with necessary resources and streamlined consultation and referral processes. They collaborate within networks of care as part of interdisciplinary teams characterized by equality, trust and respect. This approach guarantees that every woman and newborn receives personalized care, tailored to their health needs.

Midwifery models of care are adaptable to all levels of care and contexts, including home-, community and hospital-based settings; the public and private sectors and public–private partnerships; resource-constrained environments; and humanitarian and crisis settings. This ensures wide accessibility, equity and relevance across different cultural contexts for women, newborns, partners, families and communities" [6].

Introduction

I am a doula, childbirth educator, lactation counselor, and maternal health researcher, originally from a small town in Texas, United States, where I have been exclusively cared for by Certified Professional Midwives (CPMs) for sexual and reproductive healthcare. Maternal health in America is dominated by physicians. Midwives are often misunderstood as being "witchy" or only for "hippies," due to the history of midwifery-shaming in American obstetrics. My personal and professional lives have shown me the power of midwifery care. I have witnessed obstetric violence and racial inequity from physicians in the American healthcare system. When I share my positive midwifery experiences, people often disregard my stories because respectful, person-centered sexual and reproductive healthcare is so uncommon. This is not to say I am anti-physician or that midwives never abuse; only that the current system does not support sexual health needs humanely, and it requires urgent change.

This thesis offers an answer to the question of why caring, respectful, person-centered care is not accessible to many. I explore how CPMs contribute to better maternal health outcomes in underserved communities and provide evidence-informed suggestions on how to involve midwives in the formal healthcare system.

Chapter 1: Background

According to the United States (US) Census Bureau and the World Health Organization (WHO), the US has approximately 342 million people, with about 78 million (22%) at reproductive age (15-49 years old) who were assigned female at birth† [7,8].

Although the US is a high-income country (HIC), 12.4% of the population lives below the federal poverty level (FPL). Many of those reside in the southern region of the US; and, are Black, Indigenous, people of color (BIPOC), or both [9,10]. A person's overall health is not dependent on their food and exercise choices. Rather, it includes an array of social determinants of health (SDOH) ranging from their constitutional factors to policies that govern their environment [11]. A low-income person or family, has more difficulty to purchasing healthy food, accessing health insurance plans to cover healthcare services, or affording shelter and other essentials. This population is more likely to have chronic health conditions, higher stress levels, and poorer health overall [12].

Health inequalities become more concerning during pregnancy. Pregnancy increases susceptibility to complications that pose a threat to both the individual and fetus. Limiting exposure to unhealthy conditions and providing access to timely healthcare is essential to maternal and fetal health [13]. The American College of Obstetricians and Gynecologists (ACOG) suggests that a person receive prenatal care (PNC) from a qualified provider in the first trimester of pregnancy, ideally within the first ten weeks of gestation, and continue throughout pregnancy. ACOG guidelines suggest 6-10 PNC appointments for an average-risk pregnancy, and more appointments for people with increased needs. These assessments allow a provider to identify medical and social risk factors and create an individualized PNC delivery plan based on the pregnant person's needs [14].

1.1 Maternity care deserts

Nevertheless, timely care is difficult to realize due to a shortage of providers. A 2024 report by March of Dimes concludes over 35% of US counties are classified as "maternity care deserts" (MCD), which is defined as a county with no obstetric clinicians‡, no freestanding birth centers§ (FBCs), and no hospitals with a labor unit. MCDs deprive about 2.3 million individuals of reproductive age the opportunity to receive maternity care in their community [4].

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† This author recognizes that people of all genders give birth and therefore utilizes gender-neutral wording.
‡ The term "obstetric clinicians" includes obstetrician-gynecologists, certified nurse-midwives, certified midwives, and family physicians who reported delivering babies [4].
§ Freestanding birth centers are midwife-led facilities that support low-risk birthers through PNC and birth support in an out-of-hospital setting [15].

MCDs are predominately located in low-income, rural areas, where the population is largely comprised of marginalized communities that rely on government-funded healthcare, Medicaid, for healthcare coverage. Many of the MCDs are in the southern US (see Figure 1), where there is an increasing number of hospital closures due to lack of funding, insufficient or slow reimbursement rates from insurance providers, and lack of human resources for hospital staffing [4,16–18].

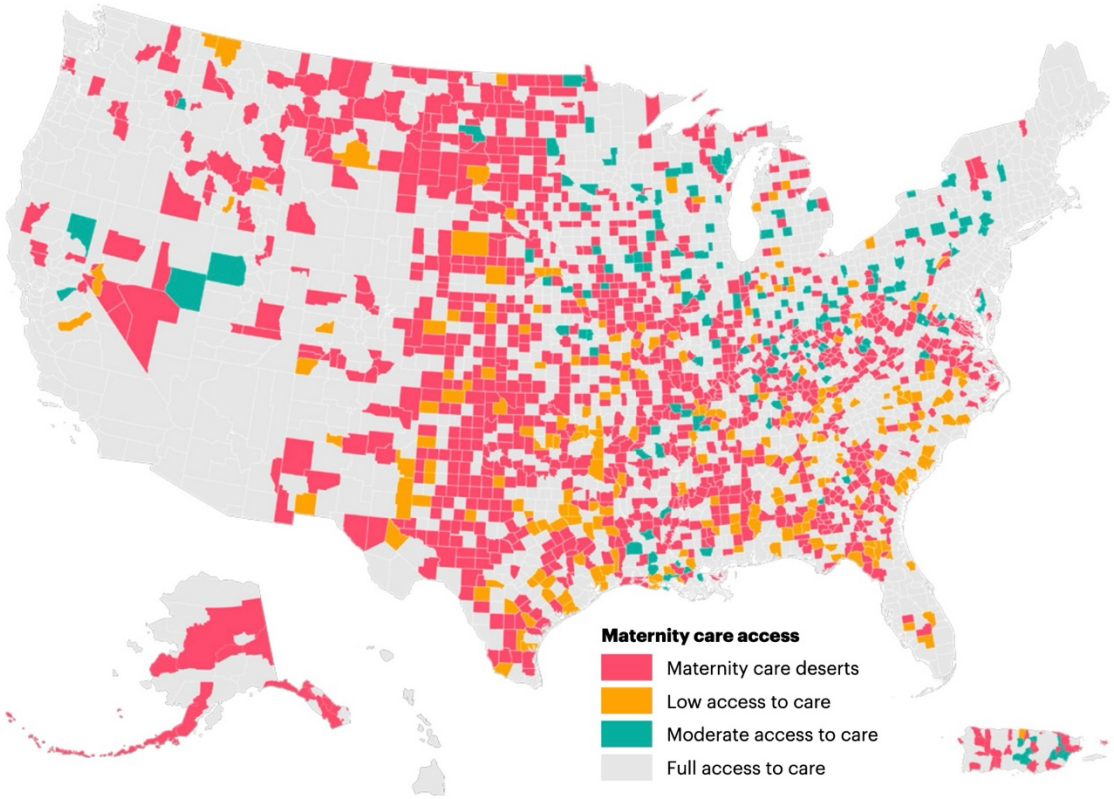

Figure 1. Maternity care access designated by county in the United States. Sourced from March of Dimes, 2024 [4]

Rural residents are more susceptible to gestational diabetes, hypertensive disorders, postpartum depression, and MMR. Rates for pregnancy-related mortality are four times higher among Black pregnant people living in rural areas than white** pregnant people in the same area. Additionally, the rates of severe maternal morbidity with need of hospitalization are higher among people living in rural areas than those in urban or urban-adjacent areas [20].

** When referring to a person's race, ethnic or cultural background, "Black" and other racial identities are capitalized, while "white" will remained lower-cased. This aligns with scholar's view that capitalizing Black, "is to acknowledge that slavery 'deliberately stripped' people forcible shipped overseas 'of all other ethnic/national ties'." [19]

About 23% of pregnant individuals do not access PNC during the first trimester, while 6.8% do not receive PNC until the third trimester or not at all, which is associated with adverse outcomes [14,21]. Those living in MCDs have a higher likelihood of receiving inadequate[††] PNC or no PNC at all, with nearly 16% of babies born in MCDs having inadequate PNC in 2020-2022. The rate of inadequate or no PNC in full-access counties is also high (approximately 14%). The main difference between these two populations is the rate of uninsured versus insured people before, during, and after pregnancy [4].

Approximately 40% of births were paid for by Medicaid in 2022 [4]. Due to the for-profit structure of the health system, providers and birth settings are not obligated to accept Medicaid-covered pregnancies. Hospital administrators encourage staff to treat Medicaid patients faster due to the lower reimbursement rates [22]. For physicians, reimbursement rates are lower for Medicaid-enrolled patients than for private insurance holders. In Florida where 78% of the entire population is enrolled in Medicaid, private health insurance covers over $14,000 more in healthcare costs than Medicaid for the birth, not including any prenatal or postpartum care [23,24]. This leads to birthing people with Medicaid being denied care at a higher rate than those with private insurance [23]. Low reimbursement rates for Medicaid contribute to an increase in hospital closures, leading to more MCDs, more people without adequate PNC, and contributing to higher MMR [4].

Reimbursement issues are not confined to hospitals but include other birth settings. Considering FBCs in the definition of MCDs, payment reimbursement and additional obstacles are problematic. As of 2018, only 33 states offer Medicaid coverage for care in FBCs, with six of those states limiting available services. Limitations include the type of provider that can deliver services within the FBC, the number of Medicaid-covered services reimbursed per year, whether PNC is covered, and conditions requiring the FBC to have a transfer agreement with a hospital [25].

Reimbursement varies by state policy, midwife type, and practice setting (hospital, FBC, or home). Midwives receive reimbursement ranging from 0% to 100% from Medicaid. Depending on the care setting and services provided, midwives with nursing degrees can receive 100% reimbursement for services, but only in half of the US states. In contrast, qualified midwives without nursing degrees working in the same setting receive no reimbursement throughout all US states [26]. Physicians' lower Medicaid reimbursement rates are disproportionately low relative to actual care costs. This imbalance extends across delivery settings, as physicians attending hospital births get much higher

[††] According to March of Dimes, "prenatal care is 'inadequate' when care begins in the fifth month of pregnancy or later or when less than 50% of the appropriate number of visits are received (adjusted for the [fetus'] gestational age" [4].

reimbursements than midwives attending the same type of birth in FBCs [27]. FBCs may be reimbursed only 15-70% as much as their hospital counterparts in the same state, leaving FBCs to absorb the remaining costs [28].

Furthermore, when a Medicaid-enrolled birthing person is transferred from a FBC to a hospital, the FBC does not receive any reimbursement for the care already provided. FBCs may need relationships or agreements with hospitals in the event of transfers, but physicians and hospitals are not obligated to make such agreements and may be negatively affected by their liability insurance when such an agreement is made [27]. Due to these restrictions which threaten the financial stability of FBCs, 70% of all FBCs are located across only 10 states [4].

This geographic distribution of birth sites is indicative of overarching systemic problems. The disjointed healthcare service policies throughout the states continues to exacerbate the difficulties of accessing appropriate, timely, affordable maternity care within MCDs [4,25–29].

1.2 Healthcare coverage

The disjointed nature of the US healthcare financing system exacerbates these barriers to access. The US is one of few HICs without universal healthcare coverage, meaning the system does not guarantee access to medical care regardless of ability to pay [30]. The structure of the US MH system is complicated due to the different types of payment mechanisms, the various providers seen during pregnancy, providers' education requirements, and different state policies regarding practitioners and birth settings [31]. Therefore, I provide an overview of the most relevant topics related to maternity care.

To pay for health services, Americans have a few options: Medicare if the birthing person has a disability, Medicaid, Children's Health Insurance Program (CHIP), private health insurance (paid for by the individual or employer-sponsored), or self-pay [31]. Medicare is a federally funded program that provides healthcare services to people under 65 years old with certain disabilities and to people aged 65 and older [32]. Medicaid and CHIP are state and federally funded programs for some people living on lower incomes to receive healthcare services; CHIP is specific for children under 19 years old and pregnant people [18,32,33]. CHIP is either offered through Medicaid or in a separate program [33]. Since Medicaid is partially state funded, each state has the power to decide which services are covered and by which providers, whether a population is eligible for Medicaid, and how much reimbursement a provider receives for services. This results in an inconsistency of care accessibility, availability, and affordability throughout the nation [18].

Individuals without government insurance or are unable to afford employer insurance can consider subsidized plans through the Healthcare Marketplace under the Affordable Care Act (ACA) of 2010 [34]. Although helpful, these initiatives leave out a large proportion of people. The majority of the uninsured population has a full-time job that does not offer health insurance yet pays too much to qualify for Medicaid, and not enough to pay for the ACA's subsidized plans [35]. As of 2023, there are 25.3 million people aged 0-64 who do not have health insurance, with the high costs cited as the biggest barrier. The monthly cost for health insurance varies based on the household's income, their geographical location, and the tier of health plan chosen. The average household income in 2022 for a family of three ranges from $61,201 (Mississippi) to $138,342 (Washington, DC) depending on the state, with an average income of $89,581 [36].

The KFF Health Insurance Marketplace Calculator allows people to find the US average monthly cost for a health insurance plan obtained through the Healthcare Marketplace with specific demographics. For a family of three, including two non-smokers aged 30 years old and a two-year-old child with an estimated household income of $89,000, the medium "silver plan" coverage costs $528 per month (7.12% of annual income). This does not include deductibles and copayments that vary from plan to plan or other out-of-pocket costs if receiving care from a provider out-of-network. Utilizing the same indicators in the calculator but changing the household income to $61,201 to represent incomes of households similar to those in southern states like Mississippi, the average monthly cost for a silver plan is $177 (3.48% of annual income), which also does not include other costs previously mentioned [37].

Considering the vulnerability of pregnant people, the lack of healthcare coverage before pregnancy may increase preexisting comorbidities and, therefore, increase the risk of maternal mortality [38].

Accessibility and affordability of PNC during pregnancy are two major barriers that contribute to poorer health outcomes for birthing people. In the US, these manifest as MCDs and inequitable insurance policies.

1.3 Recent policies

Recent policy changes have tried to reverse these coverage gaps with varying success. There have been three major shifts in sexual and reproductive health (SRH) policies specific to the availability and affordability of care since 2010.

Affordable Care Act

The ACA supports SRH and MH in two ways: Medicaid income eligibility expansion during pregnancy and inclusion of FBCs in Medicaid coverage.

The initiative permits states to increase Medicaid eligibility to households that earn up to 138% of the FPL ($36,770 yearly for a household of three). All but three states[‡‡] have chosen to increase Medicaid coverage during pregnancy above the mandated minimum of 138% FPL [34,39]. Those who are pregnant and fall under this low-income category may have all their childbirth services covered by providers enrolled in Medicaid [40].

The ACA mandates that Medicaid coverage includes all services provided at FBCs in states where they are legal, increasing the availability of quality and appropriate care [41]. Non-nurse-attended homebirths are covered by Medicaid fully or partially in 21 states [42].

American Rescue Act Plan

The American Rescue Act Plan (ARAP) of 2021 creates the option for states to expand Medicaid coverage from the minimum of 60 days to 12 months postpartum [43]. All but two states[§§] have opted for the expansion. However, 12 months after birth the family can apply for coverage again, but they only receive it if they meet the state's requirements. As a result, many families are without coverage after the child is one year old [39].

Dobbs v. Jackson Women's Health Organization decision

On June 24, 2022, *Roe v. Wade* was overturned due to the *Dobbs v. Jackson Women's Health Organization* decision. This Supreme Court decision removed the federal right to abortion care. It gave each state the right to decide on abortion restrictions, resulting in 12 states with total abortion bans, 28 states with bans based on gestational duration, and 9 states that do not restrict abortion on the basis of gestational duration, as of July 7, 2025 [44]. States with restrictive abortion policies enforce legal consequences for medical practitioners providing abortions, including felony charges, loss of medical license, and prison sentences, even if the abortion is lifesaving. Such legal threats are pushing doctors to leave restrictive states for those where they can practice without facing complaints or litigation [45–47].

These decisions directly impact healthcare access and MH outcomes. While the Medicaid expansions increase care access through broadening coverage and including FBCs, abortion bans are restricting access by decreasing the workforce and increasing poor outcome rates for infants and birthing parents [48–51].

[‡‡] Idaho, Louisiana, and South Dakota
[§§] Wisconsin and Arkansas

1.4 Obstetricians & Midwives

When pregnant, most individuals seek PNC through obstetrician-gynecologists (OB/GYNs), who are medically trained surgical doctors and experts in above average-risk*** pregnancies. Although only about 8% of pregnancies are considered "above average-risk" and need OB/GYN care in a hospital setting, 98% of births occur in a hospital, with approximately 89% of those births under the supervision of an OB/GYN and almost 10% attended by Certified Nurse-Midwives (CNM) [31,52]. Due to hospital administration, when a laboring person enters the hospital, the OB/GYN who provided PNC may or may not be the physician attending the birth. Similarly, CNMs attending hospital births usually did not provide the PNC to the pregnant person [13].

Despite the lack of obstetric clinicians, the number of OB/GYNs significantly outweighs other MH experts like midwives, unlike many other countries where the opposite is true. For example, in 2024, the US had 12 OB/GYNs and four midwives per 1,000 births, while Australia had eight OB/GYNs and 70 midwives per 1,000 births. [53].

Although there is evidence to support midwifery practice in the care of average-risk pregnancies, the US healthcare system is physician-centered, with midwives attending a low percentage of births. Midwives are educated with the Midwifery Model of Care (MMC), which is a philosophy on how to approach SRH and is adaptable to all levels of care and settings, including hospitals, FBCs, and homebirths††† [6]. There are three main types of midwives: CNMs, Certified Midwives (CMs), and Certified Professional Midwives (CPMs) or Licensed Midwives (LMs) [54].

It is legal for a person to birth in any setting without an attendant by choice or by accident. However, in 12 states, CPMs are not authorized to practice legally, even though they are trained experts in average-risk out-of-hospital births [55,57]. It is common for midwives to obtain additional LM qualification when a state recognizes LMs for certain services but not CPMs or CMs [56].

See Table 1 for key differences in midwifery titles[54–56].

*** The latest consensus on PNC delivery by ACOG uses "average-risk" and "above average-risk" language, as opposed to the previously used "low-risk" and "high-risk." Although no paper has been found on officially adopting the new terminology, the author is utilizing the updated language as it reflects more accurately that most pregnancies are not "high-risk" [31].

††† It is common practice to write "homebirth" as one word, although some journal articles write it in two words. There does not seem to be a standard, therefore this author chose the singular word because that was how it was first introduced.

Table 1. Key differences in midwives

	Nurse-Midwife	Direct Entry Midwife	
	Certified Nurse-Midwife (CNM)	Certified Midwife (CM)	Certified Professional Midwife (CPM) or Licensed Midwife (LM)
Main registration organization	American Midwifery Certification Board	American Midwifery Certification Board	North American Registry of Midwives
Education	Bachelor's in nursing, Master of Science in Midwifery	Bachelor's in any field, Master of Science in Midwifery	Midwifery school or apprenticeship completion
Licensed in number of states	All	11	37
Primary work setting	Hospital	Hospital	Out-of-hospital
Out-of-hospital specific education	Not required	Not required	Required

1. Adapted by the American College of Nurse-Midwives, 2022 to include out-of-hospital birth education from Daviss et al. [54,57]

1.5 Global recommendations

The WHO supports the MMC as the first point of contact for PNC due to the high quality of care midwives provide, the improved health outcomes, and the cost effectiveness of their services [6]. Globally, midwives can offer a wide scope of SRH services including performing and interpreting lab results, providing health information for family members of all ages, and prescribing medications [6,58,59]. According to a collaborative report by the International Confederation of Midwives (ICM), UNICEF, WHO, Jhpiego, and the United Nations Family Planning Association, when fully integrated, regulated, and licensed, midwives can provide up to 90% of all SRH services [60].

A meta-analysis of 17 studies found that people who birthed with continuity of care from a midwife were less like to have unnecessary medical interventions, had fewer out-of-pocket expenses, and had an overall positive birth experience, compared to those who birthed under a different model of care [61]. This aligns with research showing that birthing people score their birth experience higher when birthing at home with a midwife [62]. Despite these findings, midwives continue to be underutilized and underrecognized in an environment of overmedicalization of birth and increased unnecessary interventions [6].

Chapter 2: Problem statement & justification

Despite funding to improve maternity care through various federal efforts, the US has the highest maternal mortality rate (MMR) among industrialized nations, with a rate of 18 deaths per 100,000 live births in 2023. According to the Centers for Disease Control (CDC), 84% of maternal deaths were determined to be preventable [16,63–65]. In the same year, the next highest MMR among industrialized nations is Canada, with a rate of 12 deaths per 100,000 live births [66]. In the US, the racial disparity of MMR persists with Non-Hispanic Black birthers dying over three times more frequently than Non-Hispanic white counterparts of similar income and educational background [16,63].

The high MMR is partly due to the increasing rate of MCDs, resulting in delayed access to care due to increased travel time [4]. One report estimates 600 hospital closures in rural areas between 2023 and 2028, many primarily located in Southern states [67]. See Figure 2 for a map of the 112 complete hospital closures by rurality since 2005. The lack of access to care increases the chance of preterm births, cesarean sections (CS), and maternal mortality [4,68].

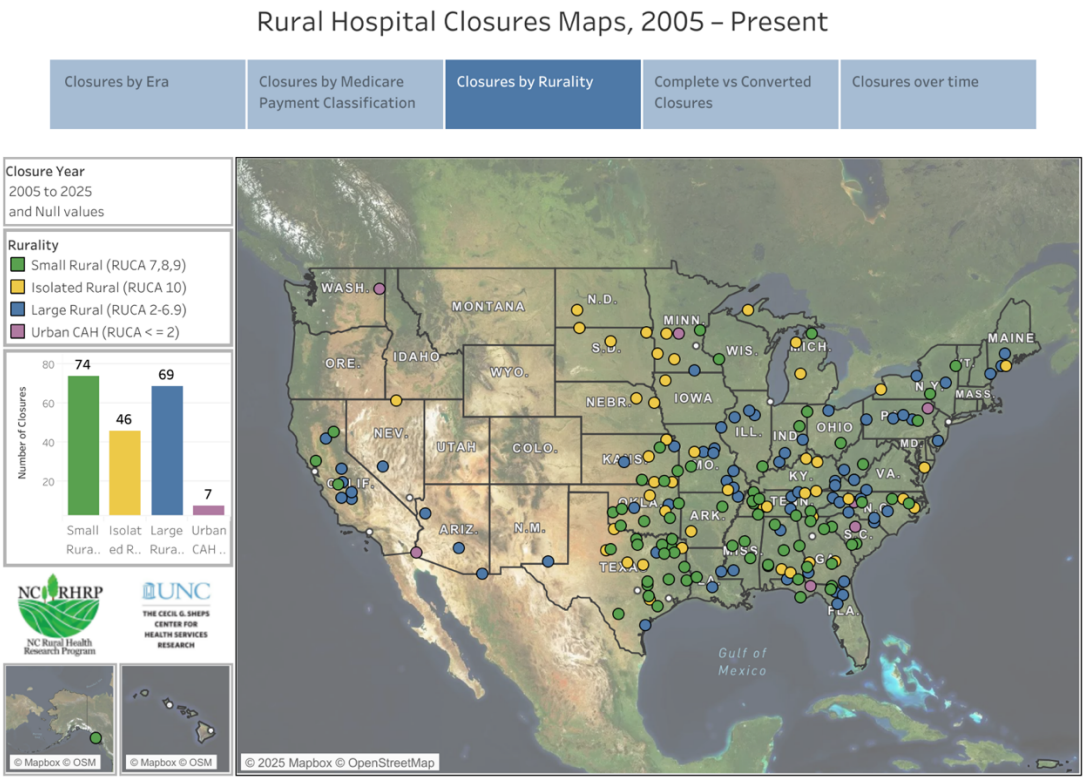

Figure 2. Map of rural hospital closures from 2005-2025, adapted from the University of South Carolina's Rural Health Research Program, 2025 [71]

Despite high hospital birth rates, interest in midwife-attended community births has increased, partly due to the COVID-19 pandemic, with an annual rate of 1.99%. Common reasons for choosing out-of-hospital births include hospital overflow of COVID-19 patients and fear of mistreatment from OB/GYNs and hospital staff [69,70].

Research suggests a need for an alternative maternity care delivery model, since most births occur in hospitals. This is exacerbated by the increase of rural hospital closures due to financial constraints and lack of staff retention [71–73]. A shift to a supportive out-of-hospital birth health system could save taxpayer money on high healthcare costs and make birth more affordable and accessible[74,75].

I will examine the MH outcomes influenced by health system risk factors regarding access to and affordability of midwife-attended out-of-hospital births in rural, low-resource settings like MCDs. Additionally, I include analyses of health outcome changes and affordability of care due to increased utilization of healthcare workers, such as the role of CPMs. With this information, I will provide recommendations to improve MH outcomes and to support the integration of CPMs.

Chapter 3: Research questions

3.1 Overall research question

How do health system accessibility and affordability factors influence maternal mortality rates throughout the last decade in the United States?

3.1.1 Sub-questions

1. How do state level maternal mortality rates from 2020-2022 relate to accessibility and affordability health system factors, including Medicaid income eligibility during pregnancy, proportion of births covered by Medicaid, births with prenatal care in the first trimester, Certified Professional Midwife (CPM) density, midwife-attended out-of-hospital births, and rate of maternity care deserts (MCD) in the United States?

2. How do Certified Professional Midwife (CPM) service characteristics[‡‡‡] influence health system accessibility, specifically the dimensions of availability and accommodation, ability to reach, affordability, and ability to pay, and what is the demonstrated or potential effect on maternal mortality?

[‡‡‡] Service characteristics refers to the typical scope of practice and accommodations CPMs provide for their clients.

Chapter 4: Objectives

4.1 Main objective

To understand the accessibility and affordability of Certified Professional Midwives' community birth services in maternity care deserts and their ability to potentially reduce maternal mortality across the United States since 2015.

4.1.1 Specific objectives

1. To examine the accessibility of Certified Professional Midwife services in rural areas in the United States through a health systems and health seeker lens.
2. To estimate the cost-effectiveness of integrated non-nurse midwifery-led care in maternity care deserts in the country.
3. To provide evidence-informed recommendations for policymakers to improve access and affordability of safe maternity care through midwifery-led options in maternity care deserts in the United States.

Chapter 5: Methodology

This thesis consists of a secondary data analysis to understand MMR in the US concerning midwife-assisted out-of-hospital birth settings and the affordability of services in MCDs. To analyze the potential effectiveness of increased midwifery care in terms of access and affordability, I have conducted a systematic approach to a literature review to understand potential health outcome benefits from integrating CPMs into the healthcare system by understanding their service characteristics. Research on other types of midwives in international contexts is included when needed to fill a gap in existing CPM-specific research. This method allows me to address the impact of midwifery integration in low-resource settings optimally.

5.1 Levesque Conceptual Framework for Healthcare Access

To ensure a cohesive analysis, the Levesque Conceptual Framework for Healthcare Access is utilized (Figure 3). The framework model covers both health systems and health seekers, with five dimensions of access described in each of them: approachability, acceptability, availability and accommodation, affordability, and appropriateness. The framework also describes the same five dimensions from a health seeker's perspective: ability to perceive, to see, to reach, to pay, and to engage. For true access to be achieved, both the health system and the population's abilities need to synchronize [76].

To provide an in-depth analysis, two sections of both sides of the framework will be utilized: health system's availability & accommodation/a person's ability to reach healthcare, as well as health system's affordability/a person's ability to pay for services. A slight adaptation has been made to include culture. Culture is noted the acceptability dimension, but due to the importance of cultural accommodation by providers, it is interpreted as an accommodation. See Figure 3 for the Levesque Conceptual Framework for Healthcare Access with markups identifying the dimensions used.

Two key components drive the decision of the dimensions chosen:

- The abundance of international literature evidencing the quality-of-care midwives provide, juxtaposed to policies limiting midwifery access in the US, during a time when access to maternity care and MH outcomes is a highly debated topic.
- The high costs for MH services on both the health system and the individual highlights the need to analyze the association between affordability/ability to pay and MH outcomes.

Limitations to the framework include:

- difficulty to categorize barriers and facilitators due to factors overlapping different dimensions,
- some dimensions' sub-categories are not equal between the health system side and health seeker side,
- does not address providers' prospectives,
- time-related factors are not represented clearly, and
- does not provide actionable steps for policy or health system reforms.

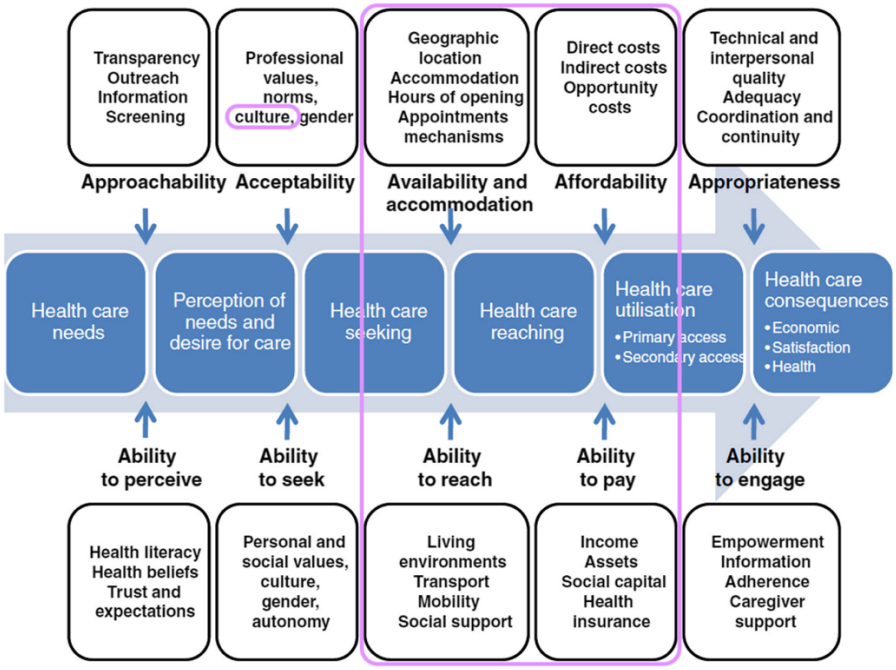

Figure 3. Levesque Conceptual Framework for Healthcare Access, 2013 [76]

The results are grouped by framework dimension and sub-category, showing a side-by-side analysis of the health system's side and health seeker's side. For example, geographic location and living environments are paired together under the availability and accommodation section.

5.2 Secondary data analysis

During initial research, two significant publications were found, and quantitative data was obtained:

- The Access and Integration Maternity Care Mapping (AIMM) Study from The Birth Place Lab in Vancouver, British Columbia, Canada [77].
- Nowhere to Go: Maternity Care Deserts Across the US, 2024 from March of Dimes [4].

The AIMM study scores each state's level of midwifery integration based on variables including scope of practice authority, autonomy, governance, midwife density, and prescriptive rights, as well as restrictive policies that may affect a person's care across birth settings. A nationwide survey of state regulatory experts validated scores, which were calculated using a modified Delphi process and resulted in the Midwifery Integration Scoring System (MISS). The scores were then correlated with health outcome variables from the CDC – Vital Statistics Database to analyze the MISS score to maternal-newborn outcomes per state. This thesis focuses on data related to CPM density and percentage of out-of-hospital births attended by a midwife per state. The integration score was not included [77].

The Nowhere to Go: Maternity Care Deserts Across the US report examined key factors affecting maternity care access across all US counties. The report identifies the counties classified as MCDs based on factors including population to maternity care-clinician ratio, income level, travel time and distance to care, fertility rate, Maternal Vulnerability Index, MH indicators, and population to behavioral health professional ratio. This provides a nuanced approach to identifying access to maternity care through the lens of the SDOH. Since the definition of an MCD does not include CPMs in the definition of "obstetric provider," the data is used as a covariate to analyze the potential effect living in an MCD can have on MH outcomes [4].

Other variables, described below, were also sourced from open-access databases. The most recent data available were included for all variables.

5.2.1.1 Variable selection process

A total of fifteen variables were collected based on the framework's definitions of availability and affordability, their relevance to the research question, and data accessibility. Initially, a forward selection approach was explored to identify statistically significant variables. Bivariate analyses, variance inflation factor (VIF), and Pearson correlation tests were conducted to evaluate relationships and potential multicollinearity among variables.

For the initial variables, I first assessed univariate distributions visually using histograms to detect outliers and skewness. Three variables[§§§] showed moderate skewness; accordingly, CPM density was log-transformed to improve normality (post-transformation skew = 0.236). Following transformation, multicollinearity was assessed by calculating VIF statistics for the remaining variables. However, these diagnostics suggested removal of

[§§§] Medicaid income eligibility level (%FPL, skew = 1.325), CPM density (skew = 2.49). midwife-attended out-of-hospital births (skew = 1.087).

variables essential to the research question. Therefore, a theory-based selection approach was adopted even though some variables were not independently statistically significant with the outcome variable. This resulted in the final six variables. Table 3 contains independent variables and preliminary statistical associations with the outcome.

Variables representing availability on the framework were:

- Midwife-attended out-of-hospital births,
- CPM density,
- PNC in the first trimester, and
- MCD prevalence.

Variables representing affordability were:

- Medicaid income eligibility limit for pregnancy and
- Proportion of births covered by Medicaid.

Subgroups of the dimensions in the framework that are not represented in the variables are not included in the results.

I acknowledge the mismatch in dataset years is a caveat of this study design. Additionally, the most recent data found on MMR is from 2020-2022. This data may be skewed due to the COVID-19 pandemic when deaths were rising, as were CPM-attended community births. An appropriate COVID variable was considered, but the VIF model showed high collinearity with proportion of MCD. Due to the importance of MCD in the research questions, MCD was chosen, and the COVID variable was removed.

See Annex 1: Variable details and their sources.

5.2.1.2 Preparing data

Datasets were compiled and organized by the descriptive identifiers (state names). MCD data were aggregated to provide the proportion of MCDs per state for comparison with other state-level data. One variable (CPM density per 1,000 births) did not have data for Minnesota; therefore, the mean of the variable across all other states was used in its place. Mean imputation preserves sample size, but it may underestimate the natural variability and weaken associations. All other independent variables included only states with complete data; no additional imputation methods were needed.

Eight states and the District of Columbia (DC) do not have data on the outcome variable, MMR and were excluded, resulting in 42 units of observation. The removal of these states could bias the analysis due to the varying levels of integration of midwifery and MCDs

across states. Therefore, the potential protective factors of CPM density and the risk factor of living in an MCD could be underestimated.

After data cleaning, the sample (n = 42) was judged sufficient for the model given six exposures, though caution is warranted regarding estimate precision due to sample size.

5.2.1.3 Model: multivariate linear regression analysis

The final regression model was conducted in RStudio to assess the association between state-level MMR (dependent variable) and state health system factors noted above.

$$MMR = \beta_0 + \beta_1 \times variable + \beta_2 \times variable + \beta_3 \times variable + \beta_4 \times variable + \beta_5 \times variable + \beta_6 \times MCD + \varepsilon$$

Statistical significance was set at alpha (α) = 0.05 for all main analyses.

5.3 Systematic literature review approach

To answer the second sub-question, I conducted a systematically approached literature review based on midwifery care services in the US, health system integration in terms of access and affordability, and the relationship to MMR. For context and comparison, the analysis includes an examination of HIC countries and low-resource settings that have integrated midwives into the formal healthcare system.

A keyword search strategy was developed using Boolean operators to identify relevant articles on Google Scholar, PubMed, and JSTOR. When relevant, snowballing was used to develop a deeper understanding. See Annex 2: Table of search terms examples and inclusion and exclusion criteria for example terms and combinations used.

Inclusion criteria include open-access research articles, journals, policy reviews, and grey literature published in English since 2015. The 10-year date range is not ideal, but it is necessary since midwifery research is not a popular research topic; this is especially true for research specific to CPMs[****] or other direct-entry midwives. Most US-based articles acknowledge the existence of multiple midwifery titles but group them despite the variety in work setting and policy restrictions. In rare instances, a work published as early as 2000 is included. These works are included only when necessary to provide historical context and evolution of policies and practices[††††].

[****] For example, when searching "Certified Professional Midwife NOT Nurse" in PubMed, the automatic date range of 1969 to 2025 totals to 161 results, many of which are not relevant and only show up because the term "certified" is included in the title or abstract. All 17 pages were viewed and 31 articles were considered relevant, 17 of which have full text available, and only 4 of those 17 have free full text access.
[††††] For example, The Lancet series on midwifery published in 2014.

Exclusion criteria include studies not published in English, any works published before 2000, works behind paywalls, and studies that focus solely on CNMs as these studies do not acknowledge the different midwifery titles in the US.

5.4 Ethical considerations

The datasets were publicly available state-level data through various sources. As reflected in the KIT Institute research ethics committee terms of reference, ethical clearance is not compulsory for secondary data analyses.

It is possible that bringing attention to inequities in underserved populations may bring unintended consequences.

Chapter 6: Results

6.1 First research sub-question[‡‡‡‡]

This section presents the results of the quantitative analyses calculating the relationship between state-level health system factors and MMR. I conducted a multiple linear regression model on a sample comprised of 42 states (*n* = 42) to test whether accessibility and affordability of out-of-hospital births are associated to MMR by state.

Variables are grouped and presented according to their relevant framework dimensions throughout all tables and analyses for consistency and clarity.

6.1.1 Availability & accommodation; Ability to reach

6.1.1.1 Univariate analysis

Descriptive statistics for each variable are shown in Table 2.

The proportion of MCDs varied substantially across states (mean = 0.286, standard distribution [SD] = 0.181, min = 0, max = 0.576), with rather symmetric distribution (skew = -0.124). CPM density per 1,000 births averaged 0.572 (SD = 0.64, range = 0.04-3.07), but was highly right-skewed (2.49), so it was log-transformed to improve normality in analyses. The proportion of midwife-attended out-of-hospital births (mean = 1.223, SD = 0.917) and the percent of PNC in the first trimester (mean = 78%, SD = 4.3%) also showed considerable variation across states, with moderate but acceptable skewness observed for midwife-attended out-of-hospital births (skew = 1.087).

Table 2. Descriptive univariate analysis of availability & accommodation/Ability to reach factors

Framework dimension	State-level factor	Mean	SD	Min	Max	Skew
Outcome variable	Maternal mortality rate	28.36	9.256	9.9	51.1	0.26
Availability & accommodation/ Ability to reach variables	Maternity care deserts per state	0.286	0.181	0	0.576	-0.124
	Certified Professional Midwife density	0.572	0.64	0.04	3.070	2.49*
	Midwife attended out-of-hospital births	1.223	0.917	0.13	3.52	1.087
	Prenatal care in the first trimester	0.782	0.043	0.697	0.858	-0.19
Affordability/ability to pay variables	Medicaid income eligibility	2.061	0.472	1.38	3.8	1.325
	Medicaid-covered births	0.4	0.088	0.18	0.635	0.055
*Variable log-transformed due to high skew						

[‡‡‡‡] How do state level maternal mortality rates from 2020-2022 relate to accessibility and affordability health system factors, including Medicaid income eligibility during pregnancy, proportion of births covered by Medicaid, births with prenatal care in the first trimester, Certified Professional Midwife (CPM) density, midwife-attended out-of-hospital births, and rate of maternity care deserts (MCD) in the United States?

These summary statistics show variability in MH system factors across states. Notably, CPM density was highly skewed and log-transformed for further analyses. The bivariate analysis between these factors and MMR follows (Table 3).

6.1.1.2 Bivariate analysis

MCDs demonstrated a significant positive correlation with MMR (r = 0.443, p = 0.0032, VIF = 1.14), suggesting greater prevalence of MCDs is associated with higher MMR. Log-transformed CPM density showed no meaningful association with MMR (r = 0.0024, p = 0.9876, VIF = 5.14). The VIF suggests moderate multicollinearity, indicating overlap with other variables. Midwife-attended out-of-hospital births showed a non-significant association with MMR (r = -0.26, p = 0.093, VIF = 1.97). PNC in the first trimester was strongly and negatively correlated with MMR (r = -0.627, p < 0.001, VIF = 1.58), indicating that states with higher rates of adequate PNC have significantly lower MMR.

Table 3. Bivariate analysis results

Framework dimension	Variable (all continuous)	r with outcome	*p*-value	VIF
Availability & accommodation/ Ability to reach variables	Maternity care deserts	0.443	0.0032	1.14
	Log Certified Professional Midwife density	0.0024	0.9876	5.14
	Midwife-attended out-of-hospital births	-0.262	0.09276	1.97
	Prenatal care in the first trimester	-0.627	<0.001	1.58
Affordability/ability to pay variables	Medicaid-covered births	0.459	0.0022	1.73
	Medicaid income eligibility	-0.266	0.08859	1.14
df = 40				

The results on midwifery accessibility, which suggest no statistical significance, are unexpected and require further investigation. Scatterplots of the two variables, log CPM density (Figure 4) and midwife-attended out-of-hospital births (Figure 5) against MMR were examined.

Log CPM density shows a negligible increase in MMR with increased CPM density. In contrast, midwife-attended out-of-hospital births show a more substantial decrease in MMR with the increase of midwife-attended out-of-hospital births. The cluster of low CPM density and low midwife-attended births scattered somewhat evenly across the regression line suggests that in environments lacking supportive policies, there are fewer midwife-attended births overall. Restrictive environments may lead to midwives practicing infrequently, illegally, or experiencing barriers to providing safe, quality care, potentially explaining the absence of association in the quantitative results.

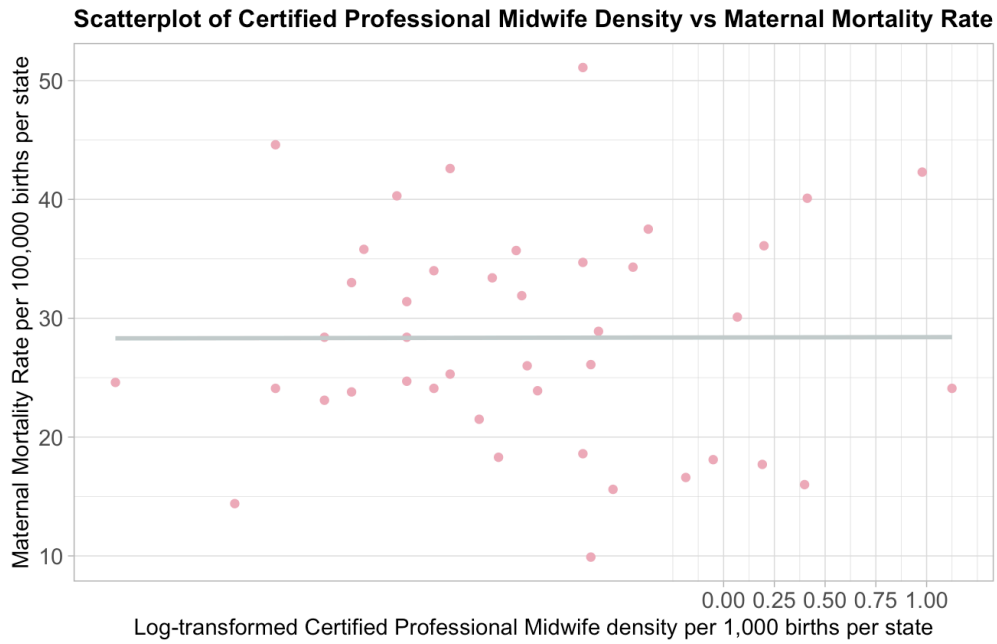

Figure 4. Scatterplot of log-transformed Certified Professional Midwife density vs maternal mortality rate. Each point represents one state (n = 42). The line represents the linear regression fit (not statistically significant). Note: Most states have low CPM density, which are compressed near zero on the x-axis following log transformation. Negative values on the x-axis represent states with low, but nonzero CPM density, as log-transformed values between zero and one become negative.

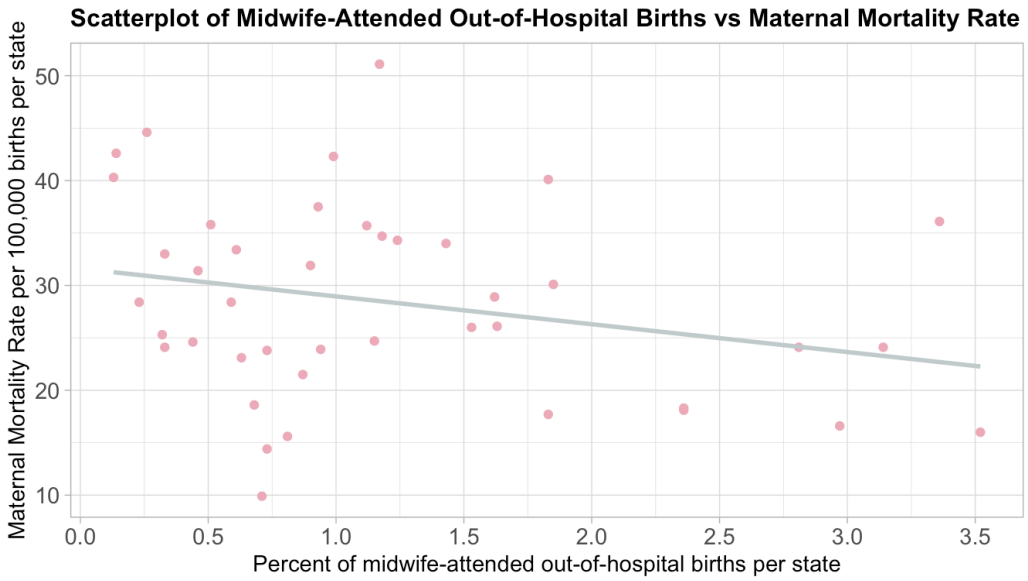

Figure 5. Scatterplot of the association between percent of midwife-attended out-of-hospital births and maternal mortality rate per state. Each point represents one state (n = 42). The line represents the linear regression fit. While a negative trend is observed, the association does not reach significance.

6.1.2 Affordability; Ability to pay

6.1.2.1 Univariate analysis

Table 2 shows the univariate analysis for affordability factors. Medicaid income eligibility threshold during pregnancy ranged from 138% to 380% times the FPL (mean = 2.061, SD = 0.472, skew = 1.325), while the proportion of births covered by Medicaid averaged 40% (SD = 0.088, range = 0.18 – 0.635) and was fairly symmetric (skew = 0.055).

Outcome variable:
The state-level MMR per 100,000 births averaged 28.36 (SD = 9.256), with a minimum of 9.9 and a maximum of 51.1 across states. The distribution was rather normal (skew = 0.26).

The univariate findings demonstrate high variability across states in both access and affordability of maternity care, supporting the need for further analyses.

6.1.2.2 Bivariate analysis

Medicaid-covered births had a significant positive correlation with MMR (r = 0.459, p = 0.0022, VIF = 1.73), meaning states with higher proportion of Medicaid-covered births experienced higher MMR. Medicaid income eligibility revealed a negative but non-significant association with MMR (r = -0.266, p = 0.089, VIF = 1.14).

Collectively, the bivariate analyses highlight that, among availability factors, adequate PNC and reduction of MCD are most strongly associated with improved maternal outcomes. The only affordability variable reaching statistical significance was Medicaid-covered births, which was associated in the opposite direction than theoretically expected. Variables without significant bivariate associations, such as CPM density and Medicaid eligibility, were nonetheless retained for multivariate analysis due to their theoretical relevance.

6.1.3 Model summary and interpretation

The full multivariate linear regression model assessed the simultaneous influence of six state-level factors on MMR. The model explained a substantial proportion of the variance in MMR across states (R^2 = 0.558, Adjusted R^2 = 0.482, F-statistic [6, 35] = 7.367, p < 0.001). Table 4 shows the results for the multivariate linear regression.

MCDs were a significant association. Log-transformed CPM density had a positive but non-significant association with MMR (B = 2.29, p = 0.136), suggesting no evidence of a protective effect after accounting for other variables. Midwife-attended out-of-hospital births were negatively associated with MMR (B = -2.38, p = 0.144), but this association did not reach statistical significance.

The strongest independent associations of MMR at the state level were PNC in the first trimester (protective) and increased prevalence of MCDs (risk factor), both reflecting the impact of availability and accessibility of care.

PNC in the first trimester was strongly associated with reduced MMR (B = -95.24, 95% CI: -154.7, -35.78, $p = 0.002$). This suggests that, holding other factors constant, an increased unit of PNC in the first trimester is associated with a decrease of about 95 maternal deaths per 100,000 births. For every increased unit in the prevalence of MCDs, MMR increased by 13.42 (95% CI: 0.9, 25.94) per 100,000 births ($p = 0.036$).

Affordability measure and midwifery factors, while important, did not have statistically significant associations in the full multivariate model.

Insurance coverage variables' (Medicaid-covered births, Medicaid income eligibility) findings may reflect the specific US context wherein Medicaid coverage is often granted only once pregnancy is established. As a result, people may go uninsured prior to pregnancy, limiting access to preventative care. This gap can lead to unmanaged comorbidities that are only addressed during pregnancy, potentially too late to prevent adverse outcomes. Thus, the model's results highlight not only the importance of care availability during pregnancy, but also suggest a need for more comprehensive, continuous insurance coverage that begins before conception to improve MH outcomes.

Table 4. Regression coefficients and statistical summary table

Framework dimension	Independent variable	Coefficient (B)	Standardized Coefficient (β)	Standard Error	95% Confidence Interval for B	t-value	*p*-value
	Intercept	104.65		26.19	[50.94, 158.35]	3.95	0.0003
Availability & accommodation/ Ability to reach variables	Maternity care deserts	13.42	0.26	6.06	[0.9, 25.94]	2.17	0.036
	Log Certified Professional Midwife density	2.29	0.22	1.97	[-0.76, 5.35]	1.524	0.136
	Midwife-attended out-of-hospital births	-2.38	-0.23	1.46	[-5.62, 0.857]	-1.493	0.144
	Prenatal care in the first trimester	-95.24	-0.44	29.17	[-154.7, -35.78]	-3.25	0.002
Affordability/ability to pay variables	Medicaid-covered births	14.3	0.13	15.21	[-16.5, 45.12]	0.942	0.352
	Medicaid income eligibility	-3.01	-0.15	2.31	[-7.74, 1.71]	-1.292	0.204
Residual standard error: 6.66 on 35 degrees of freedom (df) Multiple R^2: 0.5581, Adjusted R^2: 0.4823 F-statistic: 7.367 on 6 and 35 df, *p*-value: 3.801e-05 ($p < 0.001$)							

6.2 Second sub-research question[§§§§]

This section explores the service characteristics of CPMs and their potential ability to reduce MMR through accessibility and affordability.

6.2.1 Availability & accommodation; Ability to reach

6.2.1.1 Geographic location & living environments

Workforce density and distribution in urban versus rural areas

Multiple studies focusing on low-middle income countries (LMIC) and rural areas report that increases in midwifery workforce do not always correlate with significant reductions in MMR or other MH outcomes [78–82]. For example, some low-income countries with higher midwife density have not seen improved outcomes, while others improved outcomes without increasing midwifery workforce [78]. The effectiveness of the workforce is criticized by researchers claiming calculating density of midwives is only valid when the midwives meet the level of competency identified in global standards suggested by the International Labor Organization and ICM. Even countries with a high midwifery workforce do not meet all global standards [83]. However, when increasing midwifery density alongside systemic integration, system strengthening, and cultural acceptance, research overwhelmingly suggests a decrease in MMR in rural, low-resource areas [78–81,84–88].

Although no US-based studies were found relating midwifery density to a reduction in MMR, due to statistical inadequacies in the overall rarity of maternal mortality and lack of standardization in reporting, several studies indicated that a strong regulatory environment leads to higher midwifery workforce densities, which in turn improves MH outcomes [31,77,89–92]. Netherly et al. compared maternal and neonatal health outcomes in average-risk midwife-attended out-of-hospital births in rural areas versus urban areas. The results indicate no increased risk of adverse health outcomes for community births in rural areas versus urban areas, even though the risk profiles of the pregnant people were different [93]. In a survey of CPMs throughout the US, 32.5% reported to serve rural communities and 36.8% serve suburban residencies. Therefore the majority of CPM clients do not live in urban areas [94]. Although, the definition of “rural” creates varying results in the likelihood of local midwifery care access.

Rural counties without a town of at least 10,000 residents are less likely to have a local midwife compared to rural counties with at least 10,000 residents. This is also true for rural

[§§§§] How do Certified Professional Midwife (CPM) service characteristics influence health system accessibility, specifically the dimensions of availability and accommodation, ability to reach, affordability, and ability to pay, and what is the demonstrated or potential effect on maternal mortality?

communities with a hospital where at least half of the births are covered by Medicaid and in counties with majority BIPOC populations [95].

Since CPMs serve more rural communities and MCDs at higher rates than urban areas, clientele demographics may be a determining factor in service accessibility.

Freestanding birth center availability

FBCs are midwife-led out-of-hospital birthing options for average-risk pregnancies. As of 2021, 41 states and DC license and regulate FBCs through the Commission for the Accreditation of Birth Centers. Other states either have no regulations or are under other regulations [96].

Due to states' abilities to limit providers' services, some states have restrictions on FBCs including requiring a physician and/or nurse to be on staff or act as a consultant, limiting CPMs service delivery, requiring FBCs to obtain a state-issued "Certificate of Need" to grant licensure, and requiring hospitals to have written agreement for transfer, in which the hospital must be a certain distance from the FBC [97]. See Figure 6 for a map of regulation agreements, states with laws requiring Certificate of Need for FBC operations, and the number of FBCs per state [98].

These policies impact the ability of FBCs to stay open and provide affordable services to the community, despite the evidence supporting the midwife-led care reducing MMR [99].

Distance to nearest hospital & referral system

Strong referral systems are essential to lifesaving care. Due to the high rate of hospital closures in rural areas, the distance to emergency care is growing. Thankfully, CPMs meet the credentials to provide quality care in community settings and know when to refer care to a higher specialization [94,100]. However, the different approaches to childbirth (medical model versus midwifery model) sometimes make it difficult for OB/GYNs and midwives to work together and form partnerships, hindering the referral system [92]. Additionally, over half of rural hospitals state they are not aware of locally available midwifery care, further creating a divide in occupational understanding and respect, as well as access [101].

Most interactions between CPMs and OB/GYNs happen when a planned community birth transfers to a hospital, whether for an emergency or by client's choice for medicated pain management or otherwise. The differences in education through different models of care means physicians may have little to no experience attending unmedicated births in any setting. Similarly, CPMs and non-nurse midwives may never see physiological birth in a hospital. This may lead to a difficult transfer due to lack of understanding or respect for the other profession's approach to birth [92].

Both professions strive for person-centered care; therefore the focus must stay on the birthing person's informed decision, and the system must be strengthened around them [14,100]. This could reduce conflict between providers and remove barriers that are hindering progress for system referral strengthening, thus improving the access to timely, appropriate, lifesaving care [92].

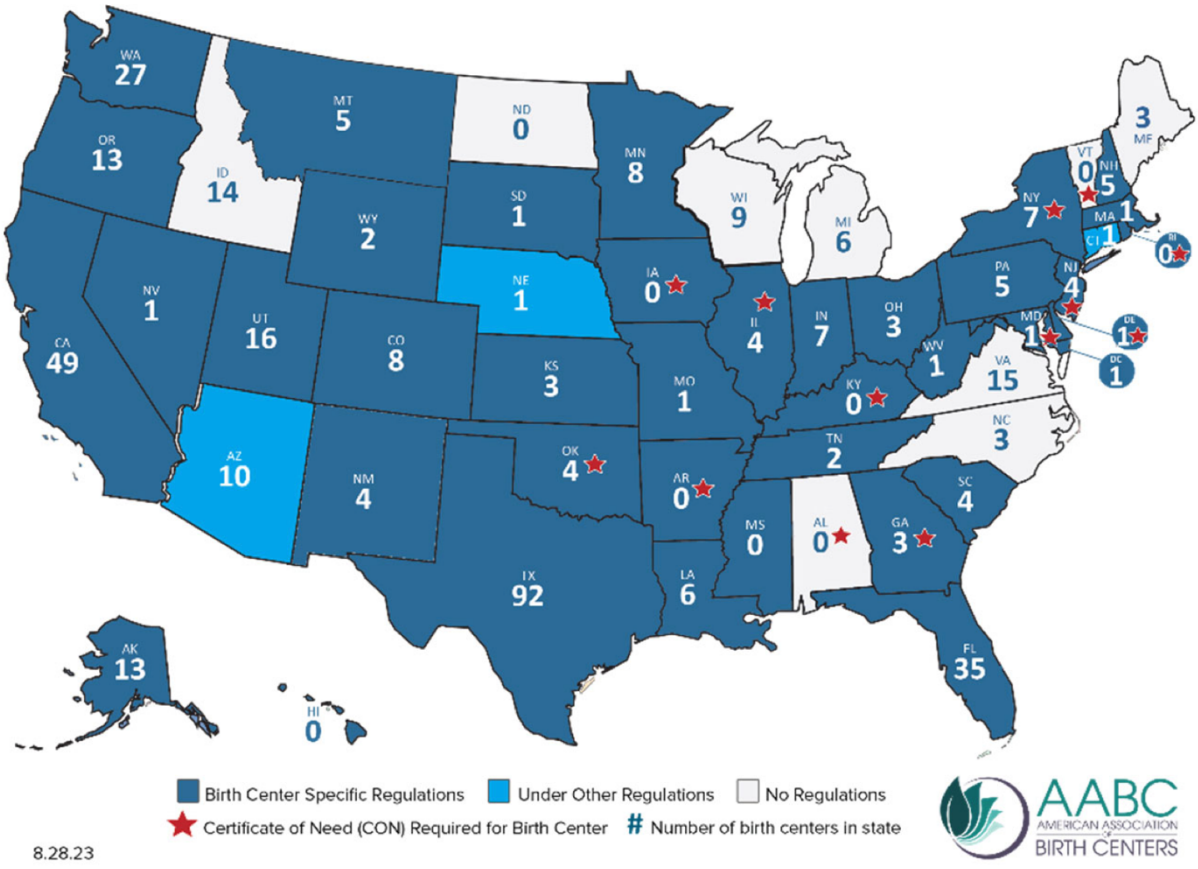

Figure 6. Map of licensure and count of freestanding birth centers in the United States. Sourced by the American Association of Birth Centers, 2021 [98].

6.2.1.2 Accommodation & transport

Appointment length & continuity of care

CPMs report prenatal appointments lasting 45-60 minutes or longer to allot for discussions around social and personal experiences, further building trust between CPM and client. This is significantly longer than physician-led appointment lengths, which are usually 10-15 minutes [94,102]. Additionally, in the physician-led maternal healthcare model, most pregnant

people have PNC appointments with nurse staff at the facility, rather than the OB/GYN, which hinders the ability to build trust and connection with the provider [102].

No research was found associating appointment length and MMR. Although there may be an association with appointment length and continuity of care building trust between provider and pregnant person, which in turn may improve communication and thus improve birth outcomes [61,102,103]. Birthers who received continuity of care were more likely to report shared-decision-making with their provider (midwife or doctor) and have an overall positive birth experience. Although, this is not the case when the person has specific cultural beliefs on birth [104].

Accommodating to cultural beliefs

Considering the cultural beliefs of a pregnant person, Coates et al. found that birthers who identified with a cultural or ethnic group had several points of statistical significance when compared to survey respondents who did not identify with a cultural or ethic group. Respondents were more likely to view spontaneous, vaginal birth as an important rite of passage and those who birth via CS "miss an important life experience". They were less likely to be told about the benefits or risks associated with planned birth interventions (planned CS or planned induction of labor) during pregnancy. This group was also less likely to trust their provider and more likely to report feeling pressured to make certain decisions [104]. This study does not identify if the provider was of same ethnic or cultural background as the birther. However, Goh et al.'s analysis pointed to nine studies where pregnant people preferred their provider to be of the same cultural background or understood the person's culture [102].

Cheyney et al. suggests CPM-led care could mitigate birth outcomes that disproportionally affect marginalized communities, including BIPOC and queer communities, through the inherent nature of the MMC providing holistic, person-centered care. Although nearly 32% of CPMs report 95% or more of their client base to be white, a survey of non-Hispanic Black birthers stated they would prefer a homebirth over hospital birth. Still, systemic barriers prevent them from accessing midwifery care [94]. This is supported by research stating when healthcare providers are diverse and reflect the patient population, the patients have a more positive experience overall [105,106].

Linares states clearly:

> Increasing the number of midwives in ethnic minorities and diversifying the maternity care workforce with individuals who represent the lived and cultural experiences of the patients they serve is warranted… The overwhelming evidence

shows the increases in health outcomes when midwives are incorporated in the healthcare team [107].

Telehealth appointments

Telehealth appointments gained popularity during the COVID-19 pandemic to decrease in-person contact. These appointments have continued in various healthcare settings, including midwifery [108].

No research was found specific to CPMs and telehealth appointments in the US. However, there is research indicating midwives from other countries have both positive and negative experiences with telehealth appointments. Midwives generally utilize telehealth appointments when it best serves the clients' needs, but prefer in-person appointments to fully address physical assessments and provide better privacy and security [109].

In-home visits

A study on rural Pakistan found that in-home PNC provided by midwives was more effective at increasing prenatal exam rates, compared to facility-based exams. This study did not associate the increase of PNC visits with a reduction in MMRs, but does state the importance of PNC to improve birth safety [84]. Community-based primary healthcare strategies in rural areas globally identify two strategies to decrease the population's MMR: regular home visits for PNC and promotion of skilled birth attendants (SBA) during birth [87].

Concerning CPM care, nearly half (48%) of CPMs in the US report to have five appointments in the initial six-week postpartum period, compared to the typical one in-facility appointment by an OB/GYN at 4-6 weeks postpartum[94,110]. The first CPM-led appointment is at the person's home within 24 hours of birth and often lasts an hour or more. Depending on the new parent's needs and abilities, a CPM may provide future postpartum visits in the person's home [94].

A randomized control trial in South Carolina analyzed the impact of the Nurse-Family Partnership (NFP) program on routine postpartum care visits and use of emergency postpartum care. Participants in the NFP were first-time parents, enrolled in Medicaid during pregnancy or birth, and have regular in-home postpartum visits by a nurse. There is no statistically significant difference in the attendance of routine postpartum visits at 12 weeks postpartum between the intervention group and the control group following the typical in-facility postpartum appointments. This indicates, generally, people enrolled in Medicaid understand the importance of postpartum care assessments and will overcome barriers to attend them. There is no significant difference between groups in whether the participants visited the in-hospital emergency department during the first 12 weeks postpartum. However, the control group did have a significantly higher likelihood to visit the

emergency department with admittance, suggesting the in-home care received in the intervention group improved people's health literacy and identifying health concerns during home visits [111].

No research was found on physicians attending in-home PNC or postpartum visits.

Transportation

Transportation includes access to a working vehicle and public transportation. Unfortunately, rural areas of the US are experiencing population growth, but not an increase in public transportation access [112]. Non-white residents in rural areas are up to three times more likely to not have access to a vehicle compared to their white counterparts, making accessibility to a facility for appointments or labor difficult [113].

Traveling long distances to receive PNC, birth support, and postpartum care is not only a financial and logistical barrier but also increases stress in the pregnant person. One quantitative, survey-based study assesses the relationship between stress and travel time to a planned birthing location by creating a point system called the Rural Pregnancy Experience Scale. This study found that those who travel over 45 minutes to the birth location have statistically significant higher stress levels (3.22 increase in point system, p = 0.001; CI: 1.38, 5.06) compared to those who travel less than 45 minutes. Additionally, participants who live further from the birthing location are more likely to be enrolled in Medicaid, have a lower education level, and be non-white, which aligns with the descriptors of most populations living in MCDs [4,114].

Considering the safety of planned homebirths, a meta-analysis on HICs finds no significant difference in the risk of poor outcomes for average-risk pregnancies between planned, midwife-attended homebirths and planned, physician-led hospital births. However, the review did find studies associating higher rates of poor birth outcomes in planned homebirths than planned hospital births, but many of these findings were in areas where it is uncommon for SBAs or midwives to attend births due to a lack of institutional and cultural support, therefore it is not the best comparison for the US where birth attendants are common across settings [115].

Safety and transportation are significant as CPMs travel to the person's home during labor with maternal and newborn safety equipment and medication for minor emergencies, thus removing the need of transportation access to a safe birthing location while in labor. The amount and type of safety equipment and medication depend on the state policy provisions for CPMs [116].

6.2.1.3 Hours of opening & mobility

The birth center model of enhanced PNC created by Alliman et al. identifies six dimensions of PNC provided by midwives in FBCs, listed below:

- All components of usual PNC
- Timely access and non-traditional hours
- Network of seamless transfer to high-risk care
- Trust, respect, and shared decision-making
- Continuity of care with the same providers
- Individualized and time-intensive health education

All components are linked to several dimensions of the framework, but "timely access and non-traditional hours" is most relevant to this result section [96].

There is no other published research found on the hours of opening in CPM-based care. However, respondents to surveys describe the barriers they must overcome to speak with their physician and state a preference for midwifery providers [102].

6.2.1.4 Appointment mechanisms & social support

Appointment mechanisms

A qualitative study interviewing young Aboriginal people (ages 16-21) in Western Australia who were pregnant within the last year found that all participants chose the pregnancy provider based on trust, appointment reminder systems, and services that provide transport to PNC appointments. The ease of booking and managing appointments facilitates continued attendance at PNC appointments [117].

Although no evidence was found on the appointment mechanisms of homebirth practice CPMs, Jolles et al. surveyed FBCs nationwide and found that FBCs that mandated midwives be on call more than 25 hours a week resulted in poorer health outcomes for the birthing parent and newborn. This could be attributed to fatigue and burnout from providing overnight care during labor and PNC appointments during the day without proper rest [118].

Social Support

A quantitative study in rural Tanzania assesses the impact on MH outcomes through improving male involvement via education on Home Based Life Saving Skills specific to pregnancy and birth. The program resulted in a 20% increase in men joining their partner at PNC appointments, compared to a 3.9% increase in the control group. Additionally, there was an increase of nearly 40% in shared decision-making with the birthing person regarding the place of birth, as opposed to a difference of 1.4% in the control group [119].

Although MMR was not directly involved in the study, focusing instead on the level of male involvement, the increase in protective factors is significant and begs further investigation of the impact on MMR. The authors believe there to be a positive impact on maternal and newborn care due to their intervention [119].

When social support to seek proper care is not present, maternal mortality can directly result. One community health worker in Kenya notes:

> There is a [birthing person] who delivered at home, and the baby dies when we reached there, and we wanted to take the mother to the hospital, [but] they refused and wanted to pray for her. So, they started praying and eventually the mother died [120].

Lack of social support for midwives is seen in the US as well. Pregnant people who plan to birth with a midwife in a community setting often do not tell their friends, family, or other healthcare providers for fear of discrimination. When they do share this information, many people make judgmental claims [121,122]. Often, the community's opinions generate the negative response. Participants in surveys who wanted out-of-hospital births often looked to friends, family, and community to learn about birthing options and found increased confidence from in-person and online communities [123]. When met with social support through peers and healthcare providers, those who seek community birth are confident and often describe their birth as "empowering" [124].

6.2.2 Affordability; Ability to pay

6.2.2.1 Direct costs & income

Health system costs

As previously mentioned, the MMC is noted for its low-intervention approach, which allows for lower costs on the health system [6]. An estimated four out of every five dollars is spent on maternal-newborn healthcare services [125]. The latest estimate for cost of an average-risk, vaginal hospital birth is $14,768, the costs being split between health insurance provider (Medicaid or private) and birthing person [126].

Hu et al. could not find quantitative results necessary to persuade Queensland, Australia's policymakers to implement a public homebirth healthcare system, so they used actual costs of care to represent a hypothetical scenario to estimate the total funds saved by supporting community births. The analysis found a total cost savings of AU$11 million to Queensland public hospitals every year [127]. Although the payment mechanism is different in the US, and the integration of midwifery care is stronger in Australia, this aligns with a US-based study finding that "each shift of one percent of births from hospital to homes

would represent an annual cost savings to society of at least $321 million… [and a] shift from hospitals to [FBCs] would save $189 million." This shift would also allow for market competition, forcing hospitals to provide higher quality care with fewer interventions at lower costs [128].

Due to about 40% of births being covered by Medicaid, it is in the taxpayer's interest to promote out-of-hospital births. Community births cost less and therefore tax dollars can go elsewhere to improve other services and infrastructures [128].

Despite several analyses suggesting the cost-saving abilities of the MMC versus the medical model of care, Martin et al. point out the lack of consistency in term definitions and poor data quality in many analyses. Midwifery care is deemed valuable for several reasons, but their examination suggests the cost-effectiveness may not be as great as other authors report [129].

Ability to pay out-of-pocket costs

The average cost to birth in an FBC is $8,309, with the out-of-pocket costs varying, while a midwife-assisted homebirth costs approximately $4,650 out-of-pocket. Due to the lack of non-nurse midwives' ability to accept private health insurance and/or Medicaid due to state policies, the out-of-pocket costs are relatively similar for in- and out-of-hospital births, assuming the provider is in network, the deductible is met, and there are no surprise-costs due to lack of understanding about the insurance policies' coverage. However, when private health insurance companies lower the premium costs, the individual may be able to pay out-of-pocket fees from those savings [128].

Unfortunately, even those with health insurance have difficulty paying for services - about 10% of adults owe medical debt. Even adults with employer-based health insurance have out-of-pocket costs that create financial distress. Survey respondents (51%) state they skipped or postponed filling a prescription in the last year, (26%) reduced spending on food, clothing and other essentials, and (17%) reported making difficult, undesirable choices to pay for healthcare costs [130].

6.2.2.2 Indirect costs & assets

Staff retention and burnout

Lack of staff retention is previously cited as a reason for rural hospital closures. About 46% of OB/GYNs suffer from burnout and cite it as an underrecognized reason for the shortage. Burnout is identified by feelings of ineptitude, lack of interest and motivation, as well as high levels of stress, anger, and resentment, which affect not only the emotional state of a person, but also the ability to provide quality care [131]. The suggestions on reducing burnout in OB/GYNs focus on individual factors, like attending yoga classes or seeking therapy.

Although these can be great stress relievers, they do not address the systemic core issue of being overworked [132].

Globally, midwives also have high reports of burnout, citing lack of professional recognition, low resources, and low salaries as some of the main contributing factors. Occupational factors, rather than individual and emotional factors, were found to be the main reason for leaving midwifery. Midwives with more opportunities for leadership roles and more autonomy in their practice are protective factors from burnout [133].

The lack of professional recognition is predominately high among US midwives. Midwives state frustrations with other providers making them feel lesser-than despite their years of education and experience. With access to maternity care declining in rural areas, it is beneficial for the US to consider structural changes and emotional interventions to protect and increase the midwifery workforce [134].

Land, home, savings or other goods

The US has one of the largest wealth inequalities among HICs. One study states that one-third of households do not have the liquid assets required to cover out-of-pocket MH costs [126]. This is particularly true for BIPOC living in rural counties. This population is likely to live in poverty and report having trouble accessing healthcare, education, and struggle to improve their standard of living due to low-income and assets [135].

6.2.2.3 Opportunity costs & social capital

Preventable lives lost

The increase in burnout among healthcare providers, leading to shortages and decreased quality of care, is a direct link to the opportunity costs of the healthcare system. These losses result in increased MMR due to lack of access, with the southern states having the lowest availability of obstetric providers compared to other US regions [136]. The number of deaths due to system inefficiency regarding lack of preventative, community-based maternity care is costing lives and increasing expensive downstream interventions[*****]. The US could save about $78.6 billion a year by improving the health system to prevent only half of the current poor MH and neonatal outcomes[†††††]. These preventative measures are within the capabilities of midwives when they are supported within the environment [137].

Trustworthy support systems

A supportive environment leads to higher rates of obtaining healthcare. People with higher social capital are better able to overcome barriers that may prevent them from seeking

[*****] For instance, emergency cesareans, treatment of complications, and Neonatal Intensive Care Unit stays.
[†††††] Poor health outcomes include maternal mortality, morbidity, neonatal death, preterm birth and low-birth weight.

PNC. However, it is not only support from their peers, but also trust in the health system that may prevent them from seeking care [138].

Approximately one in five people report mistreatment from providers during maternity care, with 40% of those respondents identifying as Black, Hispanic or multiracial [139]. Black communities are less likely to trust the medical system due to the generational trauma from inhumane testing and surgery that was performed on their ancestors. The US medical system continues to be deemed as structurally racist, with the MMR for Black communities being three times higher than white counterparts as a key argument [140]. This mistrust leads people to refuse to receive care from a doctor or refuse care all together if the provider they want is unavailable. Those who mistrust the current system are asking for increased availability of CPMs and community birth access so they can feel safe in their birthing environment [141].

6.2.2.4 Health insurance

Health insurance costs

Private health insurance plans are set up in a cost-sharing method. When cost-sharing (deductibles, copayments, and coinsurance) is too high, it can deter people from purchasing insurance, seeking care when it is needed, and can increase medical debt. Deductibles must be met before the insurance company pays for services. These deductibles are usually thousands of dollars and are typically higher in ACA Marketplace plans than in employer-sponsored plans [130]. Over 50% of deductibles for a silver plan purchased through Marketplace in 2025 is at least $6,000 [142].

About half of birthers in the US are covered by employer-sponsored health insurance [143]. Insurance usually covers a large portion of the cost, yet there is, on average, an additional $3,000 in out-of-pocket fees that only include deductibles, coinsurance, and copayments. This could be higher if the insurance plan's deductible is high or if a person seeks care out-of-network for any reason. The overall financial cost of childbirth is often underestimated due to these exclusions and wide variation in plan characteristics [126,143].

Medicaid treatment

The type of insurance a person has can determine how healthcare providers treat them. People insured under Medicaid are more likely to be mistreated during birth than those who are privately insured. The mistreatment occurs more frequently when a person is a also BIPOC, identifies as queer or transgender, or is unmarried [144]. This leads people to seek other healthcare pathways. During the COVID pandemic, community midwives were gaining popularity, partly for the distance from in-hospital COVID patients, but also because people sought a provider that made them feel safe [145]. Unfortunately, due to state

licensing and payment policies, FBCs and homebirth midwives might not accept Medicaid birthers, further exacerbating the limited access to preferred care providers [28,145].

Health literacy

Knowledge of health service availability and obtainment improves the likelihood of seeking timely, quality care, including understanding one's health insurance coverage. In 2003, 77% of American adults had difficulty accessing care due to lack of health literacy. When considering health insurance status, only 3% of Medicaid users had proficient health literacy, compared to 9% of privately insured and 15% employer insured. This lack of proficiency leads to poor health outcomes and more frequent, longer hospital stays [146]. It is the role of the provider to fill the knowledge gaps for their patient and keep them informed about proposed interventions during pregnancy and birth [147]. Birthers report having higher rates of feeling informed during pregnancy and birth under a midwife's care compared to those with a physician's care. However, the provider type was not as important as receiving person-centered care in mitigating health literacy during pregnancy and birth [145].

Chapter 7: Discussion

The overall objective is to understand the accessibility and affordability of CPM community birth services in MCDs and their association with MMR across the US since 2015.

The quantitative data analyses identified PNC in the first trimester as the strongest, most consistent protective factor of MMR at the state level. MCDs are positively associated with MMR. Although CPM density, midwife-attended community births, percent of Medicaid-covered births, and Medicaid income eligibility did not reach statical significance independently, the exposures remain thematically aligned with access and integration gaps as they represent complementary aspects of maternity care access. These findings suggest that policy efforts aimed at improving early, equitable, and timely access to maternity services, especially in low-resourced areas, are likely to reduce MMR.

Prenatal care

The high protective ability of PNC is found in both the literature and the quantitative analysis. Those who seek PNC are more likely to have other supportive factors, such as social support and higher health literacy. The difficulty is when PNC providers are hard to reach, resulting in accessing care outside of the community and increased out-of-pocket expenses for necessities like transportation. Programs providing in-home PNC can improve access and reduce poor health outcomes when cultural and environmental factors are also supported.

Maternity Care Deserts

MCD prevalence suggest a positive association to poor MH outcomes. The quantitative data and literature show that the longer a person must travel for care, the higher the likelihood they will miss PNC appointments and report higher levels of stress. Additionally, people in rural settings are more likely to live in poverty, making affording care from a preferred provider in the preferred setting more challenging. This population is also more likely to rely on Medicaid for MH coverage. Unfortunately, they are likely to not have health insurance before pregnancy due to the high costs. This results in less access to preventable care that could mitigate comorbidities affecting pregnancy health risks.

Midwifery access

The lack of significant association in the quantitative data analysis does not necessarily indicate that midwifery access is unimportant. Instead, it may reflect the complex US regulator and policy environment. Many states with restrictive laws likely have low CPM density and lower rates of community births. In these settings, midwives may face barriers to legal practice, reimbursement, or integration into the formal healthcare system,

potentially suppressing any statewide protective effects. This is supported by the literature in LMICs and HICs.

Research on LMICs suggests increasing density of midwives alone is not sufficient in improving MMR as people may not perceive midwives' attendance during pregnancy, birth, or postpartum as beneficial, resulting in unattended births. These findings are not comparable to the US, as most births are attended by a physician or a midwife across settings. However, the MMR remains significantly higher than comparable HICs. This indicates the need for health system restructuring and strengthening to support accessing care within one's community.

Due to the lack of evidence regarding the relationship between increased midwifery workforce and MMR in the US, a conclusion on association cannot be confidently stated for rural areas of the US. When considering the evidence highlighting improvements in other MH outcomes, it is believed that an increase in midwives, paired with system strengthening, community engagement, and midwife practice autonomy, can decrease MMR.

Medicaid & health insurance

Medicaid-covered births had a surprisingly positive association with MMR. Although not statistically significant, the positive association brings pause. Considering the protection that PNC provides to MMR, the positive association between MMR and Medicaid-covered births lies in the probability that people eligible for Medicaid during pregnancy may not have been eligible before becoming pregnant. This lack of insurance is a barrier to preventative care that can reduce comorbidities, which are higher among poor, rural communities. This aligns with Medicaid income eligibility limits increasing during pregnancy as a protective factor, although statistically insignificant. When a person has access to timely, affordable healthcare through insurance, they are more likely to seek preventative care, improving their long-term health, therefore reducing the MMR. However, coverage alone is not enough.

People who do not trust the health system for fear of mistreatment due to personal demographics are more likely to seek care from providers who may or may not be the best choice for their health status. For instance, those living in MCDs do not have the luxury of choosing their provider and instead must go to whomever is available within the distance they are able to travel. This is also found in communities that lack culturally accommodating providers. A provider's attitude and ability to provide culturally sensitive, person-centered care is crucial when caring for pregnant people and reducing MMR. Unfortunately, the health system is not set up to support that type of care.

Physicians often lack the ability to spend more than ten minutes with a patient or provide in-home visits due to a shortage of providers and other health system restrictions. There is also a shortage of CPMs, but due to the structure of their services catering toward person-centered care, accommodating someone's cultural needs and providing lengthy PNC is the norm.

Cost-effectiveness

Most research suggests centering midwifery care can save millions of dollars yearly. However, some researchers are skeptical due to poor data quality, not including specific demographics, and state-level policies varying so much that making such a claim cannot be done in confidence. Regardless of the data quality and varying policies, the evidence pointing to midwives providing accommodating, culturally sensitive, low-intervention care in community settings with results that are similar or even better than in-hospital care, is enough to implement midwife-friendly policies.

Overall, the fragmented health system, lack of supportive MH policies at the state and federal level, and absence of universal health coverage, combined with high healthcare expenditure, are all factors that impact the accessibility and affordability of midwives in rural settings.

Further research is needed to assess the nuanced impact of midwifery integration in diverse policy environments, specifically highlighting the association between access to CPM density and PNC in MCDs in the US.

Chapter 8: Limitations

The AIMM study is based on data gathered in 2016, before *Roe v. Wade* was overturned. The SRH landscape of the US has changed drastically since then. Research suggests health outcomes are worse in states with abortion restrictions, many of these states also have high MCD prevalence [48,49]. Additionally, some of the data originates before the COVID-19 pandemic, which increased the rate of out-of-hospital births and MMR; it is possible the cultural shift toward out-of-hospital births has continued to increase since 2020 [69,70]. I contacted the BPL for updated data, but it is not publicly available. Additionally, the dataset is limited in that it generalizes state measures and may not reflect an individuals' behavior within the health system [77].

The limitations regarding the Nowhere to Go report include:

- CPMs are not encompassed in the analysis of MCDs,
- The lack of quality and appropriateness of care in the analysis,
- The generalization of the availability of care within large, diverse communities, and
- It does not consider an individual's SDOH[‡‡‡‡‡], only the community[§§§§§].

Furthermore, other limitations worth noting include:

- the aggregated data on state level may obscure the regional variability,
- the time lag between the independent and outcome variables can interfere with their relationship, and
- unmeasured confounding factors other than MCDs may influence the overall quality of the findings.

[‡‡‡‡‡] An individual's SDOH may include age, sex assigned at birth, and constitutional factors [148].
[§§§§§] Community SDOH in the Nowhere to Go report are factors like rate of health insurance coverage in a specific county [149].

Chapter 9: Conclusion & recommendations

Health system factors associated with access and affordability of community-based midwifery care in MCDs in the US are uneven and divisive toward marginalized communities. This lack of consistency creates a system that is difficult to navigate and understand fully. There are benefits to having state-level policies, but the disadvantages are often overlooked. The recommendations below are for US policymakers.

9.1 Policy recommendations

9.1.1 National-level

State-level policies can be helpful when catering to the state's population's needs. However, healthcare access is a universal need and therefore should be determined by the federal government. Removing the state's abilities to limit the scope of practice, reimbursement rates for providers, and the Medicaid income eligibility rate would allow for Americans nationwide to have clear, succinct healthcare access regardless of their geographic location.

Federal oversight of midwifery licensing and regulation can reduce the confusion of multiple midwifery titles. Therefore, one title for all licensed midwives is recommended. This title would require all midwives meet the ICM's Essential Competencies for Midwifery Practice. This may result in the elimination of the CNM and CM titles. Midwives in hospital settings are helpful and must stay. However, the need for a nursing degree is unnecessary to midwifery due to the clinical education provided in midwifery training. Instead, facility-based midwives can obtain additional emergency-obstetric training before working in a hospital or clinic. One midwifery title can support many midwifery-friendly initiatives including:

- improving midwifery autonomy by lifting physician-supervision requirements
- allowing all midwives the ability to provide full scope of practice, thus improving access to preventative wellbeing care, as well as PNC and birth support
- supporting OB/GYN and midwife collaboration by improving trust in others' training
- increasing the rate of midwifery students due to clear, universal practice abilities

These recommendations may not be well-received from state-level policymakers as it removes their ability to tailor healthcare to their state. Therefore, the potential cost savings and reduction in adverse health outcomes due to task-sharing abilities between midwives and OB/GYNs are important highlights.

9.1.2 Health insurance coverage

The quality-of-care provided by midwives is not debated in the public health sphere, yet CPMs are often not included in health insurance coverage. It is recommended that educated and licensed non-nurse midwives be covered and reimbursed at the same rate as facility-based physicians, seeing as they both support average-risk, vaginal births and regular PNC. This is most easily achieved after a single midwifery title is enacted. Equal reimbursement can reduce barriers midwives and FBCs face when receiving payment for services, thus allowing for midwives to accept more Medicaid clients in rural areas. Fully covering pregnancy and birth costs regardless of birth setting and provider (physician or midwife) allows for greater access in rural communities.

Similarly, fully covering annual wellness visits from midwives for people who are not pregnant, allows for more access to in-community care that can reduce comorbidities and improve overall health. This does not address the Medicaid-insurance coverage gap, still leaving many without access to care. Universal healthcare is the recommended strategy to reduce this gap, but this thesis does not cover the benefits and drawbacks of universal healthcare and therefore is not officially recommended.

9.1.3 Health system strengthening

The previous recommendations do not directly impact the hospital closures. However, through those policy changes, there is an expected increase in midwives, which can reduce the burden on OB/GYNs and help maintain staff retention. It can also support referral systems when above-average risk births need specialty care.

Supporting community-based midwifery care protects health seekers' right to choose their provider and their birth setting without compromising financial means and cultural integrity, all while reducing MMR.

Annex

Annex 1: Variable details and their sources

	Variable	Indicator	Scale	Source
Outcome variable	Maternal mortality rate	Deaths under 42 days of pregnancy termination per 100,000 live births per state	Continuous	Centers for Disease Control National Vital Statistics System, The Commonwealth Fund
Exposure variables	Certified Professional Midwife density (2014)	Number of CPMs per 1000 births per state	Continuous	Centers for Disease Control National Vital Statistics System, The Birth Place Lab at University of British Columbia, Access and Integration Maternity Care Mapping Study
	Maternity care desert prevalence (2024)	Proportion of counties classified as deserts per state	Continuous	Health and Resources Service Administration, March of Dimes, Nowhere to Go: Maternity Care Deserts Across the US 2024 Report
	Out-of-hospital birth access (2014)	Proportion of births attended by midwives in home or birth center settings	Continuous	Centers for Disease Control National Vital Statistics System, The Birth Place Lab at University of British Columbia, Access and Integration Maternity Care Mapping Study
	Medicaid income eligibility limit during pregnancy (2025)	Percent of federal poverty level assigned by state	Continuous	Centers for Disease Control National Vital Statistics System, KFF
	Births covered by Medicaid (2023)	Proportion of births paid in full by Medicaid per state	Continuous	Centers for Disease Control National Vital Statistics System, KFF
	PNC in first trimester (2020-2022)	Proportion of births with PNC in the first trimester per state	Continuous	Centers for Disease Control National Vital Statistics System, Health Resources & Services Administration

Annex 2: Table of search terms examples and inclusion and exclusion criteria

midwife	AND	professional	AND	United States	NOT	Nurse
Midwifery Model of Care		integration		Netherlands		Certified Nurse-Midwife
maternal mortality		education		United Kingdom		
homebirth		density		Australia		
birth center		workforce		LMICs		
out-of-hospital birth		Medicaid		Low-resource		
community birth		availability				
certified professional midwife		affordability				
licensed midwife		policy				
Direct-entry midwife		geographic location				
Maternity care desert		accommodation				
		transport				
		living environment				
		social support				
		income				
Inclusion:	Research articles, journals, policy reviews, and grey literature published in English since 2015. Significant articles published between 2000 and 2015 are included when necessary.					
Exclusion:	Studies not published in English, any works published before 2000, studies that focus only on CNMs, studies that do not acknowledge the different types of midwives in the US if US-based research, and works with a paywall.					

Annex 3: AI declaration

KIT Institute (Masters or Short course) Participants

Declaration for Use of Generative AI (GenAI)

Check the box that applies to your completion of this assignment:

☐ I confirm that **I have not used** any generative AI tools to complete this assignment.

☒ I confirm that **I have used** generative AI tool(s) in accordance with the ***"Guidelines for the use of Generative AI for KIT Institute Master's and Short course participants"***.
Below, I have listed the GenAI tools used and for what specific purpose:

Generative AI tool used	Purpose of use
1. Grammarly	Check for spelling and grammar
2. Perplexity	Resolve unknown error codes from RStudio.

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