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Zenab Saeed

Wright State University - Main Campus, saeed.7@wright.edu

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Infant Death Rates between Different Medical Attendants

Zenab Saeed

Mentors: Dr. Jeannette Manger and Dr. Amber Todd

Scholarship in Medicine Project

By checking this box, I indicate that my mentor has read and reviewed my draft proposal prior to submission

Abstract

The function of midwives in the context of maternal health is important, especially when understanding the role of midwives in a global context compared to in the United States. Globally, midwives have served as historically important members in the process of childbirth, but their role has experienced changes in response to increased medicalization over the years, especially in the United States.¹ Based on their use and effectiveness in a global context, literature suggests that it may be beneficial for both the healthcare system, mothers, and infants to expand the role of midwives in the United States.² The purpose of this research was to compare infant death rates within the United States between births supervised by physicians (both MD and DO) versus midwives to understand if differences exist between the groups. Furthermore, in order to assess the role of potentially moderating social determinants of health, the impact of the mother's race and use of prenatal care was assessed in relation to which type of medical attendant supervised the birth. Data from between 2007 and 2017 was collected on infant birth and death records from the Centers for Disease Control and Prevention website (<https://wonder.cdc.gov>) for births that occurred in the United States to United States residents. Data was then categorized according to which type of medical attendant supervised the birth, mother's race, and mother's prenatal care. Data analysis showed that infant death rates were significantly higher when births were supervised by MD/DO physicians compared to midwives, and these differences persisted regardless of maternal race or prenatal care. These findings are relevant to helping understand the role of midwives within the United States healthcare system.

Key Words: *midwives, infant death, infant mortality, race, social determinants of health, prenatal care*

Introduction/Literature Review

From a healthcare perspective, the process of childbirth is one that is complex and involves the collaborative care between various medical professionals. One particular area of interest, especially in recent times and across cultures, is the developing and expanding role of midwives in the childbirth process. Around the world, midwives have been a historically relevant aspect of childbirth, but their role has experienced historical changes in response to increased medicalization over the years, especially in the United States.¹ Because of their effectiveness and role around the world in the care of childbearing women, literature suggests that the role of midwives should be similarly expanded in the United States.²

Previous research has demonstrated that from a financial perspective, midwives may be more effective and provide comparative care compared to physicians.³ Furthermore, research has found that birth outcomes are comparable between physician versus midwife-supervised births when births are low-risk.^{4,5} However, further research must examine whether these findings persist when assessing high-risk births.^{4,5} Previous research has also found increased patient satisfaction associated with midwife-supervised births.² These findings are further supported by a randomized, controlled trial that showed that in healthy mothers, midwives were both effective clinically and in terms of satisfaction outcomes.⁶ Further data also shows similar mortality rates compared between low-risk midwife-supervised and hospital births in the United States.^{7,8}

The outcomes of childbirth and associated infant mortality risks are influenced by various mediating and moderating factors. For example, a mother's access and use of prenatal care can impact outcomes. Previous research in the United States has demonstrated that prenatal care for mothers is important in increasing success of birth outcomes regardless of which type of medical provider supervised the birth.⁹ From a global health perspective (e.g., West Africa, Sub-Saharan

Africa, Zimbabwe, Malawi), efforts to improve birth outcomes have targeted improved access to and implementation of prenatal care.^{10,11,12,13} Access to prenatal care, however, depends on various factors and can be further influenced by barriers (e.g., transportation access, insurance, cultural attitudes, life stress, socioeconomic standing).^{14,15} These factors are further confounded by the mother's race, with previous research showing that prenatal care use is lower in African American women, leading to poorer birth outcomes.¹⁴ For this reason, it is important to recognize that assessing prenatal care as a factor impacting birth outcomes is complex and in need of additional attention. While access to prenatal care poses risk in a global context, health inequities may also create differences in prenatal care within the United States, further impacting birth outcomes.

When assessing birth outcomes and differences between various groups, the discrepancies in birth outcomes related to mother's race are often considered. Previous research has demonstrated that in the United States, mortality is significantly higher for African American infants compared to white infants. These findings, however, are compounded by additional factors like institutional racism, segregation, and built environment that perpetuate poor health outcomes for African Americans.¹⁶ Furthermore, use of prenatal care has shown to be significantly lower in African American mothers compared to white mothers due to barriers that can prevent access to prenatal care, thereby leading to worse infant mortality outcomes related to race.¹⁴ However, due to the intersectionality within the demographic factor of race, previous research remains inconclusive.^{17,18} Furthermore, an initial literature search reveals that some of the research surrounding infant mortality in relation to physician versus midwife-supervised births is dated, so a need for updated comparisons may be pertinent.

I examined whether infant death rates differ depending on which type of medical attendant (i.e., MD/DO physician versus midwife) supervised the birth. By first developing a preliminary understanding of whether differences exist between death rates for birth supervised by different medical attendants, further understanding can develop about the potential utility of midwives in maternal care within the United States. Furthermore, I aim to understand whether the additional factors of mother's prenatal care and race differ depending on the medical attendant supervising the birth. Because previous research has identified that mother's prenatal care and race can impact infant mortality, it is important to understand if these impacts persist, or are exaggerated or reduced, when comparing births supervised between different medical attendants.

Research Questions/Hypotheses

Research Questions

RQ1: How do death rates compare between births supervised by physicians (MD and DO) compared to midwives (certified and other)?

RQ2: Do differences in infant death rates persist when the mother's bridged race is considered?

RQ3: Do differences in infant death rates persist when the trimester in which mother's prenatal care began is considered?

Hypotheses

The goal of this research is to assess whether infant death rates differ depending on which type of Medical Attendant supervised the birth. More specifically, how do death rates compare between births supervised by MD or DO physicians compared to midwives (certified and other)? Furthermore, this research aims to understand if differences in infant death rates persist when the mother's bridged race is considered. It is hypothesized that infant death rates will be significantly higher between medical attendants for American Indian or Alaska Native and Black or African American mothers.

Finally, this research aims to understand if differences in infant death rates persist when the trimester in which mother's prenatal care began is considered. It is hypothesized that infant death rates will be significantly higher between medical attendants when prenatal care was absent or began in the third trimester.

Methods

Context/Protocol

I obtained data on Linked Birth/ Infant Death Records from the Centers for Disease Control and Prevention website (<https://wonder.cdc.gov>). The data was collected from the years 2007 to 2017 and was divided per each year. According to information provided on the dataset, the data only included live birth and infant death rates that occurred in the United States to United States residents. More specifically, the data were compiled via the 57 vital statistics jurisdictions through the Vital Statistics Cooperative, U.S. Department of Health and Human Services (US DHHS), Centers for Disease Control and Prevention (CDC), and National Center for Health Statistics (NCHS).

Data Collection

For the RQ1, aimed at understanding if death rates differ between births supervised by MD/DO physicians compared to midwives, I further classified the data on Linked Birth/ Infant Death Records according to Medical Attendant who supervised the birth (i.e., Doctor of Medicine (MD), Doctor of Osteopathy (DO), Certified Nurse Midwife (CNM), Other Midwife, Other, Unknown/ Not Stated) with the number of deaths, births, death rates, and percentages of deaths per each medical attendant.

For the RQ2, I also classified data within the category of Medical Attendant according to Mother's Bridged Race group (i.e., American Indian or Alaska Native, Asian or Pacific Islander, Black or African American, White) with the number of deaths, births, death rates, and percentages of deaths. According to the CDC, race bridging is used as a method of grouping races in data reporting data to make data consistent with data collected using a different set of race categories.

Finally, for RQ3, I classified data within the category of Medical Attendant according to trimester that mother's prenatal care began (i.e., no prenatal care, first trimester, second trimester, third trimester, unknown/ not stated) with the number of deaths, births, death rates, and percentages of deaths.

Data Analysis

For RQ1, data was analyzed via a paired t-test. Infant death rates between medical attendants (MD/DO physicians versus midwives) were compared for years 2007-2017.

For RQ2, data was analyzed using an ANOVA with posthoc tests to determine the effect of mother's bridged race on infant mortality and race combined with type of medical attendant.

For RQ3, data was analyzed using ANOVA with posthoc tests to determine effect of prenatal care on infant mortality combined with type of medical attendant.

Results

RQ1: How do death rates compare between births supervised by physicians (MD and DO) compared to midwives (certified and other)?

Infant death rates between 2007 and 2017 were statistically significantly higher ($p < 0.001$) when the supervising medical attendant was an MD/DO physician compared to a midwife (Table 1).

Table 1. MD/DO Physician and Midwife Infant Death Rates Between 2007 – 2017^a

| Year | Medical Attendant | Deaths | Births | Death Rate |
|------|-------------------|--------|-----------|------------|
| 2007 | MD/DO | 27,696 | 3,944,194 | 7.02 |
| | Midwife | 955 | 340,754 | 2.80 |
| 2008 | MD/DO | 26,597 | 3,879,813 | 6.86 |
| | Midwife | 948 | 338,338 | 2.80 |
| 2009 | MD/DO | 25,068 | 3,766,578 | 6.66 |
| | Midwife | 890 | 335,303 | 2.65 |
| 2010 | MD/DO | 23,265 | 3,636,204 | 6.40 |
| | Midwife | 830 | 335,629 | 2.47 |
| 2011 | MD/DO | 22,669 | 3,588,203 | 6.32 |
| | Midwife | 864 | 335,525 | 2.58 |
| 2012 | MD/DO | 22,387 | 3,582,768 | 6.25 |
| | Midwife | 793 | 342,189 | 2.32 |
| 2013 | MD/DO | 22,171 | 3,553,581 | 6.24 |
| | Midwife | 787 | 348,848 | 2.26 |

| | | | | |
|------|---------|--------|-----------|------|
| 2014 | MD/DO | 21,963 | 3,594,759 | 6.11 |
| | Midwife | 814 | 363,808 | 2.24 |
| 2015 | MD/DO | 22,107 | 3,572,527 | 6.19 |
| | Midwife | 842 | 371,504 | 2.27 |
| 2016 | MD/DO | 21,813 | 3,531,670 | 6.18 |
| | Midwife | 858 | 378,594 | 2.27 |
| 2017 | MD/DO | 20,907 | 3,438,416 | 6.08 |
| | Midwife | 942 | 381,894 | 2.47 |

May want to put average in here

Abbreviation: MD/DO, MD/DO Physicians

^aData adapted from Centers for Disease Control and Prevention

RQ2: Do differences in infant death rates persist when the mother's bridged race is considered?

Analysis revealed significant differences in infant death rate depending on mother's race ($p < 0.001$). Infant death rates were significantly higher for mothers who were American Indian/ Alaskan Natives compared to Asian/ Pacific Islanders ($p < 0.001$) and White ($p = 0.01$). Infant death rates were significantly lower for mothers who were Asian/ Pacific islander compared to American Indian/ Alaskan Natives ($p < 0.001$) and Black ($p = 0.01$). Infant death rates were significantly higher for mothers who were Black compared to American Asian/Pacific Islanders ($p < 0.001$) and White ($p < 0.001$). Infant death rates were also significantly lower for mothers who were White compared to American Asian/Pacific Islanders ($p = 0.01$) and Black ($p < 0.001$).

For American Indian/ Alaskan Native, Asian/ Pacific Islander, Black, and White mothers, the death rates were significantly higher when the supervising medical attendant was an MD/DO physician compared to a midwife ($p < 0.000$).

RQ3: Do differences in infant death rates persist when the trimester in which mother's prenatal care began is considered?

Analysis showed that infant death rates were statistically significantly higher ($p < 0.001$) for mothers who did not receive any prenatal care compared to mothers who received prenatal care, regardless of during which month they began. There were not significant differences in infant death rate depending on whether the mother began prenatal care in her first, second, third, fourth, fifth, sixth, seventh, eighth, or ninth month of pregnancy.

For mothers who did not receive any prenatal care, death rates were statistically significantly higher ($p < 0.001$) when the supervising medical attendant was an MD/DO physician (27.81) compared to a midwife (12.07). For mothers who began prenatal care during their first trimester of pregnancy, death rates were statistically significantly higher ($p < 0.001$) when the supervising medical attendant was an MD/DO physician (5.99) compared to a midwife (2.25). For mothers who began prenatal care during their second trimester of pregnancy, death rates were statistically significantly higher ($p < 0.001$) when the supervising medical attendant was an MD/DO physician (6.65) compared to a midwife (2.87). Finally, for mothers who began prenatal care during their third trimester of pregnancy, death rates were statistically significantly higher ($p < 0.001$) when the supervising medical attendant was an MD/DO physician (5.15) compared to a midwife (2.30). Overall, the significant difference in death rates between MD/DO and midwife persisted regardless of the month in which prenatal care began.

Discussion

The overall finding that infant death rates were higher overall between MD/DO doctors versus midwife may provide important insight and implications for the future practice of midwives in obstetric care. Most importantly, these findings may be useful in improving birth outcomes and reducing infant mortality rates. However, it is important to note that this finding could largely be influenced by the confound of birth risk. More specifically, it may be that MD/DO physicians supervise births that are significantly more high-risk compared to births supervised by midwives.^{7,19}

The impact of mother's race on infant birth outcomes is another important finding based on the results. Specifically, significant differences in infant death rate were seen depending on mother's race, with higher infant death rates for mothers who were American Indian/ Alaskan Natives or Black, regardless of medical attendant. These notable discrepancies in birth outcomes related to mother's race have been previously demonstrated; research shows increased mortality for African American infants compared to white infants, with influences by factors like institutional racism and discrimination within the healthcare system that perpetuate overall reduced health outcomes for African Americans.¹⁶ These findings and overall discrepancies based on race are of crucial importance and point to a potential area for intervention from the healthcare and obstetric perspective.

Moreover, regardless of mother's race, death rates were significantly higher when the supervising medical attendant was an MD/DO physician compared to a midwife. This finding could, be due to the previously discussed differences in birth risk between MD/DO physicians and midwives.^{7,19} Additionally, it may be important to consider that certain races may be more likely to choose certain birth attendants, which could impact the findings. Previous research has

identified that this may be the case, with increased use of midwives in Native American or African American populations.^{20,21}

The next finding demonstrated that infant death rates were significantly higher for mothers who did not receive any prenatal care when compared to mothers who did receive prenatal care. However, significant differences in infant death rates were not seen depending on which trimester, or even month of pregnancy, the mother began prenatal care. These findings are consistent with previous research. For example, specific to the United States, prenatal care for mothers has shown to be important in more successful birth outcomes, regardless of the type of medical provider supervising the birth.⁹ These findings are also corroborated from a global health perspective (e.g., West Africa, Sub-Saharan Africa, Zimbabwe, Malawi), as focused efforts on improving birth outcomes target prenatal care.^{10,11,12,13} Yet, it is important to understand that the factor of prenatal care itself could potentially be multidimensional; more specifically, prenatal care could be linked to other factors that could impact birth outcomes and infant death rates, like socioeconomic standing.^{14,15}

Similar to the findings related to mother's race, death rates were significantly higher when the medical attendant was an MD/DO physician compared to a midwife, regardless of when prenatal care began. This could, again, be attributed to differences in birth risk between MD/DO physicians and midwives, as previous research has found that midwives' care may be limited to low-risk births.^{7,19}

Limitations/ Future Research

The present findings contribute to the understanding of the role of midwives, especially in terms of comparing infant mortality between different medical attendants. Despite the value of the current research, the limitations provide important directions for future research.

Most importantly, the infant mortality data obtained from the Centers for Disease Control and Prevention did not account for birth risk. This implies that death rates may have been higher for physician medical attendants than midwives because the births were higher risk. Future research could stratify data based on birth risk or cause of infant death to account for this potentially confounding variable. Additionally, future research could examine differences in death rates for only low-risk births between MD/DO versus midwives to eliminate the potential confounds of high-risk pregnancies and births. Related to the findings on race and the potentially confounding factor that certain races may be more likely to choose certain medical attendants, future research could aim to further stratify data to account for these differences.

Furthermore, the dataset only included live birth and infant death rates that occurred in the United States to United States residents between the years 2007 and 2017. Because the dataset excluded births within the United States to non-residents, future research could assess whether immigration status serves as a confounding variable. Expanding data analyses to include births to non-residents is further important because it may relate to mother's race and prenatal care to demonstrate additional findings related to health inequalities and outcomes. Furthermore, because the data did not include infant mortality records from the most recent years, future research could analyze more recent data and assess if infant mortality between midwives and physicians has changed over time. The dataset also did not specify the training of the midwives, so future research could assess infant mortality depending on midwife training level. Such research could also examine if differences exist depending on more specific medical attendant training or years of experience.

Conclusion

The current study meaningfully contributed to the literature on the role of midwives in healthcare by examining if there are differences between infant mortality when compared to physician-supervised births. Although there is much research to be conducted on the potential role of midwives in maternal care, the present data suggest midwives' high efficacy and effectiveness. This research could help provide a basis to expand the scope and role of midwives in maternal care as an option for expecting mothers, especially as a more cost-effective and alternate method. Furthermore, the findings relevant to mother race and prenatal care establish important implications related to social determinants of health. Specifically, infant mortality was higher for American Indian/ Alaskan Natives and Black mothers regardless of supervising medical attendant, which points to the need for further research related to health inequalities. The finding of higher infant death rates for mothers who did not receive any prenatal care regardless of supervising medical attendant suggest the importance of prenatal care in improving health outcomes.

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