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Original article

Disparities in gestational age–specific fetal mortality rates in the United States, 2009–2013

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ABSTRACT

Purpose: Although studies have examined overall temporal changes in gestational age–specific fetal mortality rates, there is little information on the current status of racial/ethnic differences. We hypothesize that differences exist between racial/ethnic groups across gestational age and that these differences are not equally distributed.

Methods: Using the 2009–2013 data from US fetal death and live birth files for non-Hispanic white (NHW); non-Hispanic black (NHB); Hispanic; and American Indian/Alaska Native (AIAN) women, we conducted analyses to examine fetal mortality rates and estimate adjusted prevalence rate ratios and 95% confidence intervals (CIs).

Results: There were lower risks of fetal mortality among NHB women (aPRR = 0.76; 95% CI = 0.71–0.81) and Hispanic women (aPRR = 0.89; 95% CI = 0.83–0.96) compared with NHWs at 22–23 weeks' gestation. For NHB women, the risk was higher starting at 32–33 weeks (aPRR = 1.11; 95% CI = 1.04–1.18) and continued to increase as gestational age increased. Hispanic and AIAN women had lower risks of fetal mortality compared with NHW women until 38–39 weeks.

Conclusions: Further examination is needed to identify causes of fetal death within the later pregnancy period and how those causes and their antecedents might differ by race and ethnicity.

Introduction

US fetal mortality rates have remained unchanged since 2006. The most recent data from 2013 reveal a rate of 5.96 per 1000 live birth and fetal deaths [1,2]. Racial and ethnic differences in fetal mortality rates were unchanged as well, with non-Hispanic blacks having the highest fetal mortality rates in both 2006 and 2012 (10.7 per 1000 deliveries for both years). Focused efforts on lowering the rates of tobacco use, diabetes, obesity, and other maternal risk factors may reduce both fetal mortality and infant mortality [3–7]. As a "call to action," Healthy People 2020 identifies reduction in fetal mortality as one of the maternal, infant, and child health objectives [8].

Improvements in infant mortality over time are due, in part, to improvements in gestational age–specific mortality. Advances in obstetrical and neonatal care have improved survival at each week of gestation [9]. Gestational age–specific infant mortality rates have been examined in various studies over the past decades [10,11]. However, little is known about gestational age–specific fetal mortality rates both overall and in regards to disparities by race and ethnicity. National data reports have provided information regarding trends generally in early (≤27 weeks' gestation) and late (28 weeks' gestation or more) fetal mortality [1,2]; however, in-depth study by week and by racial and ethnic disparities is limited. In addition, studies have examined fetal deaths in various contexts, including preeclampsia [12] and the combination of plurality and race [13]. Although these studies provide valuable insight into the patterns of stillbirths by gestational age, the data used in these previous studies do not reflect the changes in practice that have occurred in the last few years around the limits of early elective deliveries, specifically "hard stop" policies that hospitals have employed because of the years that the studies encompassed [14]. The research related to these policies generally suggests that there is

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no influence on fetal death rates, but there has been little consideration of the role of racial and ethnic disparities in this context. Also noted in the literature is the slight increase in fetal death rate overall in the US from 1.103/1000 in 2007-09 to 1.177/1000 (2011–2013) with a relative risk of 1.067, 95% CI (1.038–1.096) [14].

The purpose of this article was to examine gestational age–specific fetal mortality rate for the last 5-year period, using the most recent data available at the time of this report (March 2016). We examined gestational age–specific fetal mortality rate for 2-week intervals overall and by race and ethnicity, specifically conducting analyses to examine current fetal death rates, estimate adjusted prevalence rate ratios (aPRR) and 95% confidence intervals [15]. Our goal with these analyses was to identify recent patterns in both early and late fetal mortality, with specific focus on racial and ethnic disparities. We hypothesize that differences exist by racial/ethnic groups across fetal gestational age and that these differences are not equally distributed. Knowledge of these patterns could help further shape the direction of initiatives related to fetal mortality reduction for populations at highest risk.

Methods

We used the public-use 2009–2013 (most recent data available at the time of analysis) US fetal death and live birth data files maintained by the National Vital Statistics System at the Centers for Disease Control and Prevention [16–19]. These public access files contain no personal identifiers, and their use for research has been deemed not human subject research by the Institutional Review Boards of University of Alabama at Birmingham and the Centers for Disease Control and Prevention. Our analyses focused on comparing gestational age–specific fetal mortality rates for non-Hispanic white (NHW); non-Hispanic black (NHB); Hispanic; and American Indian/Alaska Native (AIAN) women. Only singleton fetal deaths at 20 weeks' gestation and beyond and deliveries greater than 500 grams were included in the analyses. These selection criteria coincide with the state reporting requirements for fetal death, where some states report only deliveries over a certain birth weight or gestational age [20]. All singleton live births were included regardless of birth weight or gestational age. Twin, triplet, and higher order multiple deliveries were excluded because they may have different etiologies and need to be considered separately from singletons. Early fetal death was defined as between 20 and 27 6/7 weeks gestational age; late fetal death was defined at 28 or greater weeks gestational age. Procedures for determining birth weight and gestational age inconsistency and for imputing data have been described in detail elsewhere [21].

Our analyses were conducted on 18,030,582 deliveries (fetal deaths plus live births) from the pooled years 2009–2013. We combined these years to have enough deliveries by race and ethnicity for each gestational age with which to conduct analyses. For these analyses, gestational age data were derived from the "COMBGEST" variable in the public use data for years 2009–2013. For this period, states used a mix of last menstrual period and obstetric estimate for gestational age measurement.

After additional exclusions of records with out-of-range, inconsistent, or missing gestational age, 17,787,576 deliveries remained (98.7% of all records). Of the records, 0.42 percent were excluded because they were within gestational age range but inconsistent in birth weight; 0.88 percent were outside the gestational age range of 20–44 week; and 0.11 percent were excluded because data were missing. The proportion of missing data varied by race and ethnicity. However, none of the proportions of missing data exceeded 0.2 percent. We examined the GA-specific fetal mortality rates in 2-week gestational age categories (e.g., 30 weeks, 0 days to 31 weeks, and 6 days) to distinguish patterns in racial and ethnic disparities. Live births plus fetal deaths within each 2-week gestational age category served as the denominator for rate calculations.

Although our main focus is on the traditional fetal mortality rates and public health policy and practice implications, we included an analysis using the "fetus-at-risk approach" to compare our study with previously published literature. We calculated prospective fetal mortality rates by gestational age in single weeks, overall, and by race and ethnicity. This cumulative rate is calculated as the number of fetal deaths at a given gestational age (in single weeks) per 1000 deliveries at that gestational age or greater. This calculation represents the population at risk for fetal death, that is, using as the denominator all women who are still pregnant at a given gestational age [22]. Finally, we conducted Poisson regression analyses with an offset for the logarithm of the number of live births plus fetal deaths to estimate prevalence rate ratios and 95% confidence intervals [15] for fetal mortality overall and for each gestational age week. Non-Hispanic whites were used as the reference group. We adjusted the prevalence rate ratios for delivery year, maternal age, diabetes, and hypertensive disorders. Because some states were not using the 2003 revised birth certificate data, our measure of diabetes includes established (i.e., diabetes mellitus diagnosed before conception) or pregnancy-related (i.e., carbohydrate intolerance with the onset of pregnancy) diabetes. Hypertensive disorders include both preexisting and pregnancy-induced hypertension. These definitions are in keeping with the prior revisions from the 1989 revision of vital statistics [23]. All analyses were conducted using SAS 9.3 and STATA 14.

Results

The overall fetal mortality rate for this period was 3.29 per 1000 deliveries. Among non-Hispanic white mothers, the rate was 2.75/1000; non-Hispanic black, 5.61/1000; Hispanic, 3.06/1000; and AIAN, 3.71/1000. Figure 1 presents gestational age–specific fetal mortality overall for this 5-year period. The nadir for fetal mortality in this study population was 0.78 per 1000 deliveries at 40 weeks gestation, and the rate increased after 40 weeks. Figure 2 considers gestational age–specific fetal mortality rates by race and ethnicity. To see the differences by race and ethnicity more clearly, we broke down the graphs by early and late fetal mortality. The inset box illustrates the racial and ethnic variations among gestational age–specific fetal mortality rates at 22–28 weeks of gestation, and the larger graph depicts gestational age–specific fetal mortality rates at 28–42 weeks of gestation. NHW women had the highest fetal mortality rate at 22-week gestation, and NHB women had the lowest. When we examined late fetal mortality

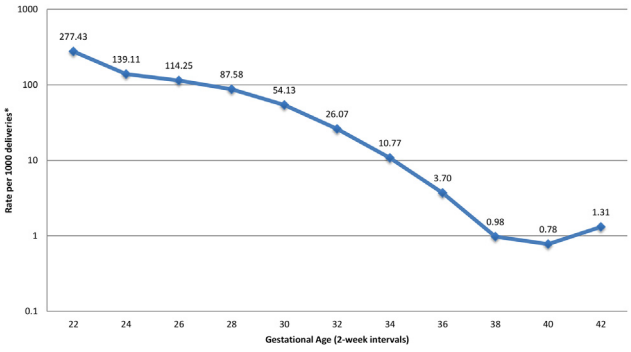

Fig. 1. Gestational age–specific fetal mortality rates, 2009–2013 US resident singleton deliveries* to US resident mothers. *Live births plus fetal deaths.