Pre-conception, Pregnancy, and Postpartum Characteristics of Women who Experience Severe Maternal Morbidity

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Abstract

Severe maternal morbidity (SMM) during pregnancy and from delivery-related complications among US women increased by 45% between 2006 and 2015, from 101.3 to 146.6 per 10,000 delivery hospitalizations. SMM during the postpartum period has also risen, increasing by 114% between 1998 and 2009. Most efforts to track severe maternal morbidity use inpatient data. Inpatient data does not provide a full picture of preconception factors, health during pregnancy, and the health events or experiences with SMM for which women sought care outside of a hospital during the postpartum period. The current study will use longitudinal 2000-2016 Medical Expenditure Panel Survey data to make two contributions to current knowledge: 1) we develop a profile of the preconception, pregnancy, and postpartum health of women who experienced SMM compared to those who did not; and 2) we produce refined SMM estimates using additional information from medical events occurring in the postpartum period.

Introduction

Deaths and serious pregnancy-related complications are on the rise among US women. Between 2000 and 2014, maternal mortality increased 26.6%, from 18.8 to 23.8 maternal deaths per 100,000 live births.[*1] Severe maternal morbidity (SMM), known as mortality "near misses," grew at an even greater rate, increasing by 45% between 2006 and 2015, from 101.3 to 146.6 per 10,000 delivery hospitalizations.[2] SMM during the postpartum period is also on the rise, increasing by 114% between 1998 and 2009.[3]

Near-miss maternal morbidity includes conditions such as hemorrhage, embolism, acute renal failure, stroke, acute myocardial infarction, and other complications during delivery or in the first year after a woman has given birth. The Centers for Disease Control and Prevention (CDC)'s department of maternal and reproductive health has defined twenty one indicators of SMM.[4] Using these indicators, the CDC estimated that SMM affected more than 50,000 women in the United States in 2014.[2] With data from the National Inpatient Sample, they also found that women who receive blood transfusions account for the greatest fraction of women with SMM. The next most common procedures associated with SMM are hysterectomy and ventilation or temporary tracheostomy.

Previous studies have shown that SMM disproportionately affects women who are racial and ethnic minorities.[5,6] Other studies have suggested links between SMM and prenatal depression,[7] and low or high pre-pregnancy BMIs.[8] Factors such as site of care, chronic medical conditions, and advanced

[*] This statistic excludes California and Texas, which were analyzed separately but saw similar rises.

maternal age (35 and older) are also associated with higher SMM levels.[9] Still more studies have suggested that factors such as insurance status and socioeconomic status may also contribute to SMM risk, but have not explicitly examined that relationship.[5,7]

Most efforts to track severe maternal morbidity use hospital inpatient data. This has allowed researchers to identify procedures and medical events linked to SMM that occur during hospitalizations. However, the limited scope of this data means that we miss important pieces of the puzzle. Inpatient data does not provide a full picture of preconception factors, health during pregnancy, experiences with SMM for which women sought care outside of a hospital during the postpartum period.

The current study will compare the preconception, pregnancy, and postpartum health and other characteristics of women who experienced serious maternal morbidity to those who did not. We use pooled Medical Expenditure Panel Survey (MEPS) data to compare the health and characteristics of women who experience severe maternal morbidity, as defined by the CDC, to other women at four critical periods: preconception, pregnancy, labor and delivery, and the postpartum period. We will compare preconception health and characteristics of women who go on to experience severe maternal morbidity to those of women who become pregnant and deliver without experiencing severe maternal morbidity and to reproductive-aged women who do not become pregnant during the observation period. Finally, we will compare health and characteristics during pregnancy, labor and delivery, and the postpartum period of women experiencing severe maternal morbidity to women who have a pregnancy without severe maternal morbidity. This study will significantly advance on our understanding of severe maternal morbidity in the U.S.

Data and Methods

Data

We use pooled data from the Medical Expenditure Panel Survey (MEPS) household component full-year consolidated, medical conditions, inpatient hospitalizations, office-based visits, outpatient visits, ER visits, home health care visits, and longitudinal files. MEPS, collected by the Agency for Healthcare Research and Quality, interviews a subsample of household residents participating in the previous year's National Health Interview Survey an additional 5 times (rounds) over a roughly 2-year period on topics related to health, health behaviors, socioeconomic and demographic information. Information is collected via a combination of an in-person interview, pen-and-paper questionnaires, and, for a subsample of MEPS participants, a survey of medical provider and pharmacy billing records. We use data from the 2000-2016 annual files and the panel 5 through panel 20 longitudinal files. Because MEPS follows participants over a roughly 2-year period, we can combine observations from before a woman becomes pregnant with those during her pregnancy and postpartum period. MEPS observes some women for all periods of interest, whereas they observe other women for only some periods. The 2000-2016 data cover a critical period of time characterized by dramatic increases in published estimates of the incidence of severe maternal morbidity, making the examination of the correlates of SMM of during this period of particular interest.

Sample

In our analyses, we will compare three groups of women aged 15-44: (1) women who did not have an observed hospitalization for the birth of a child; (2) women with an observed hospital delivery but no

observed severe maternal morbidity (as defined by the CDC, explained below); and (3) women with a hospital delivery and observed severe maternal morbidity or pregnancy complications during the antepartum, intrapartum, and/or postpartum periods. In pilot testing, we observed roughly 3,300 women of childbearing age and 350 hospital births per year, leading us to anticipate capturing approximately 56,000 women of childbearing age and 6,000 hospital births in the full pooled dataset.

Analytic Strategy

The MEPS data is comprised of many files that are structured into different units of analysis and that cover differing time periods. To impose consistency and precision in the timing of key measures and events, we will use information on interview and event dates to construct merged person-month files. Using these person-month files, we will identify all women of childbearing age (defined here as between the ages of 15 and 44) and create indicators of who was hospitalized to give birth, and, among those women, identify those experiencing SMM. We focus on women hospitalized to give birth because that is the definition of the women at risk of SMM used by most published estimates and because the number of women who give birth outside of hospital settings is quite small (1.36% in 2012[10]).

We will create time-varying measures of *mental health* (using a global 5-point Likert scale, the Kessler 6, and the mental component of the SF-12), *self-rated health* (using a global 5-point Likert scale and the physical component of the SF-12), *preconception and postpartum BMI category* (underweight, normal weight, overweight, and obese), *current smoking status*, *prenatal care adequacy* (using the Kessner/IOM index[11]), *mode of delivery* (vaginal or cesarean birth), *number of nights hospitalized*, *primary payer for hospital-based delivery* (Medicaid, private, other public, self), *race/ethnicity* (Hispanic, non-Hispanic black, non-Hispanic other, non-Hispanic white), *ratio of family income to the federal poverty line* (<100%, 100-249%, 250-399%, and 400% or more of the FPL), *education* (less than HS, HS graduate, some college with no four-year degree, four-year degree or more), *marital status* (never married, currently married, and previously married), and *age* (15-24, 25-34, 35-44).

We use the CDC definition of severe maternal morbidity,[4] which they define as "unexpected outcomes of labor and delivery that result in significant short- or long-term consequences to a woman's health." If women with observed live births experienced at least one of 21 different severe maternal morbidity (SMM) indicators during pregnancy, delivery, or up to one year postpartum, we considered them to have experienced SMM. These indicators of SMM include conditions and procedures such as acute myocardial infarction, acute renal failure, sepsis, blood transfusions, and hysterectomy.

Outline of Main Tables

- Table 1: Preconception characteristics of women by birth and SMM experience. This will include measures of preconception weight, mental health, self-rated health, smoking behavior, chronic conditions, demographics, and socioeconomic characteristics.
- Table 2: Pregnancy and labor/delivery characteristics of women by SMM experience. This will include measures of mental health, self-rated health, smoking behavior, and prenatal care during pregnancy, and information about the labor and delivery, including mode of delivery, number of nights spent in the hospital, and primary payment source for the delivery hospitalization.
- Table 3: Postpartum characteristics of women by SMM experience. This will include measures of mental health, self-rated health, smoking behavior, postpartum weight, and insurance status.

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