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**HEALTH INSURANCE STATUS AND SEVERE MATERNAL MORBIDITY OUTCOMES IN THE UNITED
STATES - A POLICY REVIEW**

by

ADEJUMOBI OTEKUNRIN, MD

Under the Direction of Colin K. Smith, DrPH

ABSTRACT

Objective: To show evidence of the relationship between insurance status, type, and duration of coverage on severe maternal morbidity and mortality outcomes in the United States.

Methods: A review of multi-state and national studies was done to show the relationship between insurance type on the incidence, timing, and outcome of severe maternal morbidities (SMM). A retrospective cohort study from 2010-2014 used data from the IBM MarketScan Multi-State Medicaid and Commercial Claims and Encounters databases to evaluate timing of SMM during delivery hospitalization of 2,667,325 women aged 15-44 years. Women with SMM were identified using the ICD-9-CM codes for 21 factors associated with SMM. Results from the national Pregnancy Mortality Surveillance System (PMSS) for 2011-2015 was reviewed for pregnancy-related deaths by sociodemographic characteristics, timing relative to end of pregnancy, and the leading causes of death. Results from 13 state maternal mortality review committees (MMRCs) from 2013-2017 on pregnancy-related deaths was reviewed for predisposing factors and preventability.

Results: For the retrospective cohort study, a total of 2,399 women (73.5%) in the Medicaid cohort and 3,993 women (75.7%) in the commercial insurance cohort with SMM after discharge were diagnosed in the first 2 weeks after delivery hospitalization discharge. In the Medicaid cohort, Black women had a higher likelihood (aOR, 1.69; 95% CI, 1.57-1.81) of SMM in the postdelivery discharge period compared with White women. In the commercial insurance cohort in the post-delivery discharge period, women residing in the southern region of the US compared with women residing in the northeastern region had a higher likelihood of SMM (aOR, 1.29; 95% CI, 1.18-1.39).

From the PMSS results (2011–2015), the national pregnancy-related mortality ratio (PRMR) was 17.2 per 100,000 live births. Black women and American Indian/Alaska Native women had the highest PRMRs (42.8 and 32.5, respectively), 3.3 and 2.5 times as high, respectively, as the PRMR for non-Hispanic White women (13.0). Timing of death was known for 87.7% (2,990) of pregnancy-related deaths. Among these deaths, 31.3% occurred during pregnancy, 16.9% on the day of delivery, 18.6% 1–6 days postpartum, 21.4% 7–42 days postpartum, and 11.7% 43–365 days postpartum. Leading causes of death included cardiovascular conditions, infection, and hemorrhage, and these causes of maternal deaths varied by timing; in pregnancy, during childbirth and postpartum. About 60% of pregnancy-related deaths from state MMRCs were determined to be preventable. The MMRC results indicated that multiple factors contributed to pregnancy-related deaths, and prevention strategies should include improving access to, and coordination and delivery of, quality care to birthing parents.

Conclusion: Pregnancy-related deaths occurred during pregnancy, around the time of delivery, and up to 1 year postpartum; leading causes varied by timing of death. 15.7% and 14.1% of SMM cases in the Medicaid and commercial insurance cohorts, respectively, first occurred after the delivery hospitalization, with disparities in factors and maternal characteristics associated with SMM. Approximately 60% of pregnancy-related deaths were preventable.

Keywords: Birthing parents, Medicaid, Medicaid expansion, Medicaid extension, maternal mortality, maternal safety bundles, severe maternal morbidity.

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A Capstone Submitted in Partial Fulfillment of the Requirements for the Degree of

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STATES – A POLICY REVIEW

by

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May 2022

DEDICATION

I dedicate this work to the loving memory of my late parents, Prince Gabriel Adejumobi Otekunrin and Chief (Mrs.) Sophia Omotayo Otekunrin.

I also dedicate this work to my wife and daughter, Iyabo and Ifeoluwa, for their unflinching support and understanding during this program. I love you guys.

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1 BACKGROUND AND INTRODUCTION

Maternal morbidity and mortality, considered as problems of the developing world, remain a major burden in the United States (U.S.) (WHO, 2015). The U.S. has the highest maternal morbidity and mortality rates among industrialized nations, even when data is limited to only white women who generally have the lowest rates, suggesting that the maternal health care system needs a major overhaul (Commonwealth Fund, Issue Brief & Report, December 16, 2020). This is despite the fact the U.S. spends more on health care and medical research for technological advancement than any other industrialized country. The U.S. ranks 60th in the world in maternal survival after childbirth (Kozhimannil, Hardeman & Henning-Smith, 2017). One of the primary drivers of the high maternal mortality in the U.S. is the high rate of severe maternal morbidity (SMM). Evidence shows that for every maternal death, 50 to 100 women experience SMM which are life-threatening complications that without timely identification and proper management, may be associated with deaths (Kilpatrick, Ecker & ACOG., 2016). Also, over the past few decades, there has been an increase in the rates of many factors associated with SMM (Creanga et al., 2014). Each year in the U.S., about 1,200 women suffer complications during pregnancy or childbirth that prove fatal (WHO, 2015) and 60,000 suffer complications that are near-fatal or result in SMM (Creanga et al., 2014). According to the latest report of the Centers for Disease Control and Prevention (CDC) on SMM in 2014, it affects over 50,000 women in the United States, and the trend has steadily increased in recent years. Data from the Pregnancy Risk Assessment Monitoring System (PRAMS) shows that blood transfusions, hysterectomy, sickle cell disease with crisis, eclampsia, sepsis, and disseminated intravascular coagulation (DIC) are some of the leading causes of SMM (CDC, 2021) (Table 1).

SMM, a subset of maternal morbidity, is recognized by the CDC through a list of 21 indicators and corresponding International Classification of Diseases (ICD) codes. A recent CDC report showed the following conditions as some of the clinical causes of pregnancy-related mortality in the US: combination of heart conditions (15%), infections (13%), cardiomyopathy or heart muscle disease (11%), severe postpartum bleeding (11%), blood clots (9%), high blood pressure (8%), and stroke (7%) (Commonwealth Fund, 2020). Evidence shows that about 50% of all maternal deaths in the U.S. are preventable (Main & Menard, 2013).

Medicaid covers about 50% of all pregnancies in the United States, with Black and Hispanic women having a higher likelihood of being covered by Medicaid in pregnancy than White women (Markus et al., 2013). In 2020, Medicaid coverage was 29.3% for non-Hispanic White women, 58.6% for Hispanic women, and 64.7% for non-Hispanic Black women (CDC NVSS, 2022). Conversely, the percentage of mothers using private insurance in 2020 was 30.1% for non-Hispanic Black women, 31.3% for Hispanic women, and 63.9% for non-Hispanic White women (CDC NVSS, 2022). Evidence from other areas of clinical practice shows that uninsured and patients covered by Medicaid receive a lower quality of care than those on private insurance or commercial insurance; causes of lower quality care for these patients include limited use of resources for them due to payor type, and use of lower-quality physicians in the same hospital for uninsured and Medicaid patients (Boxer et al., 2003; Gardner & Vishwasrao, 2010; Spencer et al., 2013). This poorer quality of care could be one of the drivers of racial/ethnic differences in the rates of SMM and outcomes. Another driver of the higher rates of SMM among Black and Hispanic women compared to White women could be the lack of preconception health insurance coverage to diagnose or treat preexisting medical conditions

like hypertension or depression, which are risk factors for SMM and mortality (Gray et al., 2012). Evidence shows that states with preconception health insurance through Medicaid expansion have lower maternal mortality rates, for which SMM is a significant risk factor (Searing & Ross., 2019).

About four million births occur yearly in the U.S., making childbirth the leading cause of hospital admissions for commercial health insurance payers and Medicaid claims (Howell & Zeitlin, 2017). The estimated annual hospital costs of childbirth and newborns in the US are over \$110 billion (AHRQ-HCUP, 2018). Medicaid covers about half of all deliveries in the country, with pregnant African American women (66%) and Hispanic women (60%) more likely to be covered by Medicaid health insurance than are pregnant White women (Markus et al., 2013; MACPAC, 2020). States are required to provide Medicaid coverage for pregnant women up to 138% of the federal poverty level (FPL) until 60 days postpartum. Still, gaps in coverage remain, especially in states that have not expanded Medicaid under the Patient Protection and Affordable Care Act (ACA) (Eckert, 2020). In non-expansion states, a pregnant woman could lose her eligibility for regular Medicaid coverage from day 61 of her delivery if her income is above the state's FPL level. Particularly prone to lack of health insurance outside of pregnancy in non-expansion states like Georgia are people of color, low-income individuals and families, and childless adults with income greater than 40% FPL and less than 100% FPL except those with disabilities (Eckert, 2020). Also, about 50,000 women or more die from post-birth severe complications which may require long-term care beyond the 60-days post-birth coverage of regular Medicaid or 180-days coverage in Georgia through H.B. 1114 (Davis et al., 2019; Petersen et al., 2019). Evidence shows the harmful effects of "churning," i.e., disruptions in

healthcare insurance coverage, especially Medicaid, which occurs most often during the critical postpartum period, on maternal and infant health outcomes including preterm births, and SMMs (Eckert, 2020). Perinatal insurance churn is observed in both Medicaid expansion (33%) and non-expansion states (50%), but more prevalent among individuals who depend on Medicaid for pregnancy-related care (Daw et al., 2019).

Studies have shown that lack of preconception health insurance including in individuals with preexisting chronic conditions, is associated with later prenatal care, suboptimal use of pregnancy care, and more significant risks of poor birth and birth-related outcomes that can endanger the lives of birthing parents (Adams et al., 2019). Black, Latina, and Indigenous women are disproportionately affected by a lack of preconception health insurance coverage. Evidence shows that from 2015 to 2017, about 50% of all non-Hispanic Black women had non-continuous coverage from preconception to post-birth, and 50% of Latina women became uninsured in the postpartum period (Daw et al., 2020). Also, using data from the Nationwide Inpatient Sample (NIS), Howell et al. (2016) found that Black women deliver in a concentrated set of hospitals with higher risk adjusted SMM rates for both White and Black deliveries. About 700 birthing parents die from pregnancy-related complications every year in the U.S. with significant racial/ethnic disparities; Black women have a pregnancy-related mortality ratio approximately three times as high as that of White women (Creanga et al., 2017; Petersen et al., 2019).

According to the WHO (2015), three factors are the leading causes of the upward trend in maternal morbidity and mortality in the U.S. First, there is an increasing number of birthing people who attend prenatal care clinics with untreated or poorly managed chronic conditions

due to lack of health insurance. These conditions like diabetes, hypertension and mental health issues are drivers of pregnancy-related complications. These individuals could benefit from community-based services including case management to help them access needed healthcare and overcome cost and other obstacles to care. Evidence shows that birthing people who lack health insurance are three to four times more likely to die of pregnancy-related complications than those who are insured (Berg et al., 2003). In 2018, 30% of pregnancy-related deaths in the U.S. occurred between 43 days and one year postpartum, and some of these deaths occur outside of the 60-day coverage of pregnancy-related Medicaid (NCHS, 2018). Keeping birthing people insured postpartum helps them maintain access to their providers, helps their providers to detect signs of complications early, screen them for postpartum depression, and manage any chronic conditions which will improve maternal and child outcomes. A second factor for the increased maternal morbidity and mortality in the U.S. according to the WHO is the inconsistency in the quality of obstetric practice in the country. The healthcare system, including hospitals and birthing centers, lack a uniform and standardized approach to managing obstetric emergencies, causing late recognition of pregnancy, childbirth, and postpartum complications (D'Alton et al., 2014). The third factor is the paucity of good data and related analysis. Maternal mortality data are missing for about half of all the states and territories in the U.S. and the expectation is that subsequent annual reports will combine multiple years to enable comparison of data for all states (Declercq & Zephyrin, 2020).

1.1 Purpose of the Study

The aim of this policy review and analysis is to evaluate the association between health insurance status, type, and duration of coverage on the incidence and outcomes of SMM and mortality in the U.S.

1.1.1 Research Questions

1. Is preconception health insurance status related to the rates of SMM and mortality?
2. Does the standardized use of rapid-cycle Maternal Data Center and Maternal Safety Bundles lead to improved quality of care for birthing parents?
3. Is extended postpartum Medicaid/CHIP insurance coverage to a year after childbirth correlated with a decrease in the mortality rate and improved SMM outcomes?

2 METHODS

This policy review and analysis used PubMed, Google Scholar, Science Direct, Cochrane Library and EMBASE to search for studies on health insurance status, payor type, demographic characteristics, preconception, prenatal and postnatal coverage, SMM and maternal mortality. A review of the results of multi-state and national studies was done to evaluate the relationship between health insurance status, payor type, and duration of coverage on the incidence, timing, and outcome of SMM.

A retrospective cohort study by Chen et al. (2021) from 2010-2014 used data from the IBM MarketScan Multi-State Medicaid database and the IBM MarketScan Commercial Claims and Encounters database to evaluate timing of SMM during delivery hospitalization of 2,667,325 women aged 15-44 years. Women with at least one factor for SMM were identified using diagnosis and procedure codes from the *International Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9-CM)* for the 21 factors associated with SMM. Each birthing parent in the sample was classified into 3 outcome groups: (1) those who had no SMM during the delivery hospitalization and the postdelivery (discharge) period, (2) those who had at least one factor of SMM during the delivery hospitalization, and (3) those who had any factor associated with de novo SMM after delivery discharge. De novo SMM after delivery discharge is defined as SMM first diagnosed during the 6 weeks (42 days) after discharge from delivery hospitalization unrelated to any factor with SMM identified during delivery. To ensure that true de novo SMM cases were identified, birthing parents who had any SMM event in the two months preceding delivery hospitalization (1,043 in the Medicaid cohort and 1,186 in the commercial insurance cohort) were excluded.

Results from the national Pregnancy Mortality Surveillance System (PMSS) of the Centers for Disease Control and Prevention (CDC) for 2011-2015 was reviewed to evaluate pregnancy-related deaths by sociodemographic characteristics, timing relative to end of pregnancy, and the leading causes of death. The Division of Reproductive Health, CDC, requests that all states, the District of Columbia, and New York City send death certificates, linked live birth or fetal death certificates, and additional data when available, on deaths that occurred during pregnancy or within 1 year after delivery. Coding of the cause of death includes these 10 mutually exclusive SMM categories: anesthesia complications; amniotic fluid embolism; cardiomyopathy; cerebrovascular accidents; hemorrhage; hypertensive disorders of pregnancy (preeclampsia or eclampsia); infection; thrombotic pulmonary or other embolism (air, fat, or septic); other cardiovascular conditions (cardiac valvular disease, congenital heart disease, congestive heart failure, and ischemic heart disease); and other non-cardiovascular medical conditions (endocrine, hematologic, immunologic, and renal).

Results from 13 state maternal mortality review committees (MMRCs) from 2013-2017 on pregnancy-related deaths was reviewed to identify predisposing factors and preventability. Each multidisciplinary MMRC used a standardized data collection system to review available data sources (autopsy reports, medical records, social service records, and vital records) in determining preventability, and contributing factors to the deaths. The study excluded deaths from drug overdose, homicide, suicide, and unintentional injury from analyses.

3 RESULTS

The retrospective cohort study of delivery hospitalizations of 2,667,325 birthing people in the U.S. from 2010-2014 showed that 809,377 (30.3%) of them had Medicaid coverage and 1,857,948 (69.7%) had commercial insurance coverage. In the Medicaid cohort, 51.1% were White, 33.2% Black, 5.1% Hispanic, and 10.6% were of another race or ethnicity. In the commercial insurance cohort, 17.1% were from the northeastern region, 20.0% from the north central region, 36.4% from the southern region, and 20.6% from the western region of the U.S. (Table 1 and Table 2). In total, 17,584 (2.2%) birthing parents in the Medicaid cohort and 32,079 (1.7%) birthing parents in the commercial insurance cohort had at least one SMM factor identified during the delivery hospitalization. In total, 3,265 (0.4%) birthing parents in the Medicaid cohort and 5,275 birthing parents (0.3%) in the commercial insurance cohort had de novo SMM after delivery discharge; de novo SMM cases after discharge was 15.7% of total SMM cases in the Medicaid cohort and 14.1% of total SMM cases in the commercial insurance cohort (Table 1). In this cohort study of 2 667 325 women in the US with delivery hospitalizations between 2010 and 2014, 14% and 16% of SMM among those with commercial and Medicaid insurance, respectively, developed de novo within 6 weeks after delivery discharge. The most common factors and maternal characteristics associated with SMM after delivery were different than those identified at delivery.

A similar pattern was found for birthing parents with Medicaid and commercial insurance in analysis of the timing of the first episode of SMM; the number of SMM cases post delivery was highest within the first week of delivery hospitalization, decreasing rapidly after the second week. A total of 2,399 birthing parents (73.5%) in the Medicaid cohort and 3,993 birthing

parents (75.7%) in the commercial insurance cohort with de novo SMM after discharge were diagnosed in the first 2 weeks after discharge from the delivery hospitalization. However, in the Medicaid cohort, only Black women had a higher likelihood (adjusted odds ratio [OR] 1.69; 95% CI, 1.57-1.81) of experiencing SMM in the postdelivery discharge period compared with White women. While in the commercial insurance cohort during the delivery hospitalization, residing in the western region compared with the northeastern region was associated with a higher likelihood of SMM (aOR, 1.37; 95% CI, 1.32-1.41). In the post-delivery discharge period, residing in the southern region of the U.S. compared with the northeastern region was associated with a higher likelihood of SMM (aOR, 1.29; 95% CI, 1.18-1.39).

Table 1: Severe maternal morbidity diagnosis by timing of diagnosis and insurance type (2010-2014^a).

| Timing of diagnosis | Medicaid | | Commercial | | Total | |
|---|----------------|-----------|------------------|-----------|------------------|-----------|
| | N (%) | 95% CI, % | N (%) | 95% CI, % | N (%) | 95% CI, % |
| All women | | | | | | |
| Total participants, N | 809,377 | NA | 1,857,948 | NA | 2,667,325 | NA |
| No SMM during and after delivery hospitalization | 788,528 (97.4) | 97.4-97.5 | 1,820,594 (98.0) | 98.0-98.0 | 2,609,122 (97.8) | 97.8-97.8 |
| Any SMM during delivery hospitalization | 17,584 (2.2) | 2.1-2.2 | 32,079 (1.7) | 1.7-1.8 | 49,663 (1.9) | 1.8-1.9 |
| Any de novo SMM during postpartum hospitalization | 3,265 (0.4) | 0.4-0.4 | 5,275 (0.3) | 0.3-0.3 | 8,540 (0.3) | 0.3-0.3 |
| Women with SMM | | | | | | |
| Total participants, N | 20,849 | NA | 37,354 | NA | | |
| Any SMM during delivery hospitalization | 17,584 (84.3) | 83.8-84.8 | 32,079 (85.9) | 85.5-86.2 | NA | NA |
| Any de novo SMM during postpartum hospitalization | 3,265 (15.7) | 15.1-16.2 | 5,275 (14.1) | 13.8-14.5 | | |

Abbreviations: NA, not applicable; SMM, severe maternal morbidity.

Source: ^aData were obtained from the 2010-2014 IBM MarketScan Multi-State Medicaid and IBM MarketScan Commercial Claims and Encounters databases. Pearson χ^2 test for the equal distribution of different SMM status across 2 populations: $\chi^2 = 871.99$; $P < .001$.

Table 2: Maternal characteristics by insurance type and timing of diagnosis (2010-2014).

| Characteristics by insurance type | No SMM during and after delivery hospitalization, N (%) | Any SMM during delivery hospitalization, N (%) | Any de novo SMM during postpartum hospitalization, N (%) | Total, N (%) |
|-----------------------------------|---|--|--|------------------|
| Medicaid | | | | |
| Total participants, N | 788,528 | 17,584 | 3,265 | 809,377 |
| Age group, yrs. | | | | |
| 15-24 | 386,384 (49.0) | 8,210 (46.7) | 1,271 (38.9) | 395,865 (48.9) |
| 25-34 | 341,399 (43.3) | 7,447 (42.4) | 1,580 (48.4) | 350,426 (43.3) |
| 35-44 | 60,745 (7.7) | 1,927 (11.0) | 414 (12.7) | 63,086 (7.8) |
| Race/ethnicity | | | | |
| Non-Hispanic White | 404,793 (51.3) | 7,185 (40.9) | 1,367 (41.9) | 413,345 (51.1) |
| Non-Hispanic Black | 259,532 (32.9) | 7,373 (41.9) | 1,507 (46.2) | 268,412 (33.2) |
| Hispanic | 40,471 (5.1) | 973 (5.5) | 115 (3.5) | 41,559 (5.1) |
| Other ^a | 83,732 (10.6) | 2,053 (11.7) | 276 (8.5) | 86,061 (10.6) |
| Fetal outcome | | | | |
| No stillbirth | 780,804 (99.0) | 16,936 (96.3) | 3,211 (98.3) | 800,951 (99.0) |
| Any stillbirth | 7,724 (1.0) | 648 (3.7) | 54 (1.7) | 8,426 (1.0) |
| Delivery method | | | | |
| Vaginal | 544,187 (69.0) | 6,489 (36.9) | 1,638 (50.2) | 552,314 (68.2) |
| Cesarean | 244,341 (31.0) | 11,095 (63.1) | 1,627 (49.8) | 257,063 (31.8) |
| Commercial | | | | |
| Total participants, N | 1,820,594 | 32,079 | 5,275 | 1,857,948 |
| Age group, yrs. | | | | |
| 15-24 | 254,357 (14.0) | 4,221 (13.2) | 722 (13.7) | 259,300 (14.0) |
| 25-34 | 1,131,666 (62.2) | 18,409 (57.4) | 2,918 (55.3) | 1,152,993 (62.1) |
| 35-44 | 434,571 (23.9) | 9,449 (29.5) | 1,635 (31.0) | 445,655 (24.0) |
| Census region | | | | |
| Northeast | 311,153 (17.1) | 5,639 (17.6) | 800 (15.2) | 317,592 (17.1) |
| North central | 436,947 (24.0) | 6,635 (20.7) | 1,185 (22.5) | 444,767 (23.9) |
| South | 663,079 (36.4) | 10,240 (31.9) | 2,207 (41.8) | 675,526 (36.4) |
| West | 372,119 (20.4) | 8,796 (27.4) | 975 (18.5) | 381,890 (20.6) |
| Unknown | 37,296 (2.1) | 769 (2.4) | 108 (2.0) | 38,173 (2.0) |
| MSA status | | | | |
| MSA | 1,553,440 (85.3) | 27,477 (85.7) | 4,470 (84.7) | 1,585,387 (85.3) |
| Non-MSA | 230,320 (12.7) | 3,928 (12.2) | 699 (13.3) | 234,947 (12.6) |
| Unknown | 36,834 (2.0) | 674 (2.1) | 106 (2.0) | 37,614 (2.0) |
| Fetal outcome | | | | |
| No stillbirth | 1,806,700 (99.2) | 31,324 (97.6) | 5,202 (98.6) | 1,843,226 (99.2) |
| Any stillbirth | 13,894 (0.8) | 755 (2.4) | 73 (1.4) | 14,722 (0.8) |
| Delivery method | | | | |
| Vaginal | 1,178,674 (64.7) | 12,640 (39.4) | 2,411 (45.7) | 1,193,725 (64.2) |
| Cesarean | 641,920 (35.3) | 19,439 (60.6) | 2,864 (54.3) | 664,223 (35.8) |

Abbreviations: MSA, metropolitan statistical area (as defined by the US Office of Management and Budget); SMM, severe maternal morbidity.

^aSpecific races included in this category were not available in the database.

Source: Data were obtained from the 2010-2014 IBM MarketScan Multi-State Medicaid and IBM MarketScan Commercial Claims and Encounters databases.

From the PMSS data (2011–2015), the national pregnancy-related mortality ratio (PRMR) was 17.2 per 100,000 live births. Black women and American Indian/Alaska Native women had the highest PRMRs (42.8 and 32.5, respectively), 3.3 and 2.5 times as high, respectively, as the PRMR for non-Hispanic White women (13.0). The PRMR was highest among birthing parents aged ≥ 35 years and unmarried birthing parents. The overall PRMR had yearly fluctuations, ranging from low of 15.9 in 2012 to a high of 18.0 in 2014 (Table 3). Leading causes of death included cardiovascular conditions, infection, and hemorrhage, and varied by timing. In combination, cardiovascular conditions account for >33% of pregnancy-related deaths; cardiomyopathy (10.8%), other cardiovascular conditions (15.1%), and cerebrovascular accidents (7.6%); non-cardiovascular medical conditions (14.3%); infection (12.5%); obstetric hemorrhage (11.2%); and undetermined (6.7%). Timing of death was known for 87.7% (2,990) of pregnancy-related deaths. Among these deaths, 31.3% occurred during pregnancy, 16.9% on the day of delivery, 18.6% on 1–6 days postpartum, 21.4% on 7–42 days postpartum, and 11.7% 43–365 days postpartum (Table 4). There was no significant difference in the timing of deaths between Black and White birthing parents for most periods. However, a greater proportion of pregnancy-related deaths among Black people (14.9%) occurred 43–365 days postpartum compared to the proportion among White maternal deaths (10.2%) during the same period ($p < 0.01$).

Table 3: Pregnancy-related deaths, by sociodemographic characteristics.

| Characteristic | No. of pregnancy-related deaths (N=3,410) | Pregnancy-related mortality ratio* (Average=17.2) |
|---|---|---|
| Race/Ethnicity (N = 3,400) | | |
| White | 1,385 | 13.0 |
| Black | 1,252 | 42.8 |
| American Indian/Alaska Native | 62 | 32.5 |
| Asian/Pacific Islander | 182 | 14.2 |
| Hispanic | 519 | 11.4 |
| Age group (yrs.) (N = 3,409) | | |
| <20 | 158 | 11.3 |
| 20–24 | 543 | 12.1 |
| 25–29 | 751 | 13.2 |
| 30–34 | 799 | 15.3 |
| 35–39 | 706 | 28.7 |
| ≥40 | 452 | 76.5 |
| Highest level of education (N = 2,938) | | |
| Less than high school | 572 | 19.8 |
| High school graduate | 1,090 | 24.2 |
| Some college | 775 | 14.8 |
| College graduate or higher | 501 | 9.4 |
| Marital status (N = 3,371) | | |
| Married | 1,543 | 13.1 |
| Not married | 1,828 | 22.8 |
| Year | | |
| 2011 | 702 | 17.8 |
| 2012 | 627 | 15.9 |
| 2013 | 679 | 17.3 |
| 2014 | 718 | 18.0 |
| 2015 | 684 | 17.2 |

Source: Pregnancy Mortality Surveillance System, United States, 2011–2015

* Number of pregnancy-related deaths per 100,000 live births.

Also, the leading causes of pregnancy-related death varied by time relative to the end of pregnancy (Figure 1). During pregnancy, cardiovascular conditions and other non-cardiovascular conditions were the leading causes of pregnancy-related death; on delivery day, hemorrhage and amniotic fluid embolism were the leading causes of maternal deaths; during the first 6 days postpartum, infection, hemorrhage and hypertensive disorders of pregnancy were the main causes of maternal death; and from 6 weeks after childbirth (43 days) up to a year (365 days) postpartum, cardiomyopathy was the leading cause of pregnancy-related death.

About 60% of pregnancy-related deaths from state MMRCs were determined to be preventable. MMRC data indicated that multiple factors contributed to pregnancy-related deaths. According to the MMRCs, contributing factors to pregnancy-related deaths and prevention strategies can be categorized at the community, health facility, patient, provider, and system levels and include improving access to, and coordination and delivery of, quality care. (Petersen et al., 2019).

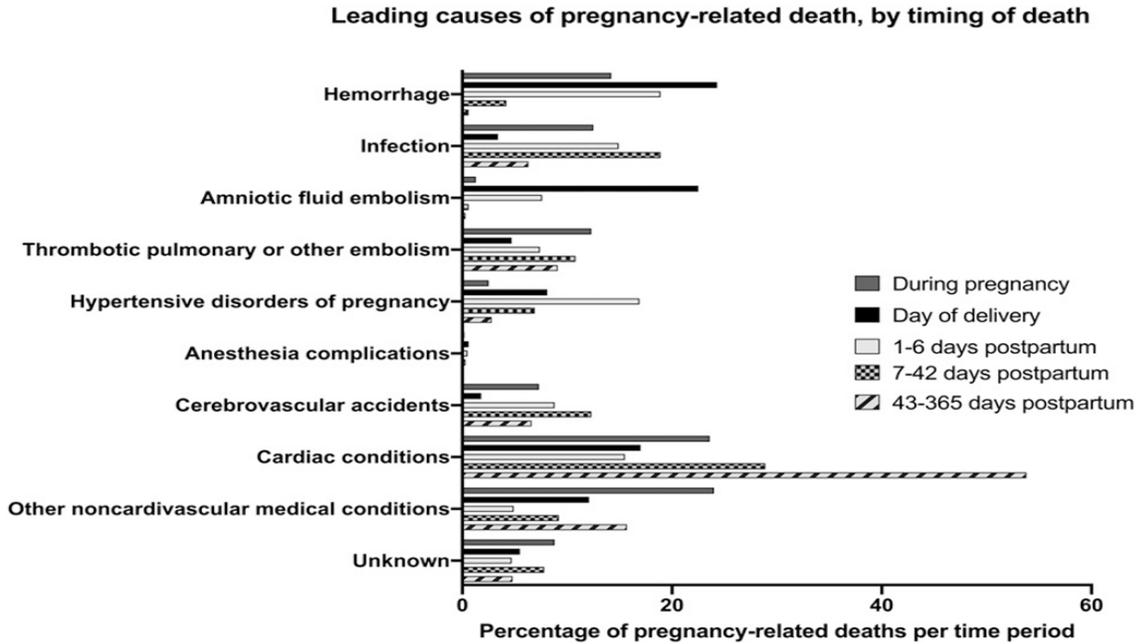
Table 4: Pregnancy-related deaths, by cause of death and time of death relative to the end of pregnancy

| Cause of death [†] | N (%) attributed to each cause | | | | | Total no. of deaths |
|--|--------------------------------|-------------------|---------------------|----------------------|------------------------|---------------------|
| | During pregnancy | Day of delivery | 1–6 days postpartum | 7–42 days postpartum | 43–365 days postpartum | |
| Hemorrhage | 72 (21.9) | 123 (37.4) | 105 (31.9) | 27 (8.2) | 2 (0.6) | 329 |
| Infection | 117 (32.5) | 17 (4.7) | 83 (23.1) | 121 (33.6) | 22 (6.1) | 360 |
| Amniotic fluid embolism | 12 (6.9) | 114 (65.9) | 42 (24.3) | 4 (2.3) | 1 (0.6) | 173 |
| Thrombotic pulmonary or other embolism | 115 (40.9) | 24 (8.5) | 41 (14.6) | 69 (24.6) | 32 (11.4) | 281 |
| Hypertensive disorders of pregnancy | 23 (10.8) | 41 (19.3) | 94 (44.3) | 44 (20.8) | 10 (4.7) | 212 |
| Anesthesia complications | 2 (20.0) | 3 (30.0) | 3 (30.0) | 2 (20.0) | 0 | 10 |
| Cerebrovascular accidents | 68 (29.8) | 9 (3.9) | 49 (21.5) | 79 (34.6) | 23 (10.1) | 228 |
| Cardiomyopathy | 48 (15.6) | 21 (6.8) | 25 (8.1) | 75 (24.4) | 138 (45.0) | 307 |
| Other cardiovascular conditions | 173 (37.6) | 65 (14.1) | 61 (13.3) | 110 (23.9) | 51 (11.1) | 460 |
| Other noncardiovascular medical conditions | 225 (52.7) | 61 (14.3) | 27 (6.3) | 59 (13.8) | 55 (12.9) | 427 |
| Unknown | 82 (40.4) | 28 (13.8) | 26 (12.8) | 50 (24.6) | 17 (8.4) | 203 |
| Total | 937 (31.3) | 506 (16.9) | 556 (18.6) | 640 (21.4) | 351 (11.7) | 2,990 |

Source: Pregnancy Mortality Surveillance System, United States, 2011–2015*

[†] Cause of death categories are mutually exclusive.

Figure 1: Leading causes of pregnancy-related death, by timing of death.



Source: Adapted from Petersen EE, Davis NL, Goodman D, et al., 2019. Vital signs: pregnancy-related deaths, United States, 2011-2015, and strategies for prevention, 13 states, 2013-2017. *MMWR Morb Mortal Wkly Rep.* 2019; 68:423-429. Note: Cardiac conditions include both cardiomyopathy and other cardiovascular disease.

3.1 Policy Analysis and Review

3.1.1 Pregnancy Medicaid and Postpartum Coverage Extension Policies

Congress established the 60-day post birth Medicaid coverage cut-off through the Omnibus Budget Reconciliation Act of 1986 (P.L. 99-509) (MACPAC, April 2021), at a time when the medical community had a comparably limited understanding of the postpartum period, making the policy of a 60-day postpartum coverage for birthing people antiquated (Health Affairs, 2021). Medicaid programs cover eligible pregnant people with incomes below 138% FPL through 60 days after giving birth. Eligibility levels for pregnant women across states for Medicaid and Children Health Insurance Program (CHIP) range from a low of 138% FPL in Idaho

and South Dakota to a high of 380% FPL in Iowa. A total of 35 states cover pregnant parents at or above 200% FPL (Brooks et al., 2021). For close to 40 years, federal law guaranteed automatic health insurance coverage for babies born to Medicaid-enrolled parents, from birth through the first year of life. Hence, while many birthing parents lose their Medicaid coverage from 61 days postpartum, their infants have continued coverage for a year (Commonwealth Fund, 2021). Adopting a year of continuous Medicaid eligibility through the State Plan Amendment (SPA) postpartum one year extension for birthing parents and their infants who maintain coverage for one year post birth, would close the coverage gaps while also reducing the paperwork for state insurance agencies. The postpartum period is critical to the health and well-being of birthing parents and their newborn as it sets the stage for long-term health and well-being for the mother-infant dyad. During the postpartum period, the birthing parent is adapting to various physical, social, and psychological changes as well as recovering from childbirth, adjusting to changing hormones in her body and learning to feed and care for her newborn (ACOG, 2018). Hence, the American College of Obstetricians and Gynecologists (ACOG) recommends ongoing comprehensive care for birthing parents, including physical, social, and psychological services in the postpartum period (ACOG, 2018; HCCI, 2020).

Six states (Colorado, Missouri, New Jersey, Rhode Island, Virginia, and West Virginia) have expanded coverage for pregnant women through CHIP, either through an option for states that cover pregnant women in Medicaid up to at least 185% FPL or a continuation of an existing Section 1115 waiver (Brooks et al., 2021; MACPAC, 2022). Also, 36 states and the District of Columbia currently extend eligibility beyond 60 days postpartum, and these states by extending insurance coverage to low-income pregnant women, lowered the financial hurdles that limit

access to antenatal care for millions of birthing people (HCCI, 2020). Reapplying for coverage after the expiration of pregnancy Medicaid from day-61 postpartum often entails long hours of commute and in-person visit to a local benefits office, a considerable barrier for new parents managing their newborn's unpredictable schedule and their own physical and emotional recovery after delivery (Georgetown University Health Policy Institute, 2021a).

Over 275 advocacy groups, national and state healthcare provider organizations, along with state MMRCs and departments of health, recommend that states extend postpartum Medicaid coverage to one year. The Medicaid and CHIP Payment and Access Commission (MACPAC) gave a strong endorsement of this policy by recommending to Congress in 2021, 12 months of postpartum coverage for pregnant individuals in Medicaid at 100% federal medical assistance percentage (FMAP) or matching rate, and to align the policy in states that expand CHIP coverage to pregnant women (Georgetown University Health Policy Institute, 2021a).

The Congressional Budget Office (CBO) combined average cost estimate to provide 10 additional months of Medicaid coverage for states and federal government is about \$1,500 per individual in 2022. This amount is expected to increase by about 6% over the 2022-2030 period. The CBO estimates that coverage extension to a year postpartum would increase Medicaid's direct spending by \$6.1 billion over the 2021-2030 period and the costs would be about the same for an additional 10 months of coverage under CHIP. Estimate shows that by 2024, because only 6 states extend CHIP coverage to birthing people, fewer than 1,000 pregnant parents would reside in a state implementing the option thereby increasing direct spending by \$5 million over the 2021-2030 period (CBO, 2021).

3.1.2 Patient Protection and Affordable Care Act (2010)

Before the Patient Protection and Affordable Care Act (ACA), some birthing parents with individual health plans wrongly assumed that they had maternity coverage only to find out when they are pregnant that they are not covered by their plan. Some of these individuals believed that if they maintained continuous coverage, they would be able to purchase a plan with maternity care when they need it, but they were wrong and disappointed when they found out it was not the case (Norris, 2020). In all states, every new small group health insurance plan must include maternity benefits, and though small employers with less than 50 employees are not required to offer health insurance coverage under the ACA, if they do, the plan must include maternity benefits (Norris, 2020). It should be noted that before the ACA, maternity coverage was available on most employer-sponsored group plans due to the 1978 Pregnancy Discrimination Act (PDA). The PDA mandates that if an employer with 15 or more employees opts to provide health insurance coverage, it must include maternity benefits.

In 2010 the ACA included antenatal and maternal care as one of the 10 essential health benefits that insurance plans on the Health Insurance Marketplace (also called Marketplace) or Medicaid must cover for pregnant women (March of Dimes, 2020). The Marketplace is an online resource that helps prospective enrollees to find and compare health plans in their state. Under the ACA, maternity care coverage is included in all individual and small group plans effective January 1, 2014, or later. Medicaid through the ACA covers about 50% of births nationwide with eligibility levels ranging from 138% FPL to 380% FPL across states. States are mandated by the ACA to cover pregnant people with incomes up to 138% FPL through 60 days post birth, i.e., end of the month of the 60th postpartum day (Ranji, Salganicoff & Gomez,

2021). In non-expansion states, Medicaid income eligibility levels for parents and other adults are much lower; median eligibility levels for parents in the 12 non-expansion states is 40% FPL (\$8,784 per year for a family of three), ranging from as low as 17% FPL in Texas to as high as 100% FPL in Wisconsin. The non-expansion states are Alabama, Florida, Georgia, Kansas, Mississippi, North Carolina, South Carolina, South Dakota, Tennessee, Texas, Wisconsin, and Wyoming (KFF, 2022). In these non-expansion states, some new parents fall into the ‘coverage gap’ as their incomes are much higher than parent eligibility levels but too low to qualify for Marketplace subsidies (available only at 100% FPL or above). Parents that fall into this gap are at risk of becoming uninsured from 61 days postpartum. In expansion states, most postpartum parents have a pathway to coverage after 60 days postpartum: either Medicaid or subsidized private insurance in the ACA Marketplaces. However, studies show that new parents with Medicaid funded childbirths experience significant churning in coverage (Daw, Kozhimannil & Admon, 2019).

3.1.3 American Rescue Plan Act (2021)

The American Rescue Plan Act (ARP) of 2021 enables states to lengthen eligibility for pregnancy-related Medicaid coverage from the current 60 days postpartum to up to one year, a time when mothers remain at elevated pregnancy-related health risk (Ranji, Salganicoff & Gomez, 2021). Prior to the ARP, states intending to extend postpartum coverage beyond 60 days had to use *Medicaid Section 1115 demonstration waivers*. Currently, Centers for Medicare and Medicaid Services (CMS) has approved this unique extended postpartum coverage waivers in Georgia (6 months of extended coverage for all pregnant people in Medicaid), Illinois (12 months of postpartum coverage for all pregnant people in Medicaid), and Missouri (12 months

of limited postpartum benefits for only postpartum individuals with a substance use disorder diagnosis). Some states either have waivers pending or have plans to submit waivers. (Georgetown University Health Policy Institute, 2021a). As an alternative to demonstration waivers, the ARP gives states the option to use the Medicaid State Plan Amendment (SPA) beginning April 1, 2022. For states seeking to extend postpartum coverage, SPA has advantages in terms of the federal approval process and funding. For birthing people, SPA has advantages in terms of eligibility, benefits covered, and provider choice. Compared to waivers that can offer comprehensive postpartum coverage or in some states have limits on populations or benefits covered, the ARP option extends postpartum coverage for one year with full Medicaid benefits. It is estimated that about 123,000 uninsured birthing people would benefit from the SPA one-year postpartum extension, covering more birthing persons over a longer period (Commonwealth Fund, 2021). Colorado, Missouri, New Jersey, Rhode Island, Virginia, and West Virginia are the 6 states that currently provide coverage to pregnant people under CHIP. For states that choose an SPA option, the one-year postpartum Medicaid coverage extension will also apply to CHIP-enrolled pregnant people, however, this might not be the case for the waiver option (Commonwealth Fund, 2021).

Through the ARP, states receive their regular Medicaid matching rate (FMAP) for the extended coverage period and the option sunsets after five years from April 1, 2022. States' regular Medicaid FMAP currently ranges from 56.2% - 84.51%, enhanced due to the public health emergency. This ARP provision for participating states means that birthing people who are citizens or legal residents could maintain their Medicaid coverage postpartum beyond the traditional 60-day period up to one year with limited out-of-pocket spending and no need to

sign up for a new plan (Ranji, Salganicoff & Gomez, 2021). Surprisingly, in non-expansion states like Florida, Georgia, and Texas, their lawmakers chose the extended postpartum coverage (Section 1115 waiver) instead of Medicaid expansion, a less effective and more costly option. Waiver extension is more costly than Medicaid expansion for states because the 10 additional months of postpartum coverage beyond the 60 days are matched at the state's regular FMAP rate (56.2% - 84.51%) compared to the 90% enhanced FMAP of Medicaid expansion under the ACA and the additional 5% in the first 2 years for new Medicaid expansion states under the ARP (Georgetown University Health Policy Institute, 2021b)

ARP falls short, however, because undocumented birthing people would still be ineligible for Medicaid coverage because federal funds cannot be used to support undocumented immigrants for Medicaid. Nevertheless, states taking advantage of Medicaid expansion provision in the ARP could concurrently use state funds to provide Medicaid coverage for undocumented birthing people in the postpartum period up to one year post-delivery (Health Affairs, 2021).

3.1.4 Financial Costs of Continuous Postpartum and Preconception Medicaid Coverage

According to the Congressional Budget Office (CBO), the estimated average cost to provide 10 additional months of postpartum Medicaid coverage is \$1,500 per person in 2022. Expectedly, more than half of this cost would be covered by federal dollars (depending on a state's federal matching level). However, states would cover the full cost of Medicaid coverage to undocumented birthing people. For instance, it would cost New York less than a tenth of 1

percent of total state Medicaid spending to provide one year of postpartum coverage to undocumented birthing people (Health Affairs, 2021).

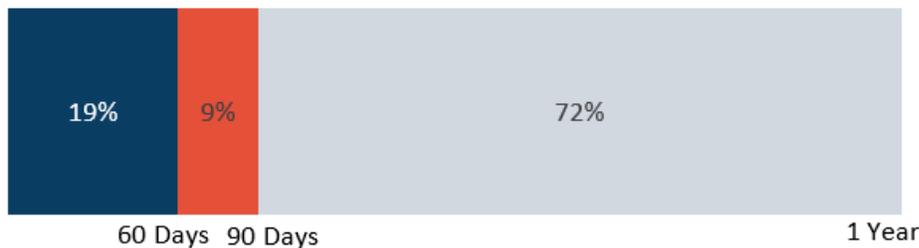
According to the Health Care Cost Institute (2020), birthing parents’ spending spans the full year following childbirth. Although about 20% of overall postpartum spending was in the first 60 days, and about 30% was in the first 90 days, approximately 70% of birthing parents spending occurred over the rest of the year (Figure 2). Spending per person was \$580 and \$870 for the first for the 60 days and 90 days postpartum, respectively. However, over the course of the full postpartum year, per person spending was above \$3,100. Also, the study showed age differences in postpartum spending per person; birthing parents aged 25-34 years (approximately 60% of study sample) had the lowest per person spending of \$2, 904, while birthing parents aged 45-54 years (less than 0.5% of study sample) had a 50% higher average spending of \$4,634 (HCCI, 2020) (Table 5).

Table 5: Full-Year Postpartum Spending by Age Group (2016)

| Age Band (Years) | Average spending per person (2016) | Proportion of sample (2016) |
|------------------|------------------------------------|-----------------------------|
| 18-24 | \$3,667 | 9.9% |
| 25-34 | \$2,904 | 61.4% |
| 35-44 | \$3,373 | 28.2% |
| 45-54 | \$4,634 | 0.4% |

Source: Health Care Cost Institute (2020).

Figure 2: Spending across the postpartum year



Source: Health Care Cost Institute (2020)

3.2 Policy Recommendations and Interventions

A key component of quality is having access to the appropriate care at the right time. Although access and quality are two important ways clinicians can reduce or prevent SMM and maternal mortality, other factors affect the need for, access to, quality and outcomes of maternity care (Kozhimannil, Hardeman & Henning-Smith, 2017).

3.2.1 Medicaid Expansion

Access to health care outside of pregnancy remains a significant challenge for low-income women, rural women, and women of color, especially in the 12 states that are yet to expand Medicaid coverage. With over 50% of pregnancies unplanned among women of all races, preconception care to treat preexisting medical conditions becomes particularly important, especially among racial/ethnic minority women who carry an excessive SMM and maternal mortality burden. The median eligibility limit in 2019 for parents in non-expansion states was 40% FPL or \$8,532 per year for a family of three compared to the minimum parental eligibility limit of 138% FPL or \$29,435 per year for a family of three in states with Medicaid expansion. In non-expansion states, women of childbearing age without a child under 18 years of age (dependent child) or not pregnant are ineligible for health insurance coverage except they have a severe disability.

As of January 2021, the median income eligibility limit for Medicaid in the United States is 200% FPL for the period of pregnancy up to 60 days from the date of delivery, albeit some non-expansion states like Georgia have partial expansions up to 180 days postpartum. While this high-income eligibility limit means that a woman's pregnancy and delivery are covered, the

same woman may be without health insurance coverage before getting pregnant, and in the critical months following delivery, the so-called coverage churn (Daw et al., 2017). The coverage churn experienced by low-income women postpartum is one of the drivers of the high maternal deaths. Some of these women may have pregnancy-related complications due to undiagnosed or untreated/poorly managed preexisting medical conditions that require long-term treatment beyond the 60 days postpartum period of regular Medicaid or the 180 days postpartum Medicaid extension in some states like Georgia. One of the MMRC reports found that 18% of maternal deaths occurred between 43 days and one year after delivery, and 58.3% of the deaths were preventable. Increasing access to care through health insurance coverage pre-pregnancy and up to a year postpartum was recommended to avert maternal deaths (MMRC, 2018).

A systematic review found that Medicaid expansion through the ACA improved access to health care through increased preconception and postpartum coverage with reductions in uninsurance, insurance churn, private insurance, and maternal mortality (Bellerose, Collin & Daw, 2022). Medicaid expansion states that provide coverage for reproductive age women (15-49 years) pre-pregnancy and continuing postpartum have had a steady decrease of about 6 to 7 maternal deaths per 100,000 live births. This reduction in maternal deaths was significantly higher among non-Hispanic Black women (16.27) and Hispanic women (6.01) (Eliason, 2020).

3.2.2 Medicaid Extension

Medicaid extension will also significantly increase access of birthing people to health coverage, and support parent and infant health. The Medicaid extension option allows states to submit a Medicaid SPA to receive FMAP for an additional 10 months of full coverage for

birthing parents after the end of the 60-day postpartum Medicaid and CHIP eligibility. States would receive their regular matching rate for the additional months of coverage. According to CBO estimates in 2020, Medicaid and CHIP provided pregnancy-related coverage to about 2 million women with approximately 1.8 million carrying their pregnancy to term. About 35% of those enrollees have income above 138% FPL. Regardless of whether a state decides to provide optional coverage to eligible parents, it must reevaluate applicants' eligibility for other coverage before the expiration of the 60-day postpartum period (CBO, 2021).

Medicaid Coverage Under the 12-Month Option: Under current law, CBO estimates that after Medicaid pregnancy coverage ends at 60 days postpartum, about HALF of all birthing parents covered (45%) become uninsured. About 30% of postpartum parents continue to receive comprehensive services from Medicaid, and about 30% enroll either in marketplace coverage or in employment-based plans. A lot of pregnant parents become uninsured due to the wide gap in Medicaid eligibility levels in pregnancy (200% FPL on average) compared with other eligibility groups; 138% FPL for Medicaid expansion state parents and an average of 45% FPL for parents in Medicaid non-expansion states. Section 3102 would provide birthing parents in states that exercise the option with 10 additional months of Medicaid coverage.

CHIP Coverage for Pregnant and Postpartum Women: Under current law, states can provide CHIP coverage to eligible pregnant parents and for 60 days postpartum. However, CHIP cannot be used to replace existing Medicaid coverage for pregnant parents. For pregnant parents to be covered under CHIP, states must provide, at a minimum, Medicaid coverage to women whose income is up to 185% FPL. In 2020, about 15,000 birthing parents received pregnancy and postpartum care under CHIP. According to CBO estimates, all those parents became ineligible

for comprehensive Medicaid and CHIP services at the end of the 60-day postpartum period. Also, states can provide CHIP-funded coverage to pregnant parents through a SPA or a continuation of an existing Section 1115 waiver. Six states (Colorado, Missouri, New Jersey, Rhode Island, Virginia, and West Virginia) enroll pregnant women in CHIP-funded coverage (MACPAC, 2022).

Private Health Insurance for Pregnant and Postpartum Women: Some women whose Medicaid coverage ends after the 60-day postpartum period enroll in private health insurance. According to CBO estimates in states that implement the option under section 3102, fewer than 5% of parents who become ineligible each year for Medicaid or CHIP currently have coverage through a marketplace and 30% enroll in employment-based coverage. It is projected that under section 3102 over the 2021-2030 period, approximately 10,000 and 100,000 birthing parents annually would delay enrollment for about 10 months either in marketplace coverage or in employment-based coverage, respectively (CBO, 2021).

3.2.3 Improving the Quality and Safety of Maternal Care

A 2018 report of the CDC based on MMRCs review of 237 maternal deaths in nine states showed that better quality of care could have prevented 63% of the deaths. Most of these maternal deaths resulted from provider, facility, and system factors including inadequate clinical skills, delayed recognition of complications, delayed or ineffective management of obstetric emergencies, and lack of coordination of care between providers (Report of 9 MMRCs, 2018).

In 2015, the federal Maternal and Child Health Bureau (MCHB) funded by the Health Resources and Services Administration (HRSA) formed the Alliance for Innovation in Maternal

Health (AIM). AIM is led by ACOG which collaborates with over 25 national organizations working in 44 states including D.C. and about 1,766 birthing facilities, on the use of maternal safety bundles. AIM operates through state health systems to align national, state, and hospital level efforts to improve maternal safety and health outcomes (ACOG, 2022). The maternal safety bundles are evidence-based best practices and protocols for use in maternity care and obstetric complications in hospital and outpatient settings. These safety bundles are for obstetric hemorrhage, severe hypertension in pregnancy, reduction of cesarean births, heart conditions in maternal care, obstetric care of pregnant and postpartum women with substance use disorder, obstetric blood clots and maternal sepsis. The Maternal Safety Consensus Bundle provides a roadmap for the 4Rs: Readiness, Recognition, Response, and Reporting & Systems Learning. Systems learning includes health systems-wide provider bias (implicit and explicit bias) and teamwork training incorporated into the cultures of all clinical and community areas where birthing parents are being cared for, in addition to raising organizational and individual provider awareness on cultural humility and competency (Howell et al., 2018; Hughes et al., 2016). Through sustained regular education of healthcare providers, improving health provider workforce diversity and holding each other accountable for improving care and health outcomes for racially and ethnically diverse birthing people, the process to shift the narrative in racial inequities at large may begin.

Safety bundles have been shown to reduce racial and ethnic related differences in maternal health outcomes. For instance, a controlled trial of one Quality Improvement (QI) toolkit in California involving 147 hospitals with over 330,000 births annually showed a decrease of 20.8% in SMM from hemorrhage (22.7 vs. 18.0 SMMs per 100 hemorrhage cases)

at intervention hospitals compared with a 1.2% decrease at nonintervention hospitals. Between 2006-2013, overall maternal deaths in the state decreased by 57% (16.9 vs. 7.3 maternal deaths per 100,000 live births); maternal deaths among non-Hispanic Black women also reduced by about 50% (51.0 vs. 26.4%) (Main, 2018). AIM has the goal of making every birthing hospital and facility in the U.S. use these safety bundles to reduce maternal mortality by 50% by 2025.

3.2.4 Doula Support

Access to doula support for pregnant and postpartum Black women has historically also been limited despite the known benefits, such as lower rates of cesarean delivery, lower rates of forceps or vacuum deliveries, childbirth education and preparedness, labor support and advocacy, decreased use of epidural/pain medication in labor, shorter labor hours, fewer complications, improved birth outcomes, and decreased maternal stress (Kozhimannil et al., 2014; Thomas et al., 2017). Non-medical doula support in maternity care delivery systems could improve satisfaction, reinforce positive relationships, and reverse the negative associations between lack of access to social determinants of health and birth outcomes (Kozhimannil et al., 2016b). Doula services are not usually covered under currently available traditional health insurance plans including Medicaid, which contributes to inequities in access due to financial barriers (Hans, Edwards & Zhang, 2018; Kozhimannil & Hardeman, 2016a). Currently, Minnesota and Oregon have Medicaid coverage for doula services with clear ethical, equity, and financial rationale for the policy (Kozhimannil & Hardeman, 2016a). However, there has been a few bottlenecks in the implementation of the policy with attention required to payment rates, doula enrollment processes, reimbursement requirements, diversity, and distribution of workforce (Kozhimannil, Vogelsang & Hardeman, 2015).

3.2.5 Improved Surveillance and Data Collection

Another factor driving the high rates of SMM and maternal mortality in the U.S. is the general lack of good and sufficient data for related analysis on maternal and infant health outcomes. In 2015, only half of the states in the U.S. had MMRCs, and the data collected is not systematically used to guide changes aimed at reducing maternal morbidity and mortality. There was no national forum for the states to share either their best practices for reviewing maternal deaths or the relevant lessons that they may have learned (Agrawal & WHO, 2015). According to the Commonwealth Fund (2020), it is surprising that maternal mortality data are missing for about 50% of all U.S. states and territories, and the expectation is that subsequent annual reports will combine multiple years to enable the comparison of all states (Declercq & Zephyrin, 2020). A lot of Medicaid and commercial insurance data consist of limited individual characteristics; race and ethnicity data are sometimes missing in the commercial insurance data, and similarly, geographic information data is sometimes missing in the Medicaid data (Chen et al., 2021).

Available evidence shows the prevalence of widespread low-value care among U.S. residents, leading to unnecessary medical expenses and even harm. State-level policies should be evaluated to reduce low-value care by mandating medical error reporting and validation, and use of claims data and electronic health records to measure low-value care (Health Affairs, 2022). The California Maternal Quality Care Collaborative (CMQCC) formed in 2006 to address rising maternal deaths and complications in the state is a case in point. Formed as a public-private partnership to lead maternal quality improvement activities, the CMQCC took steps over the next 10 years to link public health surveillance to actions: mobilized a wide range of

public and private partnerships; developed a rapid-cycle Maternal Data Center to support and sustain quality improvement initiatives; and implements a series of data-driven large-scale quality improvement programs. Significantly, while the maternal mortality rate in the U.S. worsened in the 2010s, by 2013 California's maternal mortality rate was reduced by 50% to a three-year average of 7.0 maternal deaths per 100,000 live births: comparable to the average rate of 7.2 per 100,000 live births in Western Europe (Main, Markow & Gould, 2018).

Maternal levels of care and variability in quality of care must be empirically examined. Research is needed to study the location of childbirth and outcomes of care and the drivers of variability in quality of care. Attention should focus on differences between rural and urban contexts in maternal levels of care and variability in obstetric procedure utilization in birthing facilities (Kozhimannil et al., 2016a; Kozhimannil, Hardeman & Henning-Smith, 2017).

3.2.6 Do Nothing

This means to continue with the status quo which is both unsustainable and not evidence-based best practice.

4 DISCUSSION AND CONCLUSION

4.1 Discussion

Data and research drive policy analysis, review, and advocacy. This policy analysis and review used evidence from the studies of Chen et al. (2021) and Petersen et al. (2019). The retrospective cohort study of Chen et al. used a sample of 2,667,325 women with delivery hospitalizations in the U.S. from 2010-2014 and found that SMM developed de novo within 6 weeks after delivery discharge in 14% and 16% of individuals with commercial and Medicaid insurance coverage, respectively. The study found differences in the factors and maternal characteristics associated with SMM at delivery and after delivery or discharge: although Black women, Hispanic women, and women of other races/ethnicities had higher rates of SMM during delivery hospitalization than White women, it was only the disparity between Black and White women that persisted into the post-discharge period. Also, residing in the western region of the U.S. during delivery hospitalization was associated with a higher likelihood of SMM (aOR 1.37) compared with residing in the northeastern region; and residing in the southern region of the U.S. after delivery hospitalization was associated with a higher likelihood of SMM (aOR 1.29) compared with the northeastern region. The authors concluded that focus on SMM assessment should be extended to the postdelivery discharge period for opportunities to improve maternity care.

Peterson et al. used data from CDC's national Pregnancy Mortality Surveillance System (PMSS) from 2011–2015 to calculate: PRMRs per 100,000 live births overall and by sociodemographic characteristics; distribution of pregnancy-related deaths by timing relative to the end of pregnancy; and leading causes of death. The national PRMR was 17.2 per 100,000

live births; Black women (42.8) and American Indian/Alaska Native women (32.5) had the highest PRMRs, 3.3 and 2.5 times higher, respectively, than the PRMR for White women (13.0).

Timing of death was also known in 87.7% of pregnancy related deaths: during pregnancy (31.3%), on day of childbirth (16.9%), 1-6 days after childbirth (18.6%), 7-42 days after childbirth (21.4%), and 43-365 days after childbirth (11.7%). The authors also used detailed data on pregnancy-related deaths between 2013–2017 from 13 state MMRCs to analyze:

preventability and contributing factors to pregnancy-related deaths. The state MMRCs found that pregnancy-related deaths did not differ significantly by race/ethnicity or timing of death, and that 60% of these maternal deaths were preventable. The CDC concluded that since pregnancy-related deaths occurred during pregnancy, around the time of childbirth and up to a year after childbirth, strategies to address contributing factors to SMM and pregnancy-related deaths should be multidimensional: at the patient, provider, health facility, community, and system levels.

Evidence from both studies used in this policy analysis and review shows that access to good quality healthcare preconception (to treat preexisting conditions), in pregnancy, during childbirth and up to a year postpartum is imperative to address the high rates of SMM and pregnancy-related mortality in the U.S. Daw et al. (2017) showed that health insurance coverage churn experienced by low-income women preconception and in the critical period after childbirth is one of the drivers of pregnancy-related morbidity and mortality. A systematic review by Bellerose, Collin & Daw (2022) found that *Medicaid expansion* through the ACA improved maternal healthcare access preconception and postpartum with reductions in uninsurance, insurance churn, private insurance (cost savings), and maternal mortality.

Medicaid expansion states have had a steady decrease of about 6-7 maternal deaths per 100,000 live births: reduction in maternal deaths was significantly higher among Black women (16.27) and Hispanic women (6.01) (Eliason, 2020). *Medicaid extension* will also significantly increase access of birthing people to health coverage, and support parent and infant health. Daw et al. (2020) showed that Black, Indigenous, and people of color (BIPOC) experience higher rates of disruptions in perinatal insurance than White birthing parents. Medicaid extension by states is permitted by current federal law through a SPA or the 1115 waiver process, however, SPA has several advantages for states and birthing parents: SPA option provides coverage for the entire population of birthing people unlike a segment of the population (e.g., substance use treatment) by waivers; SPA extends coverage to a year postpartum with full benefits unlike waivers that have varying durations and benefits (e.g., 6 months extension); SPA ensures consumer protection under federal law (e.g., no cost sharing) unlike waivers without such protections; SPA would provide federal matching funds for additional expenses incurred by states unlike waivers that have budget neutrality and states must show that that federal costs would not be increased; SPA has administrative simplicity and provides parallel two-generation continuous coverage and eligibility in Medicaid-financed birth for birthing parents and their infants (APHA, 2021).

Evidence shows the effectiveness of maternal safety bundles in improving safety and quality of maternal care. Use of safety bundles reduced SMM from hemorrhage (20.8%), maternal deaths (57%), and racial/ethnic differences in maternal outcomes; maternal deaths among non-Hispanic Black women also reduced by about 50% (51.0 vs. 26.4%) (Main, 2018).

The Maternal Safety Consensus Bundle provides standardized evidence-based best practices and protocols for use in maternity care and obstetric complications and a roadmap for the 4Rs: Readiness, Recognition, Response, and Reporting & Systems Learning. Systems learning includes health systems-wide provider bias and teamwork training incorporated into the cultures of all clinical and community areas where birthing parents are being cared for, in addition to raising organizational and individual provider awareness on cultural humility and competency (Howell et al., 2018; Hughes et al., 2016).

Doula support for pregnant and postpartum birthing parents has been shown to: reduce the rates of cesarean deliveries; reduce the rates of operative vaginal deliveries (forceps or vacuum); improve childbirth education and preparedness; provide labor support and advocacy for birthing parents; decrease use of painkillers in labor; reduce birth-related complications; and improve birth outcomes (Kozhimannil et al., 2014; Thomas et al., 2017). Doula services should be covered by traditional insurance plans including Medicaid as done currently in Minnesota and Oregon (Kozhimannil & Hardeman, 2016a).

Improved surveillance and data collection by including race and ethnicity data in commercial insurance data collection, and geographic location information in all Medicaid data collection processes. All states should have a rapid-cycle Maternal Data Center to support and sustain quality improvement initiatives and implement a series of data-driven large-scale quality improvement programs as was done in California with improved maternal health outcomes (Main, Markow & Gould, 2018).

Limitations of the studies: The retrospective cohort study of Chen et al. (2021) has some limitations. First, the Medicaid data was obtained from multiple unknown states in the U.S.

which may affect the representativeness of the results regarding de novo SMM rates postdelivery discharge, and geographic and racial disparities. The commercial database used for the study comprised a convenience sample of the U.S. population. Second, study data had limited individual characteristics: race and ethnicity are missing in commercial insurance data while geographic information is missing in Medicaid data. Third, the diagnosis and procedure codes in administrative databases are recorded for billing and not research purposes. Fourth, restriction of study sample to individuals with continuous insurance enrollment for at least 6 weeks post hospital discharge reduced sample size by 11% in the Medicaid cohort and 6% in the commercial insurance cohort which may have biased the estimates of SMM rates by timing of diagnosis upward or downward.

The Morbidity and Mortality Weekly Report (MMWR) of the CDC by Petersen et al. (2019) has some limitations. First, errors in reported pregnancy status could lead to overestimation or underestimation of pregnancy-related deaths. Second, aside from data for White women and Black women, data for other races or Hispanic origin have inconsistencies of reporting on death certificates and surveys. Third, pregnancy-relatedness in PMSS for cancer-related deaths or injury-related deaths like homicides, suicides, or drug overdose have paucity of information on circumstances of these deaths and is the reason why they are often not included in PRMR. Fourth, not all preventable deaths according to the MMRCs had a prevention strategy to address the contributing factors.

Areas for Further Research: Future research should expand focus of SMM assessment to the post-hospital discharge period for new insights into the burden of post birth morbidity. More robust data collection on death certificates about the circumstances of maternal death is

needed because MMRC data found suicides and drug overdoses to be a leading predisposing cause of pregnancy-related mortality (Zaharatos et al., 2018) and a comprehensive review of all pregnancy-related deaths can lead to identification of the contributing factors and implementation of strategies to prevent future events.

4.2 Conclusion

Evidence shows that over half of the cases of SMM and pregnancy-related mortality in the U.S. are preventable. A key component of quality is having access to the appropriate care at the right time, especially by low-income Black, Indigenous and people of color (BIPOC). Although access and quality are two important ways clinicians can reduce or prevent SMM and maternal mortality, other factors affect the need for, access to, quality and outcomes of maternity care. Medicaid expansion ensures that all individuals in a state at or below 138 FPL have access to preventive care and management of any preexisting health conditions that may cause complications in pregnancy, during childbirth, and for varying periods postpartum. Medicaid coverage extension postpartum for one year is imperative as evidence shows that 11.7% of pregnancy-related deaths occur between 43-365 days after childbirth. Medicaid postpartum extension through SPA in the ARP rather than Medicaid extension waiver 1115 is preferable because it offers birthing parents and their infants a parallel pathway for dual continuous coverage with full benefits for a year after childbirth, with no copays, ease of application for states, and federal matching funds for additional expenses incurred by states without budget neutrality. The maternal safety bundles are evidence-based best practices and protocols that should be standardized for use in maternity care and obstetric complications in

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hospital and outpatient settings nationwide. Evidence shows that it reduced hemorrhage related SMM by 20.8%, maternal deaths by 57% and Black maternal deaths by 50%. The Maternal Safety Consensus Bundle provides a roadmap for the 4Rs: Readiness, Recognition, Response, and Reporting & Systems Learning. Systems learning includes health systems-wide provider bias and teamwork training. Doula support in pregnancy, during childbirth and the postpartum period has been shown to reduce the rates of cesarean section, use of analgesia in labor, poor maternal and infant outcomes, especially among BIPOC. There should be Medicaid coverage for doula services nationwide as currently practiced in Minnesota and Oregon. There should be federal and state policies on improved surveillance and data collection for maternity care. Rapid-cycle Maternal Data Center should be developed to support and sustain quality improvement initiatives for maternity services nationwide with implementation of data-driven quality improvement programs. Policies should mandate medical error reporting and validation, and use of claims data and electronic health records to measure low-value care.

In conclusion, to reduce the huge annual cost of childbirth and newborns in the U.S. estimated at over \$10 billion, improvement in healthcare access and provision of evidence-based interventions to birthing people preconception, in pregnancy, during childbirth, and postpartum is imperative to reduce the high rates of adverse maternal and infant outcomes.

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APPENDICES

Appendix A

Key Terms and Definitions

Maternal Mortality: Deaths during pregnancy and up to 42 days after childbirth that are from causes related to pregnancy. This definition is used by the World Health Organization (WHO) for international comparisons and reported as a ratio per 100,000 live births.

Pregnancy-Related Mortality: Deaths during pregnancy and up to one year after childbirth that are from causes related to pregnancy. This definition is used by the Centers for Disease Control and Prevention (CDC) to report trends in the U.S. per 100,000 live births.

Pregnancy-Associated Mortality: Deaths during pregnancy and up to one year after childbirth, irrespective of cause.

Preventable Death: A death is considered preventable if the Maternal Mortality Review Committee determines that there was some chance of the death being averted by one or more reasonable changes to patient, community, provider, health facility, and/or system factors.

Severe Maternal Morbidity: Unexpected outcomes of labor and delivery that result in significant short- or long-term consequences to a woman's health. It could be a life-threatening diagnosis or a lifesaving procedure.

Birthing People/Parent: Women and individuals who are pregnant, and those who give birth to a child. This is an inclusive term in recognition that not all individuals who become pregnant and give birth identify as women.

Sources: Birthing People/Parent (O'Neil et al., 2021); Maternal Mortality, Pregnancy-Associated Mortality, Pregnancy-Related Mortality (Commonwealth Fund, 2020); Severe Maternal Morbidity (Kilpatrick, Ecker, J. L., & ACOG, 2016); Preventable Death (Petersen et al., 2019).