Women's Health Issues 31-3 (2021) 245–253

ELSEVIER

WOMEN'S HEALTH ISSUES

www.whijournal.com

Health Equity

Race, Medicaid Coverage, and Equity in Maternal Morbidity

Clare C. Brown, PhD, MPH [a,*], Caroline E. Adams, BS [b], Jennifer E. Moore, PhD, RN, FAAN [b,c]

[a] University of Arkansas for Medical Sciences, Little Rock, Arkansas
[b] Institute for Medicaid Innovation, Washington, District of Columbia
[c] University of Michigan Medical School, Department of Obstetrics & Gynecology, Ann Arbor, Michigan

Article history: Received 12 May 2020; Received in revised form 10 November 2020; Accepted 15 December 2020

A B S T R A C T

Background: Severe maternal morbidity (SMM) affects 50,000 deliveries in the United States annually, with around 1.5 times the rates among Medicaid-covered relative to privately covered deliveries. Furthermore, large racial inequities exist in SMM for non-Hispanic Black women and Hispanic women with rates being 2.1 and 1.4 times higher than White women, respectively. This study aimed to compare the differences in SMM among women of different races/ethnicities and delivery insurance types. Quantifying the rates of SMM based on the intersection of race/ethnicity and insurance status can help to elucidate how multiple forms of oppression and racism may contribute to the substantial inequities in SMM among Black women.

Methods: Using hospital discharge data from the Healthcare Cost and Utilization Project National Inpatient Sample (years 2016 and 2017), we conducted multivariate logistic models to evaluate equity in maternal outcomes among women with different primary payers, overall and stratified by race/ethnicity.

Results: We found a rate of SMM equal to 138.3 per 10,000 deliveries. Differences in the rate of SMM among non-Hispanic Black, non-Hispanic Asian, and Hispanic women relative to White women were lower among Medicaid-covered deliveries relative to deliveries of all payer types. For example, among all payers, Black women had 2.17 (221.3 vs. 102.1 per 10,000) times the rate of SMM compared with White women; however, among Medicaid-covered deliveries, Black women had 1.84 (227.3 vs. 123.2) times the rate. Despite increased risk associated with Medicaid coverage (adjusted odds ratio, 1.12; 95% confidence interval, 1.07–1.16), the risk was no longer significant in the stratified regression including Black women (adjusted odds ratio, 1.06; 95% confidence interval, 0.98–1.15).

Conclusions: Our findings suggest that Black women with Medicaid do not have higher rates of SMM relative to Black women with private insurance. National and state policy efforts should continue to focus on addressing structural racism and other socioeconomic drivers of adverse maternal outcomes, including barriers to high-quality care among women with Medicaid coverage.

Equity, defined as the absence of avoidable or remediable differences among groups of people, is a critical concept in health care, as pursuance of equity is necessary for allowing all people a fair opportunity to attain their highest level of health (World Health Organization, 2020). Racism at the interpersonal, institutional, and structural levels has been recognized as a root cause of racial inequity in maternal health outcomes (Prather, Fuller, Marshall, & Jeffries, 2016; Wang, Glazer, Howell, & Janevic, 2020). Structural racism is closely interlinked with economic, social, and gender-related oppression, compounding barriers to health and health care for Black and Hispanic women, as well as women of other non-White races and ethnicities. Maternal mortality and severe maternal morbidity (SMM) have garnered important national momentum and attention in the United

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors. C.C.B. received support from the Arkansas Center for Health Disparities (ARCHD), which is supported by the National Institute on Minority Health and Health Disparities (NIMHD) of the National Institutes of Health (NIH) (award ID number: 5U54MD002329).

Declaration of Conflicts of Interest: C.C.B. serves as a research fellow for the Institute for Medicaid Innovation.

Institutional Review Board: This study was deemed nonhuman subjects research by the University of Arkansas for Medical Sciences Institutional Review Board (#260999).

* Correspondence to: Clare C. Brown, PhD, MPH, University of Arkansas for Medical Sciences, Department of Health Policy and Management, 4301 Markham St Slot 820-12, Little Rock, AR, 72205.

E-mail address: cbrown3@uams.edu (C.C. Brown).

1049-3867/$ - see front matter © 2020 Jacobs Institute of Women's Health. Published by Elsevier Inc.
https://doi.org/10.1016/j.whi.2020.12.005

States owing to an increasing awareness of concerning disparities and inequities.

SMM, defined as unexpected outcomes of labor and delivery that result in significant short- or long-term consequences, almost tripled in the United States from 1993 to 2014 (49.5 vs. 144.0 per 10,000 deliveries) (Centers for Disease Control and Prevention [CDC], 2020). In 2015, the rate of SMM among non-Hispanic Black (hereafter "Black") women was more than twice the rate among non-Hispanic White (hereafter "White") women (240.7 vs. 113.6 per 10,000), and the rate of SMM among Hispanic women (161.3) was 1.4 times as high (Fingar, Hambrick, Heslin, & Moore, 2018). Given the higher rates of SMM among Black and Hispanic women relative to White women, as well as the greater case-fatality rates from pregnancy-related complications, particularly among Black women, understanding the differences in the rates of SMM among women of differing races and ethnicities may be critical for decreasing the racial inequity in maternal mortality and morbidity (Conrey et al., 2019; Howell, 2018).

It is estimated that approximately half of the cases of SMM and maternal mortality may be preventable with timely and appropriate management of the woman's health (Howell, 2018). Risk factors for SMM are multifaceted and complex; however, many of the factors associated with racial inequity in maternal health among races may be rooted in structural racism, which can impact SMM through multiple individual-level and health care system–level factors. Economic inequity owing to the growing unequal distribution of wealth in the United States has also been an increasing concern for maternal health and SMM. For example, Black women and Hispanic women are more likely to be uninsured or to have Medicaid coverage, and women with Medicaid coverage have relatively higher rates of SMM compared with women with private coverage (Fingar et al., 2018). Furthermore, Black women are more likely to deliver at a hospital with a worse quality of care, to face individual-level stressors such as discrimination and implicit bias in the clinical settings, or to be impacted by the accumulation of such discrimination and stressors over their lifetimes (Howell, Egorova, Balbierz, Zeitlin, & Hebert, 2016; Martin, Hamilton, Osterman, Driscoll, & Drake, 2018).

Dismantling structural racism in health care requires evaluation grounded in the concept of intersectionality, which suggests analyses should not define individuals solely by gender, economic status, or race (Ford & Airhihenbuwa, 2010). It is necessary to understand and assess how individuals may be impacted by multiple systems of oppression and racism simultaneously, which may have a compounding effect that further exacerbates inequity associated with any single oppressing system. For example, for non-White women, the confluence of racism, sexism, and other systemic barriers contributes to income inequity, which impacts insurance status and increases the likelihood of other coexisting barriers. Ultimately, both racism and oppression need to be addressed together to effectively protect the health of women in an equitable manner. Given differences in proportions of each insurance coverage type among women of different races and ethnicities, understanding the differences in rates of SMM among women with different expected primary payer and of different races/ethnicities may provide insight into the associations of structural racism and oppression on inequities in SMM.

This study used data from the Healthcare Cost and Utilization Project (HCUP) National Inpatient Sample (NIS) for 2016 and 2017 to describe the associations between expected primary payer and race/ethnicity with the risk of SMM. Previous analyses have examined trends and characteristics in SMM over time and across relevant patient- and hospital-level variables, including race and primary payer. Our study adds to this literature by evaluating the most currently available data and by describing differences in SMM by both race/ethnicity and payer. Race is a social construct. Differences found by race/ethnicity should not be attributed to race/ethnicity itself, but rather root causes such as structural racism and other systemic oppressors that contribute to inequities in access to care and health outcomes (Ford & Airhihenbuwa, 2010).

Methods

Data

The data used in this study included hospital discharge data obtained from the HCUP NIS for 2016 and 2017. The NIS, produced by the Agency for Healthcare Research and Quality, contains a 20% sample of hospital discharges among target hospitals and can be used to obtain national hospitalization estimates in the United States (HCUP, 2019). The NIS includes hospital information, patient demographics, and patient clinical information based on diagnosis and procedural codes using the *International Classification of Diseases, Tenth Revision, Clinical Modification/Procedure Coding System* (ICD-10). Our study included 2016 and 2017 because these 2 years of data are the most recently distributed and represent the first two full years of data since the adoption of ICD-10.

Sample Population

Our study identified delivery hospitalizations using an enhanced method based on selected diagnosis codes, diagnosis related group codes, and procedure codes (Kuklina et al., 2008). We identified a total of 1,501,606 delivery hospitalizations with one of the following: a delivery diagnosis code (O80, O82), outcome of delivery diagnosis code (Z370-Z374, Z3750-Z3754, Z3760-Z3764, Z3759, Z3769, Z377, Z379), diagnosis related group code (765–768, 774, 775), or vaginal or cesarean delivery procedural code (10D00Z0-10D07Z8, 10E0XZZ). We excluded deliveries with an abortion diagnosis (O00-O0899; $n = 3,360$) and deliveries with missing information for age ($n = 77$), place of residence ($n = 3,971$), ZIP code income ($n = 10,681$), primary expected payer ($n = 1,891$), or race/ethnicity ($n = 78,872$). An additional 19,889 deliveries were excluded for those who transferred into or out of the hospital, resulting in a final sample of 1,382,865 deliveries (weighted $n = 6,914,317$).

Outcome Measures

Our primary outcome measure was SMM identified using the CDC SMM indicator list (CDC, 2020). This algorithm uses ICD-10 codes to identify 16 diagnosis-based and 5 procedural-based SMM indicators.

Following previous studies, all deliveries with at least one procedure-based indicator were identified as SMM; however, deliveries with only diagnosis-based indicators additionally must have had a) in-hospital death, b) a cesarean delivery with a length of stay of 5 days or more, or c) a vaginal delivery with a length of stay of 3 days or more (Admon et al., 2018; Lazariu, Nguyen, McNutt, Jeffrey, & Kacica, 2017).

As a robustness check, based on guidance from the CDC, we also conducted all analyses on a measure of SMM that excluded deliveries with only a blood transfusion. This measure of SMM was calculated identically to the overall measure of SMM with one exception: blood transfusion (one of the five CDC procedural-based indicators) was no longer counted as an indicator for SMM. This second measure of SMM is used among other evaluations, including those by the CDC (CDC, 2020), to ensure a valid measurement of SMM. Specifically, blood transfusion is intended to identify hemorrhage; however, using blood transfusions alone may incorrectly identify a delivery as having SMM.

Covariate Measures

Covariates specific to an individual woman included age, race and ethnicity, expected primary payer, presence of any comorbidity, delivery type (i.e., cesarean or vaginal), median household income at the ZIP code level, and location of residence (i.e., large metropolitan, small or medium metropolitan, micropolitan, or rural) based on ZIP code. Any comorbidity was defined by the Elixhauser comorbidity algorithm provided by HCUP. Specifically, a person was indicated to have any comorbidity if they had any one of the Elixhauser comorbidity measures that do not have diagnosis codes that overlap with diagnosis codes used to calculate the SMM indicators. Individuals with one of four excluded comorbidities (congestive heart failure, coagulation deficiency, pulmonary circulation disorders, and peripheral perivascular disease) and with no other Elixhauser comorbidity were indicated as having no comorbidity. Similarly, hypertensive encephalopathy was removed from the combined hypertension comorbidity, such that an individual with only hypertensive encephalopathy was indicated as not having a comorbidity. These exclusions decreased the percent of deliveries with any comorbidity from 35.2% to 34.0%. Deliveries that had a primary expected payer of self-pay or no charge (n = 33,368) were categorized as having an other expected payer.

Hospital characteristics included census region, ownership, location (i.e., rurality) and teaching status, safety net hospital designation, and minority-serving hospital designation. Safety net hospitals included hospitals in the top quartile of hospitals in terms of the percentage of discharges that were Medicaid or self-pay, and minority-serving hospitals included hospitals in the top quartile of hospitals in terms of the percentage of discharges that were to individuals who were not of White race. Designations were determined for each year separately.

Statistical Analysis

Descriptive statistics included percentages and Wald χ^2 tests to test for differences in characteristics among deliveries with and without SMM. Bar charts were constructed to provide rates of SMM stratified by race and by payer and additionally include the percent of deliveries that fall within a given primary payer category for each race/ethnicity.

Multivariate logistic regressions were estimated to describe the association of patient-level and hospital-level characteristics and the likelihood of SMM overall and separately for White (unweighted = 727,838; weighted = 3,639,185), Black (unweighted = 207,547; weighted = 1,037,735), and Hispanic (unweighted = 285,419; weighted = 1,427,093) women.

Analyses were completed using survey procedures in SAS 9.4 (SAS, Inc, Cary, NC) to account for the complex survey design of NIS data. Specifically, the NIS data includes information that accounts for stratification based on the hospital census division, clustering at the hospital level, and discharge weights that can be used to derive national estimates (HCUP, 2019). Visualizations were created using Tableau 2019.4. Statistical significance was assumed at a p value of less than .05. This study was deemed nonhuman subjects research by the institutional review board at the first author's institution (#260999).

Results

Among the 1,382,865 delivery hospitalizations in our study, we identified 19,120 cases of SMM representing a rate of SMM equal to 138.3 per 10,000 deliveries. Deliveries were most commonly to individuals who were aged 20–29 years (49.2%), White (52.6%), and privately insured (50.5%) (Table 1). The rate among Black women was 2.2 times the rate among White women (221.3 vs. 102.1 per 10,000; $p < .001$), and the rates among Hispanic women (160.9) and Asian women (151.4) were 1.6 and 1.5 times the rate among White women, respectively.

To better understand the relationship between race, payer, and SMM, we created bar charts to indicate rates of SMM stratified by payer and by race. Figure 1 suggests that, regardless of payer, rates of SMM among Black women were higher than among women of any other race/ethnicity, and rates were lowest among White women. However, when describing differences in rates between races/ethnicities within a given payer relative to the differences among all payers, the differences between SMM rates of Black, Hispanic, and Asian women and the rate among White women were lower in the Medicaid group. For example, among all payers, the ratio of the rate of SMM among Black women to White women was 2.17 (221.3 vs. 102.1 per 10,000) (Figure 1); however, among Medicaid-covered births, the ratio was 1.84 (15% lower).

Relatedly, the difference in the rate of SMM among Black women with Medicaid and the rate among Black women with private insurance was smaller than the difference between rates among Medicaid relative to privately covered births for White, Asian, and Hispanic women. The rate of SMM among Black women with Medicaid was 1.13 times the rate among Black women with private insurance (Figure 1; 227.3 vs. 201.3 per 10,000; not statistically significant indicated by overlapping 95% confidence intervals [CIs]). This difference is 23% smaller than the relative difference (1.47 times) among Medicaid-covered births versus privately covered births among women of all races (Table 1; 166.6 vs. 112.7; $p < .05$) and 17% smaller than the difference (1.36 times) among White women (Figure 1; 123.2 vs. 90.9 per 10,000; $p < .05$). Additionally of note is that 64% of births to Black women as well as 64% of births to Hispanic women were Medicaid-covered compared with 30% of deliveries to White women.

Table 2 provides adjusted regressions for SMM overall and stratified by race/ethnicity. White women had lower rates of SMM relative to any other racial/ethnic group. Specifically, relative to White women, Black women (adjusted odds ratio [aOR], 1.47; $p < .001$), Asian women (aOR, 1.55; $p < .001$), and Hispanic women (aOR, 1.30; $p < .001$) had increased odds of SMM. The factor with the largest association with SMM was having any of the defined Elixhauser comorbidities (aOR, 5.54; $p < .001$). Deliveries to women in the Midwest (aOR, 0.68; $p < .001$), the South (aOR, 0.79; $p < .001$), or the West (aOR, 0.78; $p < .001$) had lower odds of SMM relative to women who live in the Northeast, and deliveries in private and urban hospitals had lower rates of SMM relative to deliveries in public hospitals or rural hospitals,

Table 1
Demographic Characteristics and Rates of Maternal Morbidity per 10,000 Deliveries (Unweighted $n = 1{,}382{,}865$; Weighted $n = 6{,}914{,}317$)

Patient Characteristics	%	Severe Maternal Morbidity per 10,000 Deliveries*	Severe Maternal Morbidity, Excluding Blood Transfusions per 10,000 Deliveries*
Age, years			
<20†	5.4	194.0	44.0
20–29	49.2	130.1	33.8
30–39	42.3	132.8	47.2
≥40	3.1	243.8	101.3
Race/ethnicity‡			
Non-Hispanic White†	52.6	102.1	31.4
Non-Hispanic Black	15.0	221.3	71.1
Hispanic	20.6	160.9	45.9
Non-Hispanic Asian	6.4	151.4	49.7
Other	5.3	158.2	43.6
Payer			
Private†	50.5	112.7	35.8
Medicaid	43.7	166.6	48.7
Medicare	0.7	280.4	126.4
Other (including self-pay)	5.1	127.8	37.3
Any comorbidity§			
No†	66.0	48.3	16.3
Yes	34.0	313.0	92.4
Delivery type			
Vaginal†	67.6	76.2	17.9
Cesarean section	32.4	267.9	92.7
Median household income quartile‖			
1	28.9	172.0	48.5
2	24.9	133.8	41.7
3	24.3	123.3	38.8
4†	21.8	115.3	38.0
Location of residence			
Large metropolitan†	58.7	145.8	47.1
Small/medium metropolitan	28.5	123.1	37.8
Micropolitan	7.7	138.9	29.6
Rural (noncore)	5.2	135.5	28.6
Hospital characteristics			
Region			
Northeast†	16.4	170.6	49.1
Midwest	20.2	105.0	37.6
South	40.0	144.1	40.3
West	23.3	134.5	44.4
Ownership			
Public†	11.9	185.8	53.3
Private nonprofit	73.8	134.9	42.2
Private for profit	14.3	116.2	32.4
Location/teaching status			
Rural†	9.0	137.9	18.3
Urban nonteaching	23.9	113.1	29.6
Urban teaching	67.1	147.2	49.7
Safety net hospital¶			
No†	63.8	118.2	37.4
Yes	36.2	173.7	50.5
Minority-serving hospital¶			
No†	66.0	115.6	36.0
Yes	34.0	182.3	54.0

Authors' analysis of data from the Healthcare Cost and Utilization Project, National Inpatient Sample, years 2016 and 2017. Severe maternal morbidity (SMM) was identified using the Centers for Disease Control and Prevention SMM indicator list. SMM without Blood Transfusion indicates that a delivery with only a blood transfusion indicator, and no other SMM indicator, was identified as not having SMM.

* All tests for differences in rates between different characteristics were significant at a value of $p < .001$.

† Reference category in multivariate regressions.

‡ Race/ethnicity excluded in regressions on group analyses evaluating deliveries within race/ethnicities.

§ Any comorbidity among 25 Elixhauser comorbidity measures, which excluded congestive heart failure, coagulation deficiency, hypertensive encephalopathy, pulmonary circulation disorders, and peripheral perivascular disease.

‖ Household income is measured as the median household income at the ZIP code level, and it is based on the woman's location of residence.

¶ Safety net and minority-serving hospital designations include hospitals in the top quartile of hospital discharges with Medicaid payment and women who were not of White race, respectively. Designations were determined for each year separately.

respectively. There was increased risk of SMM associated with delivering in a safety net hospital (aOR, 1.12; $p = .001$) or delivering in a minority-serving hospital (aOR, 1.24; $p < .001$). For CIs and p values, refer to Appendix A and Appendix B.

Associations were largely of similar magnitude and significance across the regressions stratified by race, relative to findings from the adjusted regressions before stratification (Table 2). Of note is that the increased odds of SMM for Medicaid-covered deliveries relative to privately covered deliveries was no longer significantly different among the group of Black women for SMM (Table 2) or for SMM excluding blood transfusions (Table 3). However, there was not a statistical difference in the odds of SMM associated with Medicaid among all women (aOR, 1.12; 95% CI, 1.07–1.16) compared with the risk among Black women (aOR, 1.06; 95% CI, 0.98–1.15), given the overlapping CIs.

Robustness Check: Evaluation of SMM Excluding Blood Transfusions

Analyses of the second SMM measure, which did not count deliveries with only a blood transfusion as having SMM (Table 2), were largely the same as the primary analyses (Table 3). A bar chart similar to Figure 1 but for SMM excluding deliveries with only blood transfusion can be found in Appendix C, and CIs from the regressions can be found in Appendix A and Appendix D. There were three primary differences in the findings associated with the two SMM outcomes. First, the risk of SMM (Table 2) associated with the youngest two age categories was significantly lower in the SMM measures excluding blood transfusions (Table 3). Specifically, the risk of SMM among women younger than age 20 (aOR, 1.62; 95% CI, 1.52–1.72) and for women aged 20–29 years (aOR, 1.02; 95% CI, 0.99–1.06) was lower for the SMM outcome that excluded blood transfusions (aOR, 1.14 [95% CI, 1.01–1.29] and aOR, 0.78 [95% CI, 0.73–0.82], respectively). Second, the risk of SMM associated with having any comorbidity (aOR, 5.54; 95% CI, 5.32–5.76) was lower (aOR, 4.30; 95% CI, 4.04–4.58) for the SMM excluding blood transfusion outcome, and the risk associated with having a cesarean section (aOR, 2.89; 95% CI, 2.79–2.98) was higher (aOR, 4.11; 95% CI, 3.87–4.37). Finally, the risk of SMM associated with the hospital being an urban nonteaching hospital (aOR, 0.88; 95% CI, 0.79–0.99) or an urban teaching hospital (aOR, 0.89; 95% CI, 0.80–0.99) was in the opposite direction for the SMM outcome that excluded blood transfusions (aOR, 2.00, 95% CI, 1.66–2.41 and aOR, 2.71; 95% CI, 2.27–3.25, respectively).

Discussion

This study evaluated the rates of SMM among delivery hospitalizations to women of different races/ethnicities and with different expected primary payers. Similar to previous research

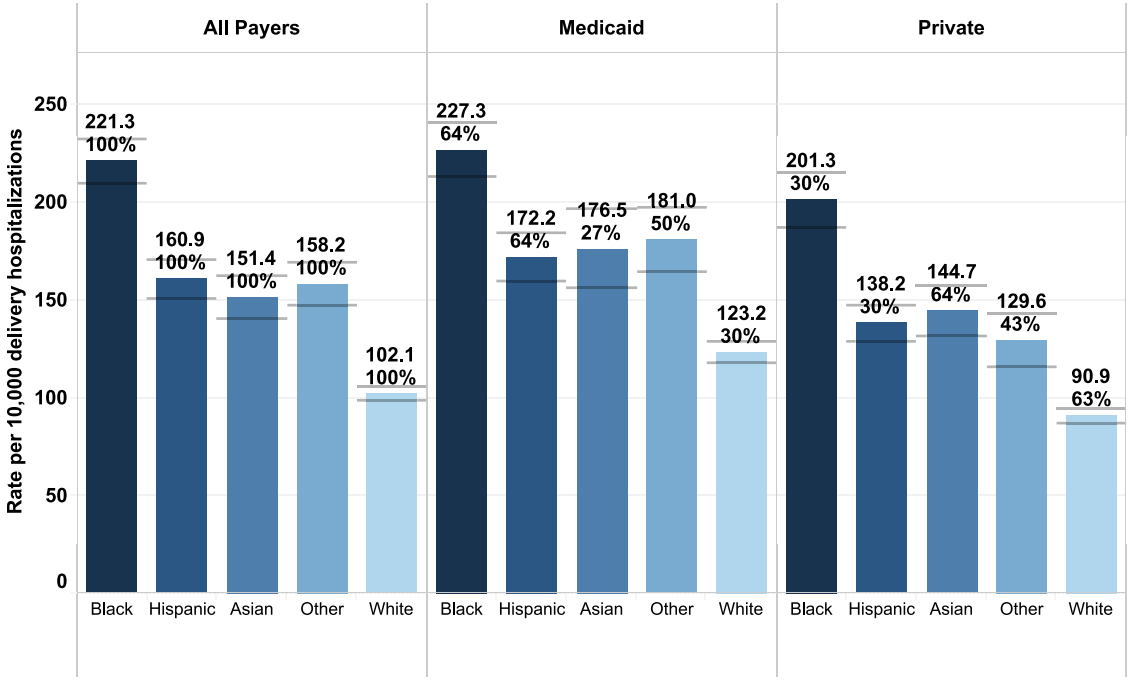

Figure 1. Rates of severe maternal morbity, by payer and by race/ethnicity. Authors' analysis of data from the Healthcare Cost and Utilization Project, National Inpatient Sample, years 2016 and 2017. Severe maternal morbidity (SMM) was identified using the Centers for Disease Control and Prevention SMM indicator list. Overall $N = 1{,}382{,}865$; White $n = 727{,}838$; Black $n = 207{,}547$; Hispanic $n = 285{,}419$; Asian $n = 88{,}116$; and Other $n = 73{,}945$. The top values represent rates of maternal morbidity per 10,000 deliveries. The bottom values represent the percent of deliveries for a given race/ethnicity that fall within the respective payer category. Horizontal lines represent lower and upper bounds of 95% confidence intervals. To avoid, artificially narrow 95% confidence intervals, intervals were constructed using unweighted values.

that evaluated inequity in adverse pregnancy-related outcomes among women of different races and ethnicities, we found that deliveries to Black women had more than twice the rates of both SMM outcomes (i.e., SMM overall and SMM excluding blood transfusions) relative to deliveries to White women, and deliveries to Hispanic women had 1.6 times the rates. We add to this literature by finding no statistically significant difference in the risk of SMM among Medicaid-covered deliveries compared with privately covered deliveries for Black women.

The higher rates of SMM found for Black and Hispanic women highlight important questions regarding the role of racism and oppression. Research has documented the association of racism and oppression on maternal health outcomes at various levels. Black women have reported experiencing harmful racialized pregnancy stigma that influence perceptions of pregnancy, access to care, and satisfaction with care (Mehra et al., 2020). The effects of structural racism may play out in interpersonal interactions, through institutional factors such as delivery hospital characteristics and responsiveness to quality of prenatal care, and by impacting economic equity and as a result, insurance status (Wang et al., 2020).

The findings from our study align with previous evaluations that found higher rates of SMM among Medicaid-covered deliveries (Fingar et al., 2018). Medicaid coverage may be associated with barriers to obtaining high-quality health care, such as worse access to health care services related to lower reimbursement rates and fewer accepting providers relative to commercial or private coverage (Goudie et al., 2020). Furthermore, Medicaid provides coverage for individuals with low income, who may face other social determinants that may contribute to psychological and physiological risk factors for SMM, such as lower use of prenatal care services related to inadequate transportation (Howell, 2018).

As such, understanding the factors associated with the higher rates of SMM among the Medicaid population is important for establishing programs that can effectively improve pregnancy-related health. Of particular importance in our study was that among deliveries to Black women, we found no differences in unadjusted or in adjusted rates of either SMM outcome with respect to having a delivery that was Medicaid- or privately covered. Our finding that Black women with Medicaid coverage did not have higher rates of SMM compared with Black women with private insurance suggests that there are likely other facets of structural racism that contribute to the higher rates of SMM among Black women. A previous study that evaluated births from New York City found that women with Medicaid coverage who delivered in a given hospital did not have an increased risk of SMM compared with women with private coverage from the same hospital (Howell et al., 2020). Although our study did not look at within-hospital variations, our findings also suggest that Medicaid coverage itself is not likely to be the most prominent factor driving the higher rates of SMM among insured Black women. The increased risk of SMM associated with delivery at a safety net hospital supports previous findings that facility-level factors (Howell et al., 2016), rather than individual-level factors alone, may be drivers of adverse maternal outcomes. We add to this literature by showing that, even within fully adjusted subset analyses for deliveries to Black and to Hispanic women, hospital-level factors remain important predictors for risk of SMM. There may additionally be unique relationships between insurance-related differences for SMM overall and for SMM without blood transfusions. Although the blood transfusion indicator is intended to serve as a measure of maternal hemorrhage, this indicator may be dependent on factors outside of the woman's health (Howell, 2018; Kozhimannil, Interrante, Henning-Smith, & Admon, 2019). For example, the provision of blood

Table 2
Adjusted Logistic Regressions for Associations Between Patient-Level and Hospital-Level Characteristics and Maternal Morbidity*

Patient Characteristics	Overall	White	Black	Hispanic
Age				
<20	1.62†	1.70†	1.38†	1.82†
20–29	1.02	1.00	0.98	1.06
30–39	Ref	Ref	Ref	Ref
≥40	1.42†	1.45†	1.31†	1.27†
Race/ethnicity				
Non-Hispanic White	Ref	—	—	—
Non-Hispanic Black	1.47†	—	—	—
Non-Hispanic Asian	1.55†	—	—	—
Hispanic	1.30†	—	—	—
Other	1.32†	—	—	—
Payer				
Private	Ref	Ref	Ref	Ref
Medicaid	1.12†	1.12†	1.06	1.14†
Medicare	1.52†	1.14	1.85†	1.61‡
Other (including self-pay)	1.14§	1.22†	1.01	1.08
Any comorbidity‖				
No	Ref	Ref	Ref	Ref
Yes	5.54†	5.64†	4.90†	5.82†
Delivery type				
Vaginal	Ref	Ref	Ref	Ref
Cesarean section	2.89†	2.72†	3.47†	2.80†
Median household income quartile¶				
1	1.12†	1.09‡	1.06	1.15‡
2	1.05	1.09‡	0.97	1.01
3	1.02	1.00	1.02	1.07
4	Ref	Ref	Ref	Ref
Location of residence				
Large metropolitan	Ref	Ref	Ref	Ref
Small/medium metropolitan	0.95	0.95	0.94	0.92
Micropolitan	1.08	1.07	0.97	1.28‡
Rural (noncore)	1.09	1.07	0.97	1.19
Hospital characteristics				
Region				
Northeast	Ref	Ref	Ref	Ref
Midwest	0.68†	0.70†	0.71†	0.67†
South	0.79†	0.90‡	0.75†	0.72†
West	0.78†	0.88‡	0.69†	0.70†
Ownership				
Public	Ref	Ref	Ref	Ref
Private nonprofit	0.84†	0.97	0.77†	0.76†
Private for profit	0.74†	0.89	0.70†	0.64†
Location/teaching status				
Rural	Ref	Ref	Ref	Ref
Urban nonteaching	0.88‡	0.88	0.77‡	0.98
Urban teaching	0.89‡	0.90	0.83	0.90
Safety net hospital#				
No	Ref	Ref	Ref	Ref
Yes	1.12§	1.10‡	1.22†	1.07
Minority-serving hospital#				
No	Ref	Ref	Ref	Ref
Yes	1.24†	1.21†	1.31†	1.15§

Authors' analysis of data from the Healthcare Cost and Utilization Project, National Inpatient Sample, years 2016 and 2017. Severe maternal morbidity (SMM) was identified using the Centers for Disease Control and Prevention SMM indicator list.

* Overall unweighted n = 1,382,865; weighted n = 6,914,317. White unweighted n = 727,838; weighted n = 3,639,185. Black unweighted n = 207,547; weighted n = 1,037,735. Hispanic unweighted n = 285,419; weighted n = 1,427,093.

† $p < .001$.

‡ $p < .05$.

§ $p < .01$.

‖ Any comorbidity among 25 Elixhauser comorbidity measures, which excluded congestive heart failure, coagulation deficiency, hypertensive encephalopathy, pulmonary circulation disorders, and peripheral perivascular disease.

¶ Household income is measured as the median household income at the ZIP code level, and it is based on the woman's location of residence.

Safety net and minority-serving hospital designations include hospitals in the top quartile of hospital discharges with Medicaid payment and women who were not of White race, respectively. Designations were determined for each year separately.

transfusion may be influenced by the availability of resources within a hospital, and women with Medicaid coverage are more likely to deliver at hospitals with fewer resources and a worse quality of care.

Our finding that hospitals' rurality may have different associations with the risk of SMM overall and risk of SMM excluding blood transfusions aligns with the previous literature. Specifically, a previous study found that the odds of SMM excluding blood transfusions were lower for rural residents relative to urban residents, whereas the risk of SMM overall was greater for rural residents (Kozhimannil et al., 2019). Additionally of note is that, in our study, we found similar relationships with respect to hospital rurality for deliveries for Black and White women; however, we found that, among Hispanic women, delivery in an urban hospital had a stronger association with SMM excluding blood transfusions, indicated by an aOR of greater than 4, relative to the risk associated with delivery in a rural hospital. These findings together suggest that deliveries in rural areas may face unique barriers compared with deliveries in urban areas. For example, hospitals in rural areas may be less likely to update initiatives and technologies aimed at decreasing the rates of adverse maternal outcomes, may have less access to resources needed to prevent and to treat adverse maternal outcomes, and may serve populations that are at an increased risk related to access to prepregnancy and prenatal care and other socioeconomic factors (Kozhimannil et al., 2019).

This study had several limitations. First, our analysis used an observational design and hospital discharge data that are primarily intended for billing purposes. As such, the conclusions of this work do not suggest causality. However, we used the current CDC algorithm specified for hospital discharge data that uses the ICD-10 coding system, and we used previously established methodology for identifying SMM. Specifically, a delivery with only one or more diagnosis-based indicator (i.e., zero procedural-based indicators) was required to additionally meet a minimum length of stay threshold and/or to have resulted in mortality during the hospitalization (Admon et al., 2018).

Second, we were unable to separately analyze subgroups of Hispanic populations owing to a lack of this information within the data source and were unable to separately analyze Native American individuals owing to small sample sizes. Native American women have rates of SMM that are nearly equal to or greater than the rates among other races and ethnicities, including rates that are greater than the rates among Black women in some analyses (Admon et al., 2018; Leonard, Main, Scott, Profit, & Carmichael, 2019). Additionally, Native American women have among the lowest rates of prenatal care initiation in the first trimester and have high rates of risk factors for adverse maternal outcomes, such as high levels of stress and rates of diabetes (Howell, 2018). Given the high proportion of Native American and Hispanic women who have a Medicaid-covered birth (Admon et al., 2018), future analyses should consider alternative approaches, such as a separate data source or additional years of data, to further analyze these populations. Finally, this data set does not contain all relevant patient-level factors, such as number of prenatal care visits or timing of initiation of prenatal care, and the information used to adjust for median household income is based on the median household income in the woman's ZIP code of residence.

Implications for Policy and/or Practice

The findings from this study can be leveraged to move beyond the analysis of SMM by race/ethnicity and payer through policy

Table 3
Adjusted Logistic Regressions for Associations between Patient-Level and Hospital-Level Characteristics and Maternal Morbidity Excluding Blood Transfusions*

Patient Characteristics	Overall	White	Black	Hispanic
Age, years				
<20	1.14†	1.21	0.96	1.23
20–29	0.78‡	0.75‡	0.76‡	0.79‡
30–39	Ref	Ref	Ref	Ref
≥40	1.61‡	1.67‡	1.42§	1.42§
Race/ethnicity				
Non-Hispanic White	Ref	—	—	—
Non-Hispanic Black	1.56‡	—	—	—
Non-Hispanic Asian	1.46‡	—	—	—
Hispanic	1.20‡	—	—	—
Other	1.20§	—	—	—
Payer				
Private	Ref	Ref	Ref	Ref
Medicaid	1.19‡	1.28‡	1.01	1.33‡
Medicare	2.22‡	1.62§	2.71‡	2.19§
Other (including self-pay)	1.14	1.29†	1.27	1.26
Any comorbidity‖				
No	Ref	Ref	Ref	Ref
Yes	4.30‡	4.26‡	4.13‡	4.40‡
Delivery type				
Vaginal	Ref	Ref	Ref	Ref
Cesarean section	4.11‡	4.12‡	4.29‡	4.14‡
Median household income quartile¶				
1	1.13§	1.13	0.95	1.22†
2	1.13§	1.20§	0.91	1.14
3	1.04	1.06	0.96	0.97
4	Ref	Ref	Ref	Ref
Location of residence				
Large metropolitan	Ref	Ref	Ref	Ref
Small/medium metropolitan	0.91†	0.96	0.82§	0.90
Micropolitan	1.32‡	1.24†	1.46†	1.50
Rural (noncore)	1.14	1.08	1.04	1.46
Hospital characteristics				
Region				
Northeast	Ref	Ref	Ref	Ref
Midwest	0.93	0.98	0.95	0.90
South	0.85‡	0.92	0.80§	0.70‡
West	1.02	1.10	0.81	0.95
Ownership				
Public	Ref	Ref	Ref	Ref
Private nonprofit	0.85‡	0.86†	0.85	0.75§
Private for profit	0.73‡	0.80†	0.70§	0.65‡
Location/teaching status				
Rural	Ref	Ref	Ref	Ref
Urban nonteaching	2.00‡	1.73‡	1.92§	4.32‡
Urban teaching	2.71‡	2.60‡	2.83‡	4.52‡
Safety net designation#				
No	Ref	Ref	Ref	Ref
Yes	1.09†	1.15†	1.29‡	0.88
Minority-serving hospital#				
No	Ref	Ref	Ref	Ref
Yes	1.11†	1.12	1.03	1.11

Authors' analysis of data from the Healthcare Cost and Utilization Project, National Inpatient Sample, years 2016 and 2017. Severe maternal morbidity (SMM) was identified using the Centers for Disease Control and Prevention SMM indicator list. SMM without Blood Transfusion indicates that a delivery with only a blood transfusion indicator, and no other SMM indicator, was identified as not having SMM.

* Overall unweighted $n = 1{,}382{,}865$; weighted $n = 6{,}914{,}317$. White unweighted $n = 727{,}838$; weighted $n = 3{,}639{,}185$; Black unweighted $n = 207{,}547$; weighted $n = 1{,}037{,}735$. Hispanic unweighted $n = 285{,}419$; weighted $n = 1{,}427{,}093$.

† $p < .05$.

‡ $p < .001$.

§ $p < .01$.

‖ Any comorbidity among 25 Elixhauser comorbidity measures, which excluded congestive heart failure, coagulation deficiency, hypertensive encephalopathy, pulmonary circulation disorders, and peripheral perivascular disease.

¶ Household income is measured as the median household income at the ZIP code level, and it is based on the woman's location of residence.

Safety net and minority-serving hospital designations include hospitals in the top quartile of hospital discharges with Medicaid payment and women who were not of White race, respectively. Designations were determined for each year separately.

and practice innovations that address the root causes of racism and oppression. Interventions to decrease health inequities must take into consideration the power dynamics that are driven by racism and oppression at the political, social, and economic levels that are core drivers of inequity and must focus on systemic changes to be effective and sustainable. Policy and practice innovations must also be designed and implemented with an equity lens to avoid further exacerbating existing racial inequities.

In our study, Medicaid coverage was no longer a significant predictor of SMM among Black women and many facility-level factors remained significant predictors in race-stratified analyses. These findings have at least two important policy implications. First, this finding suggests that, for Black women, Medicaid coverage itself may not be a risk factor for SMM. Having evidence-based evaluations that support Medicaid coverage is important for ensuring equitable outcomes for populations that may be simultaneously experiencing multiple systems of oppression, including structural racism. The implications of our findings regarding Medicaid coverage and maternal outcomes during the delivery hospitalization are important to consider for economic inequity in maternal health during the "fourth trimester," or the 12 weeks after childbirth (Stuebe et al., 2019). Specifically, our study evaluated SMM during the inpatient stay for the delivery. In 2018, The American College of Obstetricians and Gynecologists released new recommendations that included providing continuous care for 12 weeks postpartum instead of one visit at 6 weeks postpartum (American College of Obstetricians and Gynecologists, 2018). Given that approximately 50% of maternal mortality occurs after the day of delivery, establishing policies that allow states to extend Medicaid coverage for individuals of low income through the first year after childbirth, beyond the 60 day cut-off point that many states use, has the potential to decrease inequity in adverse maternal outcomes by improving rates of follow-up care and by more quickly identifying women who are at high risk of adverse postpartum outcomes (Stuebe et al., 2019).

Second, our findings suggest that focusing on sociodemographic and social stressors may best address the higher rates of SMM experienced by Black and Hispanic women. Given the correlation between SMM and maternal mortality, these findings may have similar implications for addressing equity in pregnancy-related death. In addition to improving continuity of insurance in the postpartum time period, efforts to address drivers of inequity during the preconception, prenatal, and delivery time periods are also critical (Howell, 2018). For example, women who are not non-Hispanic White are more likely to have a Medicaid-covered delivery (Martin et al., 2018). Actions that could advance racial equity in maternal outcomes include increasing the continuity of insurance coverage before pregnancy as well as increasing access to services for Medicaid-covered women, such as to doulas during delivery or to group and other innovative models of prenatal care (Daw et al., 2020; Kozhimannil & Hardeman, 2016). Group prenatal care models may provide social support and connection to the health care system that may help to mediate stressors related to traditional prenatal care and management of chronic conditions (Gareau et al., 2016). Covering services provided by doulas and community health workers may complement state Medicaid program efforts to address racial inequities in maternal health by providing pregnant and postpartum women with emotional, social, and educational support (Bohren, Hofmeyr, Sakala, Fukuzawa, & Cuthbert, 2017; Gadson, Akpovi, & Mehta, 2017).

However, few state Medicaid programs reimburse for doulas or community health workers, making these services inaccessible to many enrollees. Increased access to midwifery-led care and freestanding birth centers may also aid in decreasing racial inequities in SMM. Research has consistently demonstrated improved or equivalent safety, quality, and value of midwifery-led care, with births involving midwives having lower total costs, improved infant outcomes, and fewer inductions, episiotomies, artificial rupture of membranes, and cesarean deliveries (Benatar, Garrett, Howell, & Palmer, 2013; Hill et al., 2018; Johantgen et al., 2012; Yang, Attanasio, & Kozhimannil, 2016). Yet inadequate access to and coverage of midwifery-led care and freestanding birth centers continue to be a barrier for those enrolled in Medicaid (Moore, George, Bakst, & Shea, 2020).

Removing the structural barriers to allow for continual insurance coverage may lead to improved maternal health, earlier and more consistent use of prenatal care, and identification of women who may be at high risk for adverse maternal outcomes and in need of case management. With respect to improving equity in care during the delivery hospitalization, national and state-level policies should continue to focus efforts on improving quality of care at the facility level, such as by implementing safety bundles for addressing severe morbidities during delivery as well as improving access to resources for safety net hospitals. Adoption of Patient Safety Bundles developed by the Alliance for Innovation on Maternal Health may support a decrease in the racial/ethnic inequities in maternal health outcomes. One bundle that is specifically focused on the decrease of peripartum racial/ethnic disparities outlines specific steps for health systems and care providers to focus on related to readiness, recognition and prevention, response, and reporting/systems learning (Council on Patient Safety in Women's Health Care, 2016).

Conclusion

We found large differences in rates of SMM among women of different races/ethnicity and expected primary payers, with smaller payer-related differences among Black women. Our findings suggest that national and state policy efforts should continue to focus on addressing structural racism and other socioeconomic drivers of adverse maternal outcomes, including barriers to high-quality care among women with Medicaid coverage, in rural areas, and in safety net hospitals.

Acknowledgments

We thank our colleagues from IBM Watson Health for assistance with organizing the data for this analysis. Funding for the assistance provided by IBM Watson Health came from the Institute for Medicaid Innovation. We would additionally like to thank all HCUP Data Partners for their contribution to the HCUP Nationwide databases. A list of HCUP Data Partners can be found at https://www.hcup-us.ahrq.gov/db/hcupdatapartners.jsp. CCB had full access to all the data in the study and takes responsibility for the integrity of the data and the accuracy of the data analysis.

Supplementary Data

Supplementary data related to this article can be found at https://doi.org/10.1016/j.whi.2020.12.005.

References

Admon, L. K., Winkelman, T. N., Zivin, K., Terplan, M., Mhyre, J. M., & Dalton, V. K. (2018). Racial and ethnic disparities in the incidence of severe maternal morbidity in the United States, 2012–2015. *Obstetrics & Gynecology*, 132(5), 1158–1166.

American College of Obstetricians and Gynecologists. (2018). Optimizing postpartum care. ACOG Committee Opinion No. 736. *Obstetrics & Gynecology*, 131, e140–e150.

Benatar, S., Garrett, A. B., Howell, E., & Palmer, A. (2013). Midwifery care at a freestanding birth center: A safe and effective alternative to conventional maternity care. *Health Services Research*, 48(5), 1750–1768.

Bohren, M. A., Hofmeyr, G. J., Sakala, C., Fukuzawa, R. K., & Cuthbert, A. (2017). Continuous support for women during childbirth. *Cochrane Database of Systematic Reviews*, CD003766.

Centers for Disease Control and Prevention (CDC). (2020). Severe maternal morbidity in the United States. Available: www.cdc.gov/reproductivehealth/MaternalInfantHealth/SevereMaternalMorbidity.html. Accessed: April 15, 2020.

Conrey, E. J., Manning, S. E., Shellhaas, C., Somerville, N. J., Stone, S. L., Diop, H., … Goodman, D. (2019). Severe maternal morbidity, a tale of 2 states using data for action—Ohio and Massachusetts. *Maternal and Child Health Journal*, 23(8), 989–995.

Council on Patient Safety in Women's Health Care. (2016). Reduction of peripartum racial/ethnic disparities (+AIM). Available: https://safehealthcareforeverywoman.org/council/patient-safety-bundles/maternal-safety-bundles/reduction-of-peripartum-racial-ethnic-disparities-aim/. Accessed: November 10, 2020.

Daw, J. R., Kolenic, G. E., Dalton, V. K., Zivin, K., Winkelman, T., Kozhimannil, K. B., & Admon, L. K. (2020). Racial and ethnic disparities in perinatal insurance coverage. *Obstetrics and Gynecology*, 135(4), 917–924.

Fingar, K. F., Hambrick, M. M., Heslin, K. C., & Moore, J. E. (2018). *Trends and disparities in delivery hospitalizations involving severe maternal morbidity, 2006-2015. HCUP Statistical Brief #243*. Rockville, MD: Agency for Healthcare Research and Quality. Available: www.hcup-us.ahrq.gov/reports/statbriefs/sb243-Severe-Maternal-Morbidity-Delivery-Trends-Disparities.pdf. Accessed: November 10, 2020.

Ford, C. L., & Airhihenbuwa, C. O. (2010). Critical race theory, race equity, and public health: Toward antiracism praxis. *American Journal of Public Health*, 100(Suppl 1), S30–S35.

Gadson, A., Akpovi, E., & Mehta, P. K. (2017). Exploring the social determinants of racial/ethnic disparities in prenatal care utilization and maternal outcome. *Seminars in Perinatology*, 41(5), 308–317.

Gareau, S., Lòpez-De Fede, A., Loudermilk, B. L., Cummings, T. H., Hardin, J. W., Picklesimer, A. H., … Covington-Kolb, S. (2016). Group prenatal care results in Medicaid savings with better outcomes: A propensity score analysis of Centering Pregnancy participation in South Carolina. *Maternal and Child Health Journal*, 20, 1384–1393.

Goudie, A., Martin, B., Li, C., Lewis, K., Han, X., Kathe, N., … Thompson, J. (2020). Higher rates of preventive health care with commercial insurance compared with Medicaid: Findings from the Arkansas Health Care Independence "Private Option" program. *Medical Care*, 58(2), 120–127.

Healthcare Cost and Utilization Project (HCUP). (2019). *Overview of the National (Nationwide) Inpatient Sample (NIS)*. Rockville, MD: Healthcare Cost and Utilization Project. Available: www.hcup-us.ahrq.gov/nisoverview.jsp. Accessed: April 15, 2020.

Hill, I., Dubay, L., Courtot, B., Benatar, S., Garrett, B., Blavin, F., … Thornburgh, S. (2018). Strong start for mothers and newborns evaluation: Year 5 project synthesis. Available: https://downloads.cms.gov/files/cmmi/strongstart-prenatal-finalevalrpt-v2.pdf. Accessed: November 10, 2020.

Howell, E. A. (2018). Reducing disparities in severe maternal morbidity and mortality. *Clinical Obstetrics and Gynecology*, 61(2), 387–399.

Howell, E. A., Egorova, N. N., Balbierz, A., Zeitlin, J., & Hebert, P. L. (2016). Site of delivery contribution to black-white severe maternal morbidity disparity. *American Journal of Obstetrics and Gynecology*, 215(2), 143–152.

Howell, E. A., Egorova, N. N., Janevic, T., Brodman, M., Balbierz, A., Zeitlin, J., & Hebert, P. L. (2020). Race and ethnicity, medical insurance, and within-hospital severe maternal morbidity disparities. *Obstetrics & Gynecology*, 135(2), 285–293.

Johantgen, M., Fountain, L., Zangaro, G., Newhouse, R., Stanik-Hutt, J., & White, K. (2012). Comparison of labor and delivery care provided by certified nurse-midwives and physicians: A systematic review, 1990 to 2008. *Women's Health Issues*, 22(1), e73–e81.

Kozhimannil, K. B., & Hardeman, R. R. (2016). Coverage for doula services: How state Medicaid programs can address concerns about maternity care costs and quality. *Birth (Berkeley, Calif.)*, 43(2), 97–99.

Kozhimannil, K. B., Interrante, J. D., Henning-Smith, C., & Admon, L. K. (2019). Rural-urban differences in severe maternal morbidity and mortality in the US, 2007–15. *Health Affairs*, 38(12), 2077–2085.

Kuklina, E. V., Whiteman, M. K., Hillis, S. D., Jamieson, D. J., Meikle, S. F., Posner, S. F., & Marchbanks, P. A. (2008). An enhanced method for identifying obstetric deliveries: Implications for estimating maternal morbidity. *Maternal and Child Health Journal*, 12(4), 469–477.

Lazariu, V., Nguyen, T., McNutt, L. A., Jeffrey, J., & Kacica, M. (2017). Severe maternal morbidity: A population-based study of an expanded measure and associated factors. *PloS One*, 12(8), e0182343.

Leonard, S. A., Main, E. K., Scott, K. A., Profit, J., & Carmichael, S. L. (2019). Racial and ethnic disparities in severe maternal morbidity prevalence and trends. *Annals of Epidemiology*, 33, 30–36.

Martin, J. A., Hamilton, B. E., Osterman, M. J., Driscoll, A. K., & Drake, P. (2018). Births: Final data for 2017. *Natl Vital Stat Rep*, 67, 1–50.

Mehra, R., Boyd, L. M., Magriples, U., Kershaw, T. S., Ickovics, J. R., & Keene, D. E. (2020). Black pregnant women "Get the Most Judgment": A qualitative study of the experiences of Black women at the intersection of race, gender, and pregnancy. *Women's Health Issues*, 30(6), 484–492.

Moore, J. E., George, K. E., Bakst, C., & Shea, K. (2020). Improving maternal health access, coverage, and outcomes in Medicaid: A resource for state Medicaid agencies and Medicaid managed care organizations. Available: www.medicaidinnovation.org/_images/content/2020-IMI-Improving_Maternal_Health_Access_Coverage_and_Outcomes-Report.pdf. Accessed: November 10, 2020.

Prather, C., Fuller, T. R., Marshall, K. J., & Jeffries, W. L. (2016). The impact of racism on the sexual and reproductive health of African American women. *Journal of Women's Health*, 25(7), 664–671.

Stuebe, A., Moore, J. E., Mittal, P., Reddy, L., Low, L. K., & Brown, H. (2019). Extending Medicaid coverage for postpartum moms. *HealthAffairs Blog*. Available: www.healthaffairs.org/do/10.1377/hblog20190501.254675/full. Accessed: April 15, 2020.

Wang, E., Glazer, K. B., Howell, E. A., & Janevic, T. M. (2020). Social determinants of pregnancy-related mortality and morbidity in the United States: A systematic review. *Obstetrics and Gynecology*, 135(4), 896–915.

World Health Organization. (2020). Equity. Available: www.who.int/healthsystems/topics/equity/en/. Accessed: November 10, 2020.

Yang, Y. T., Attanasio, L. B., & Kozhimannil, K. B. (2016). State scope of practice laws, nurse-midwifery workforce, and childbirth procedures and outcomes. *Women's Health Issues*, 26(3), 262–267.

Author Descriptions

Clare C. Brown, PhD, MPH, is an Assistant Professor in the Health Policy and Management Department, Fay W. Boozman College of Public Health, University of Arkansas for Medical Sciences. Her research interests include health care services research, primarily among minoritized populations.

Caroline E. Adams, BS, is a health policy and research assistant at the Institute for Medicaid Innovation. Her research focuses on public health science and policy, specifically within Medicaid and women's health.

Jennifer E. Moore, PhD, RN, FAAN, is the founding executive director at the Institute for Medicaid Innovation and research professor at the University of Michigan Medical School. Her research in women's health and Medicaid intersects with clinical practice and policy.