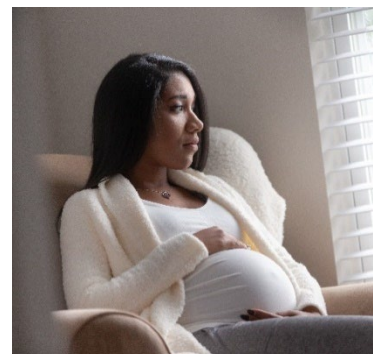


Wisconsin Data Resource: Severe Maternal Morbidity, 2016-2023

Background and Overview

Severe maternal morbidity (SMM) is defined by the CDC (Centers for Disease Control and Prevention) as “unexpected outcomes of labor and delivery that result in significant short- or long-term consequences to a woman’s health.” These outcomes may be directly related to pregnancy, like eclampsia or hemorrhage. SMM also includes broader medical conditions like heart failure or kidney failure.



Studies suggest that the national SMM rate is increasing.^{1,2} Understanding SMM is a key approach to improving maternal health in Wisconsin.

Data notes: This report describes SMM trends in Wisconsin from 2016 to 2023 using ICD-10 diagnostic and procedure codes in the hospital record (see appendix). While blood transfusion is included in the CDC definition, the quantity of blood is not available in the hospital record, meaning deliveries with only a blood transfusion may not truly qualify as an SMM. For this reason, delivery hospitalizations that required only a blood transfusion were not included here.

Additionally, [Severe Maternal Morbidity Among Wisconsin Residents, 2010–2014](#), released in 2015, identified SMM using ICD-9 codes, meaning it cannot be compared to this report. The tenth revision of the International Classification of Diseases (ICD-10) was released in 2016.

Key takeaways:

- The 2023 statewide SMM rate was **77.9 per 10,000 delivery hospitalizations**, or approximately one case of SMM for every 125 deliveries.
- The SMM rate in Wisconsin **increased significantly** from 2016 to 2023.
- The SMM rate **is lower among people ages 20 to 29** compared with people under 20 years and over 30 years old.
- The SMM rate for **Non-Hispanic Black people** is more than 1.5 times the rate for non-Hispanic white people.
- The SMM rate for people with **Medicaid or BadgerCare Plus** is higher than for those with private insurance.



Honoring life: Each case of severe maternal morbidity represents a person and a story. By sharing this information, we hope to honor the lives and families impacted by using their stories to help prevent further hardship. Please care for yourself as you need while processing.

Executive Summary

Severe maternal morbidity (SMM) refers to “unexpected outcomes of labor and delivery that result in significant short- or long-term consequences to a woman’s health” (CDC). Studies suggest that the national SMM rate continues to increase.^{1,2} This report describes trends in Wisconsin SMM from 2016 to 2023 using the [CDC's SMM definition](#).



Data notes: While transfusions can be considered a marker for SMM, delivery hospitalizations that required only a transfusion were not included in this data resource. Due to this exclusion and changes in ICD codes in 2016, this report should not be compared to the [report released in 2015](#).

How has SMM changed in Wisconsin?

SMM in Wisconsin increased significantly between 2016 and 2023. The rate increased from 60.0 per 10,000 delivery hospitalizations in 2016 to 77.9 per 10,000 delivery hospitalizations in 2023.

Who is at greatest risk for SMM?

- People 40 years and older
- Non-Hispanic Black people
- People with public health insurance

Which types of SMM are most common?

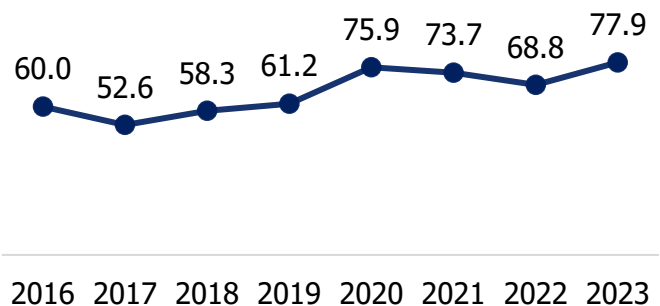
Hemorrhagic complications (unusual bleeding or clotting) are the most common SMM group, followed by renal (kidney-related) and respiratory complications.

Reducing SMM in Wisconsin

Wisconsin’s Maternal Mortality Review Team releases recommendations to help prevent maternal deaths. Many of these recommendations can also help prevent SMM. View the [2016–17 report](#) and the [2020 report](#) to learn more.

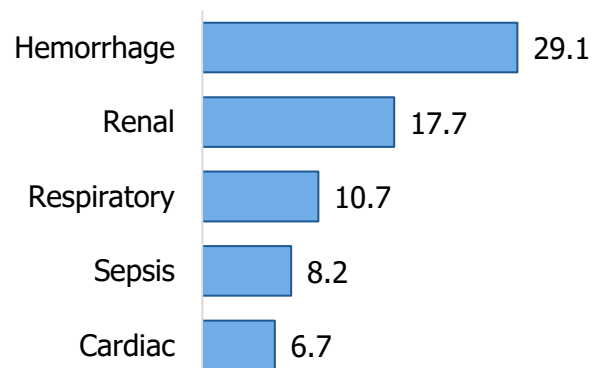
Severe maternal morbidity, Wisconsin, 2016–2023

Rate per 10,000 delivery hospitalizations



Severe maternal morbidity rate by group, 2019–2023

Rate per 10,000 delivery hospitalizations



Which types of SMM are most common?

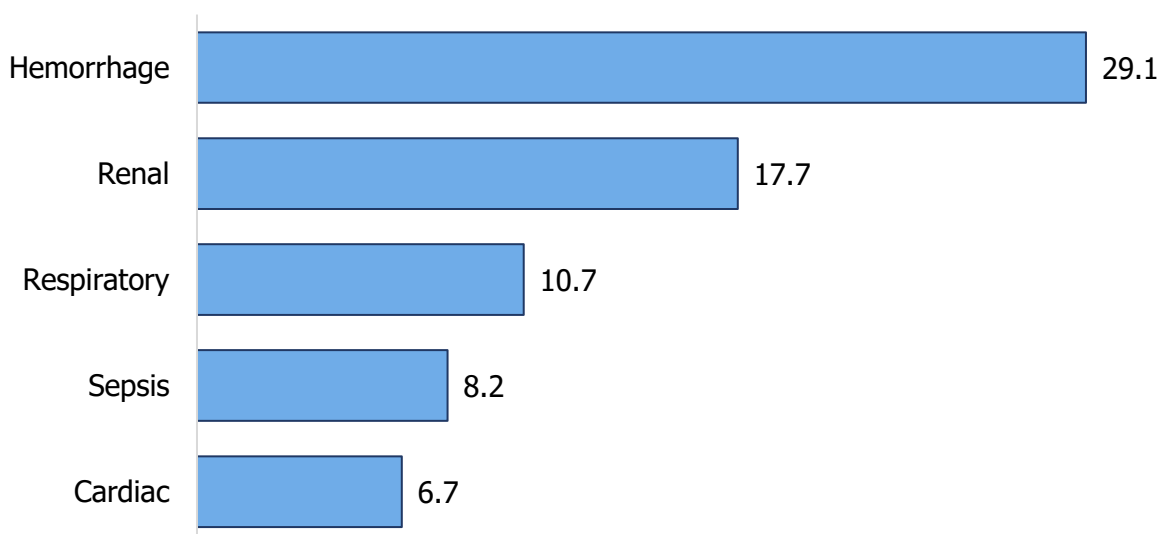
In this report, specific types of SMM have been categorized into groupings for analysis. To see rates for specific types of SMM and the ICD-10 codes used to define each group, please see the [appendix on page 11](#). Other SMM groups, including other obstetric and medical complications, were not included in this section but are in the appendix for reference.

SMM group definitions:

- **Hemorrhagic complications** are blood-related complications caused by unusual bleeding or clotting. This category includes shock (extreme drop in blood pressure), hysterectomy, and disseminated intravascular coagulation (blood clots).^{10, 11}
- **Renal complications** are kidney-related morbidities caused by acute kidney failure. As a result, the kidneys can no longer remove waste from blood.¹²
- **Respiratory complications** are complications that affect the system responsible for breathing and include acute respiratory distress syndrome, temporary tracheostomy, and ventilation (externally supported breathing).
- **Cardiac complications** are complications affecting the heart and blood vessels. Cardiac complications include heart attacks, cardiac arrest, heart failure, blood clots in the lung, aneurysm (swollen blood vessel), or dangerous changes to the heart's rhythm.¹³
- **Sepsis** is the result of an infection caused by pathogens (for example bacteria, viruses, or fungi). If the infection gets out of control, the body's response endangers important organs and bodily functions.

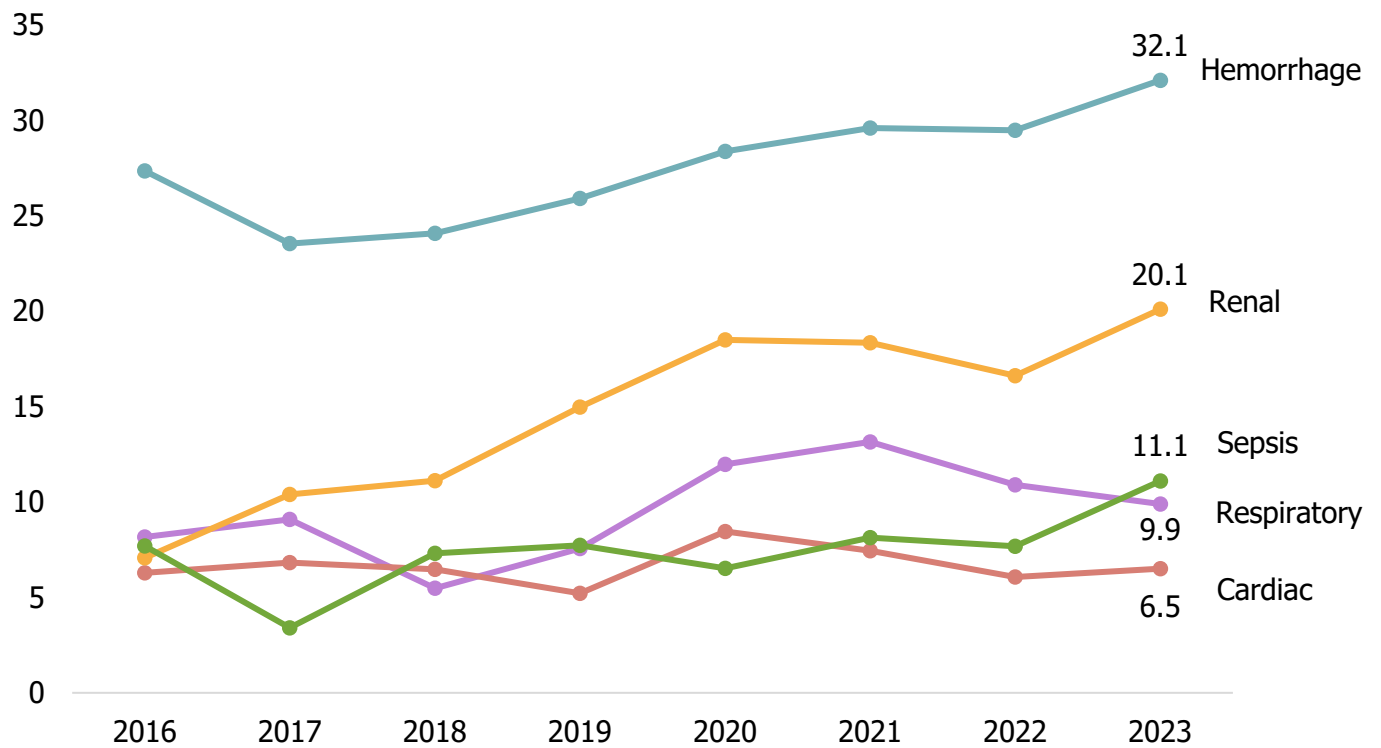
SMM rate by group, 2019–2023

Rate per 10,000 delivery hospitalizations



Annual SMM rate by group, 2016–2023

Rate per 10,000 delivery hospitalizations

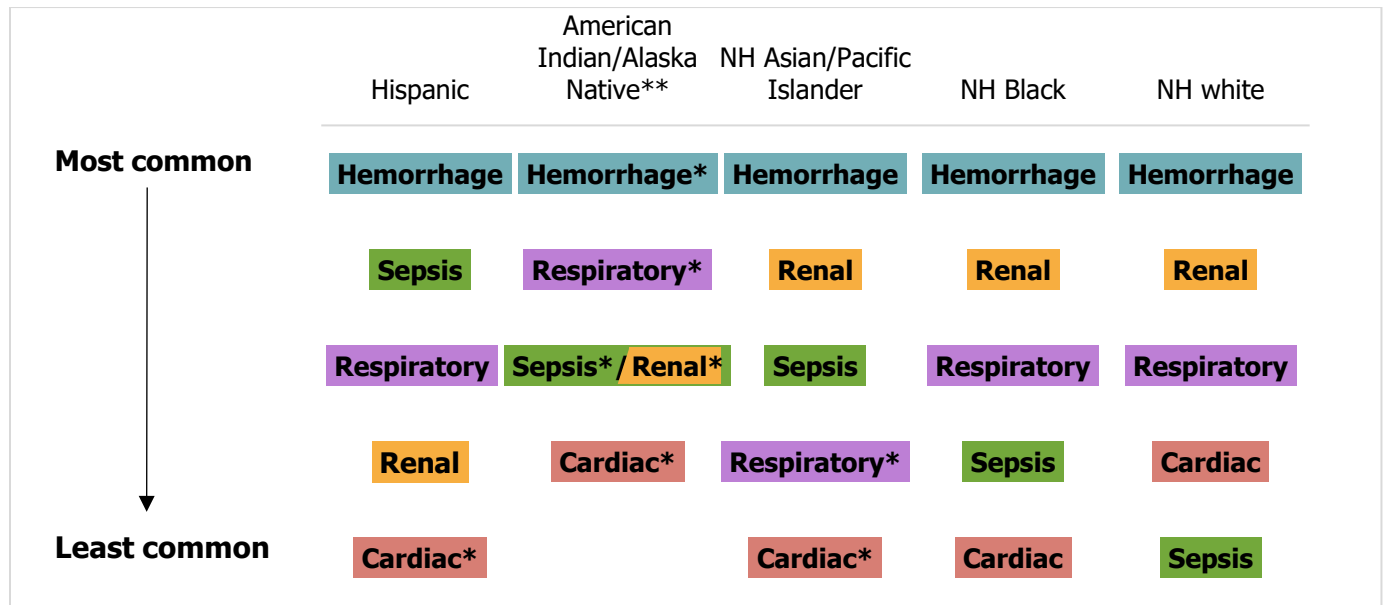


Key takeaways:

- The renal SMM rate increased significantly between 2016 and 2023, from 7.1 to 20.1 cases of renal complications at delivery per 10,000 delivery hospitalizations.
- The rates of all other SMM groups did not change significantly from 2016 to 2023.
- The hemorrhage SMM rate has remained significantly higher than all other SMM groups over time.

The rate of renal complications at the time of delivery has also increased nationally, from 9.5 per 10,000 delivery hospitalizations in 2016 to 19.3 per 10,000 delivery hospitalizations in 2021.¹ National data mirrors Wisconsin data in that some of the most common SMM nationally are also the most common in the state.¹

SMM groups by race and ethnicity, 2019–2023



NH = Non-Hispanic

*Interpret with caution. Fewer than 20 events.

** Includes people who identify as more than one race and Hispanic ethnicity.

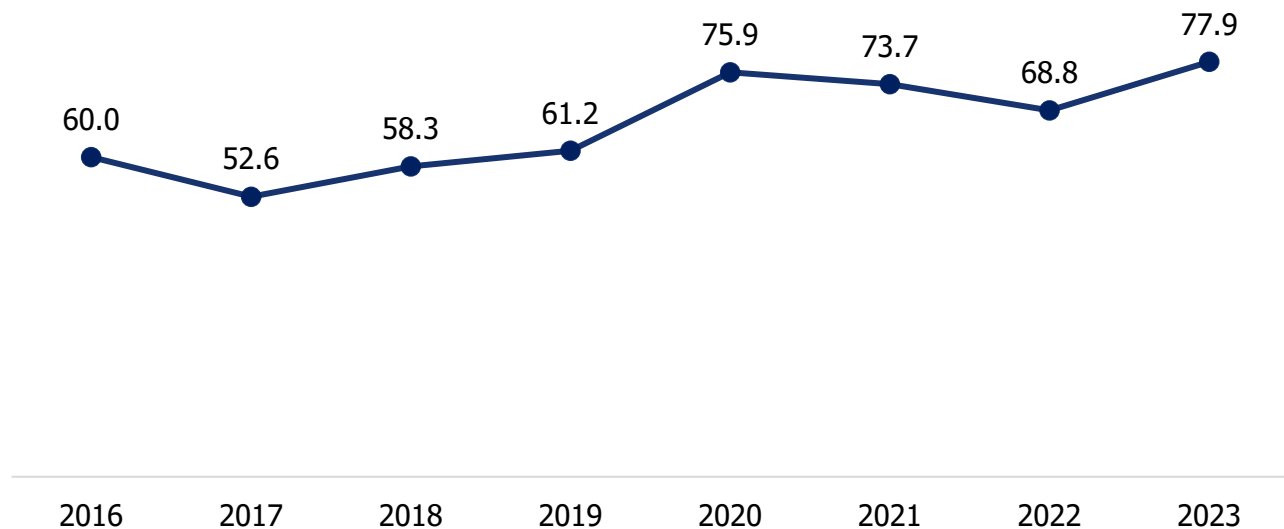
Key takeaways:

- Hemorrhage was the leading SMM group across all race and ethnic groups.
- Renal failure was either the second or third leading SMM group for all race and ethnic groups except Hispanic.
- Sepsis was the second most common SMM group for the Hispanic population.

How has SMM changed in Wisconsin?

Wisconsin SMM Rate, 2016–2023

Rate per 10,000 delivery hospitalizations



Key takeaways:

- The SMM rate in 2023 was 77.9 per 10,000 delivery hospitalizations.
- The SMM rate changed significantly between 2016 and 2023, increasing by 30% over seven years.
- The SMM rate increased by 24% from 2019 to 2020, a significant change that was likely impacted by the COVID-19 pandemic.

What could explain these trends?

The increase in the SMM between 2016 and 2023 mirrors national trends. The United States SMM rate (which includes blood transfusions) increased by 36% between 2016 and 2021.^{1*} The most recent national data that did not include blood transfusions revealed that Wisconsin had a lower SMM rate than the country overall (2019; Wisconsin: 61.2; United States: 79.7).²

The significant increase in 2020 may be related to the COVID-19 pandemic. Pregnant people with COVID-19 are more likely to experience SMM than those without.³ Pregnant people may also have faced difficulty accessing care due to lack of hospital capacity, fear of COVID-19 infection, and clinic closures.

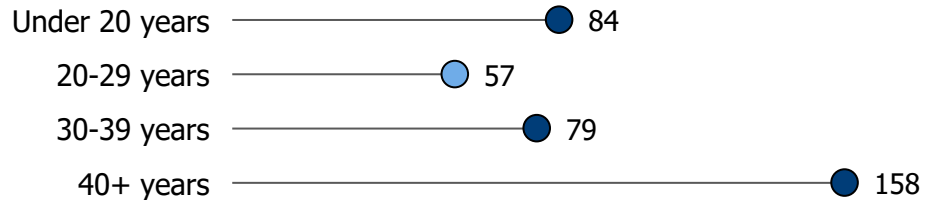
*This change is not directly comparable to the data in this report as the study included deliveries with only blood transfusions in the SMM count.

Who is at greatest risk for SMM?

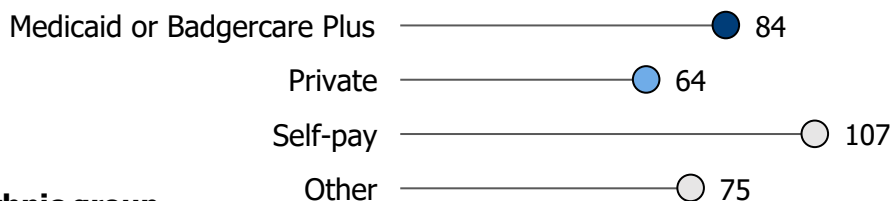
SMM rate by demographic characteristics, 2019–2023

Rate per 10,000 delivery hospitalizations

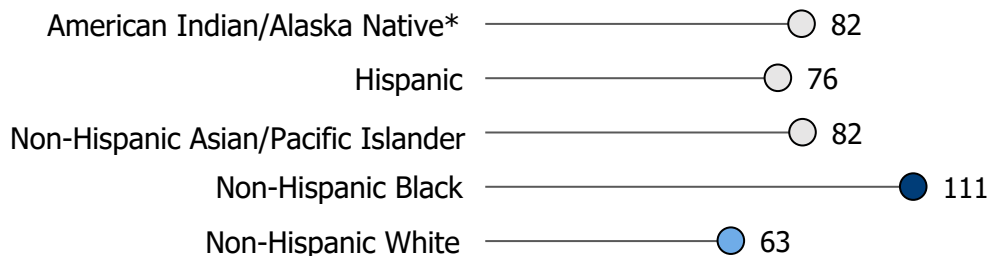
Age



Insurance coverage



Racial/ethnic group



- Reference group
- Statistically significant difference compared to reference group
- No statistically significant difference compared to reference group

* Includes people who identify as more than one race and Hispanic ethnicity.

Key takeaways:

- People between 20 and 29 years old are significantly less likely to experience SMM than all other age groups. People age 40 and older are at the highest risk.
- People covered by public insurance (Medicaid or BadgerCare Plus) are significantly more likely to experience SMM than privately insured people.
- Non-Hispanic Black people are significantly more likely to experience SMM than non-Hispanic white people, with an SMM rate more than 1.5 times higher.

What could explain these trends?

Higher SMM rates among older birthing people is likely related to the increased likelihood of other conditions as age increases.⁴ The stress of pregnancy can exacerbate pre-existing

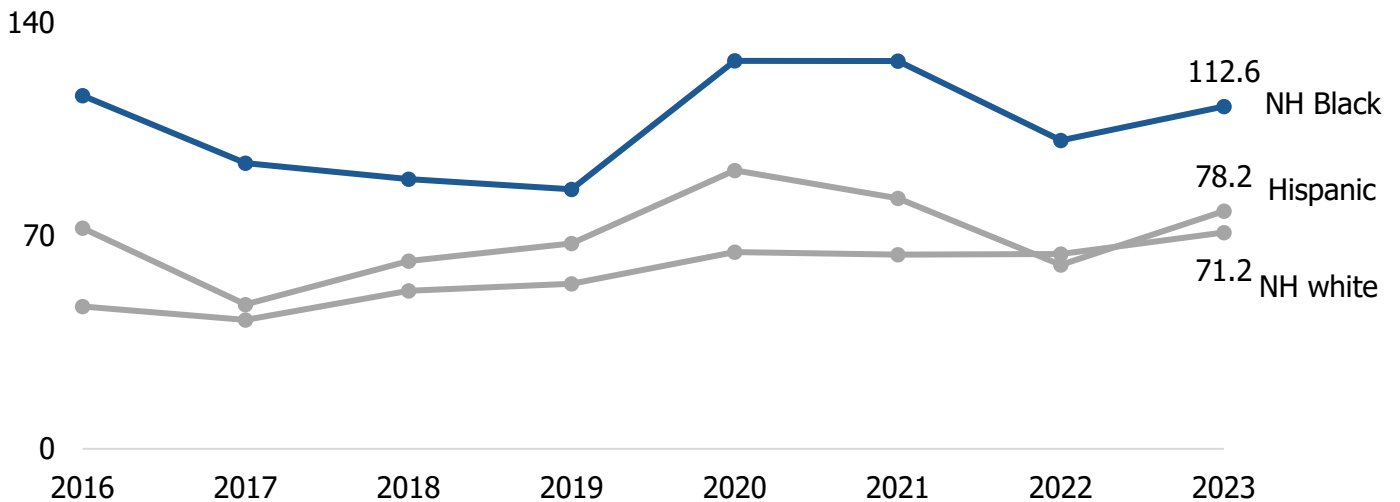
conditions, leading to an increased risk of SMM.^{4,5} The increased SMM rate among people with public insurance may be related to access to and quality of care, as people covered by Medicaid are less likely to report starting prenatal care in the first trimester or adequate care overall.^{6,7} Additionally, pregnant people may not qualify for Medicaid before becoming pregnant, which may limit their access to health care prior to pregnancy.^{7,8}

The higher SMM rate among Non-Hispanic Black people can be traced back to racist institutional practices and personal experiences of racism. Racist institutional practices have negatively affected socioeconomic opportunities for communities of color, reducing access to quality health care and insurance coverage.⁹ Racist institutional practices have also affected access to living environments that promote healthy behaviors, such as eating nutritious foods.⁹

Within the health care system, providers may disregard or ignore concerns voiced by Black patients, leading to delayed action to address urgent or emergency health concerns.⁹ In addition, navigating experiences of racism in the health care setting and everyday life causes stress that can increase the risk of other chronic diseases which are associated with SMM.⁹

Non-Hispanic Black people have experienced severe maternal morbidities at a significantly higher rate than non-Hispanic white and Hispanic people over the past eight years.

Rate of SMM per 10,000 delivery hospitalizations

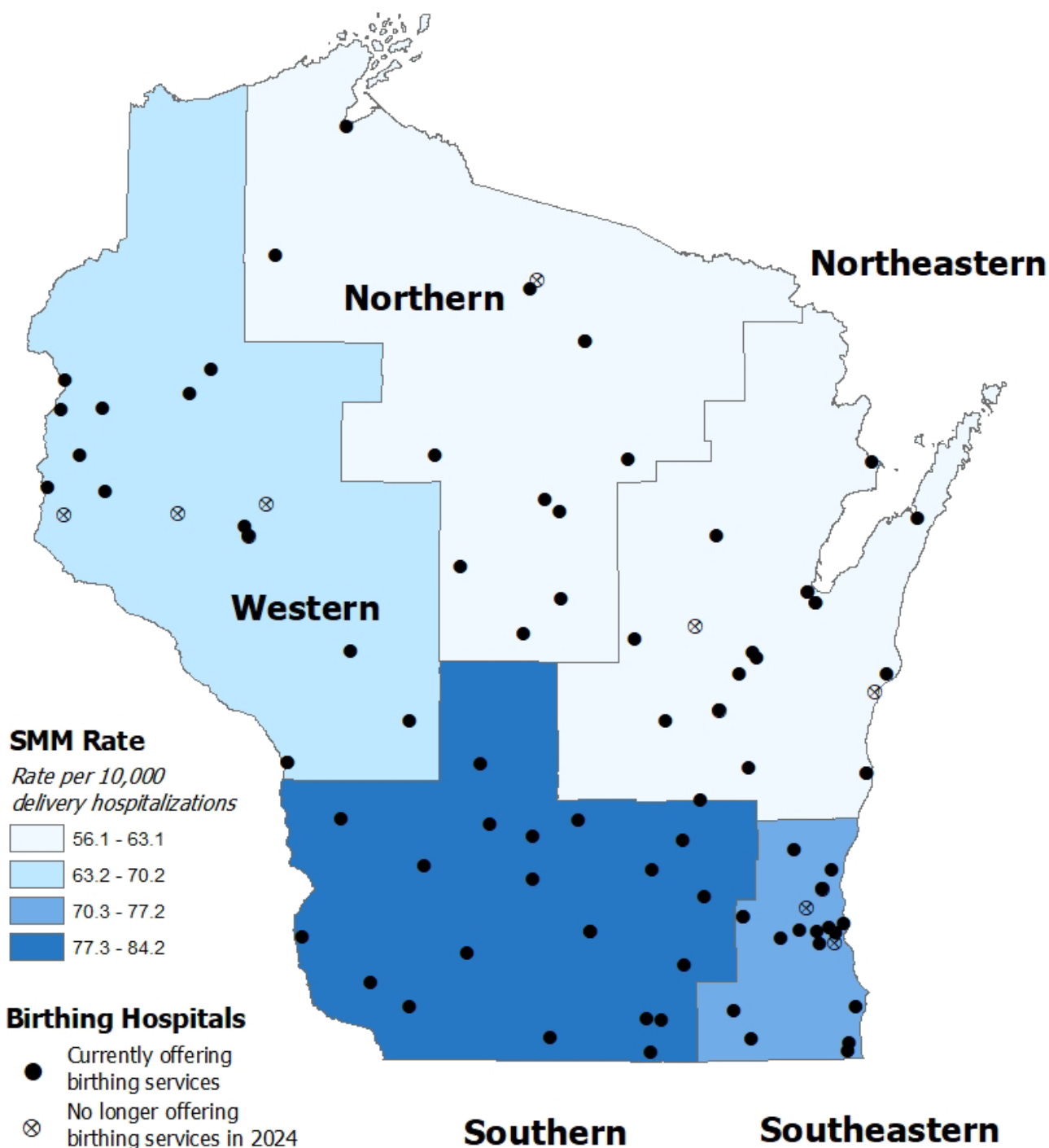


NH = Non-Hispanic

Not all racial or ethnic groups could be included in this graph due to small numbers.

Data note: Race and ethnicity data are often inconsistently reported in hospital discharge records, which can lead to an incomplete picture of other racial and ethnic disparities in SMM. Alternate ways to identify race and ethnicity, including using self-reported data from the birth certificate, are being explored to improve surveillance and reporting.

Wisconsin SMM rate by region, 2019–2023



The SMM rate is higher in Southern and Southeastern Wisconsin than the rest of the state. Pregnant people with high-risk pregnancies may seek out birthing hospitals with greater ability to care for complex medical situations. Birthing facilities across Wisconsin can assess their capacity to care for high-risk patients with the [Wisconsin Association for Perinatal Care's Levels of Care Self-Assessment process](#).

Emerging issue: Recently, a number of hospitals have closed or paused labor and delivery services, leading to increasing gaps in maternity care for many Wisconsinites. These gaps may impact SMM rates as birthing people lose access to care close to home.

How can we reduce SMM in Wisconsin?

Wisconsin's Maternal Mortality Review Team (MMRT) reviews each death that occurs during or within one year of the end of pregnancy to better understand why the person died and how to prevent future deaths. The following recommendations are intended for providers, facilities, communities, and systems to help prevent maternal deaths. Many of these recommendations can also help prevent SMM.

Examples of recommendations that could help prevent SMM include:

- Providers should always arrange for in-person postpartum visits for high-risk patients or as soon as possible if abnormal findings (such as high blood pressure) are encountered during televisits.
- Hospitals should prioritize coagulation testing for pregnant and postpartum patients with bleeding and report critical values immediately to the clinical team.
- Facilities should have simulations for management of postpartum hemorrhage at least yearly for all providers.
- Policymakers should recognize and address systems-level issues that place certain populations at higher risk for COVID-19 or other acute community concerns. For example, ensure that all individuals have the opportunity for supplemental financial assistance during a pandemic.

Please visit the [Wisconsin Maternal Mortality and Morbidity webpage](#) to view the most recent reports, including the [2016-17 Wisconsin Maternal Mortality Report](#) and [Wisconsin MMRT Recommendations: 2020 Pregnancy-Associated Deaths](#) to see more recommendations and learn more about preventing both SMM and maternal mortality.

Funding support

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Appendix

SMM by type, 2019–2023

SMM Type	Rate per 10,000 delivery hospitalizations
Acute renal failure	17.7
Disseminated Intravascular Coagulation	14.5
Hysterectomy	11.9
Acute respiratory distress syndrome	9.3
Sepsis	8.2
Shock	7.0
Eclampsia	4.9
Pulmonary Edema/Acute heart failure	4.3
Ventilation	3.8
Puerperal cerebrovascular disorders	3.5
Air and thrombotic embolism	3.1
Cardiac arrest/Ventricular fibrillation/General heart failure	0.8
Acute Myocardial Infarction	0.7
Aneurysm	0.7
Severe anesthesia complications	0.7
Conversion of cardiac rhythm*	0.7
Sickle cell anemia with crisis*	0.5
Amniotic fluid embolism*	0.5
Heart failure during procedure or surgery*	0.1
Temporary tracheostomy*	0.2

*Interpret rate with caution. Less than 20 cases.

SMM ICD-10 Codes

Other SMM groups, including other obstetric and medical complications, were not included in this data resource but can be found below for reference.

SMM Group	SMM Type	ICD-10 Codes
Renal	Acute renal failure	N17.x, O90.4
Cardiac	Acute myocardial infarction	I21.xx, I22.x
Respiratory	Acute respiratory distress syndrome	J80, J95.1, J95.2, J95.3, J95.82x, J96.0x, J96.2x, J96.9x, R06.03, R09.2
Other obstetric complications	Air and thrombotic embolism	D57.00, D57.01, D57.02, D57.211, D57.212, D57.219, D57.411, D57.412, D57.419, D57.811, D57.812, D57.819
Other obstetric complication	Amniotic fluid embolism	O88.112, O88.113, O88.119, O88.12, O88.13
Cardiac	Aneurysm	I71.xx, I79.0
Cardiac	Cardiac arrest/V fib./General heart failure	I46.x, I49.0x
Cardiac	Conversion of cardiac rhythm	5A12012, 5A2204Z

Hemorrhage	Disseminated Intravascular Coagulation	D65, D68.8, D68.9, O45.002, O45.003, O45.009, O45.012, O45.013, O45.019, O45.022, O45.023, O45.029, O45.092, O45.093, O45.099, O46.002, O46.003, O46.009, O46.012, O46.013, O46.019, O46.022, O46.023, O46.029, O46.092, O46.093, O46.099, O67.0, O72.3
Other obstetric complication	Eclampsia	O15. X
Cardiac	Heart failure during procedure or surgery	I97.120, I97.121, I97.130, I97.131, I97.710, I97.711
Hemorrhage	Hysterectomy	OUT90ZL, OUT90ZZ, OUT97ZL, OUT97ZZ
Other medical complication	Puerperal cerebrovascular disorders	A81.2, G45.x, G46.x, G93.49, H34.0x, I60.xx, I61.xx, I62.xx, I63.00, I63.01x, I63.1xx, I63.2xx, I63.3xx, I63.4xx, I63.5xx, I63.6, I63.8x, I63.9, I65.xx, I66.xx, I67.xx, I68.xx, O22.50, O22.52, O22.53, I97.810, I97.811, I97.820, I97.821, O87.3
Cardiac	Pulmonary Edema/Acute heart failure	I50.1, I50.20, I50.21, I50.23, I50.30, I50.31, I50.33, I50.40, I50.41, I50.43, I50.810, I50.811, I50.813, I50.814, I50.82, I50.83, I50.84, I50.89, I50.9, J81.0
Sepsis	Sepsis	A32.7, A40.x, A41.x, I76, O85, O86.04, R65.20, R65.21, T81.12XA, T81.44XA
Other obstetric complication	Severe anesthesia complications	O29.112–O29.119, O29.122–O29.129, O29.192–O29.199, O29.212–O29.219, O29.292–O29.299, O74.0, O74.1, O74.2, O74.3, O89.0x, O89.1, O89.2, T88.2XXA, T88.3XXA
Hemorrhage	Shock	O75.1, R57.x, T78.2XXA, T81.10XA, T81.11XA, T81.19XA, T88.6XXA
Other medical complication	Sickle cell disease with crisis	D57.00, D57.01, D57.02, D57.211, D57.212, D57.219, D57.411, D57.412, D57.419, D57.811, D57.812, D57.819
Respiratory	Temporary tracheostomy	OB110F4, OB113F4, OB114F4
Respiratory	Ventilation	5A1935Z, 5A1945Z, 5A1955Z

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