

Overview of Severe Maternal Morbidity in Michigan 2011-2019



Severe Maternal Morbidity Overview

Severe Maternal Morbidity (SMM) is defined as the unexpected outcomes of labor and delivery that result in significant short- or long-term consequences to a woman's health.¹ SMM is routinely monitored in Michigan using the Michigan Inpatient Database.² Inpatient delivery hospitalizations are identified based on delivery diagnoses, procedures and diagnosis-related group codes. Ectopic, molar and pregnancies with abortive outcomes are excluded from the analyses. After the delivery hospitalizations are identified, diagnosis and procedure-based ICD-10 codes are used to identify cases that fall within a severe morbidity inclusion category.

SMM Inclusion Categories:

- Acute Heart Failure/Pulmonary Edema
- Acute Myocardial Infarction
- Acute Renal Failure
- Adult Respiratory Distress Syndrome
- Air and Thrombotic Embolism
- Amniotic Fluid Embolism
- Aneurysm
- Blood Transfusions
- Cardiac Arrest/Ventricular Fibrillation
- Conversion of Cardiac Rhythm
- Disseminated Intravascular Coagulation
- Eclampsia
- Heart Failure/Arrest during Procedure or Surgery
- Hysterectomy
- Puerperal Cerebrovascular Disorder
- Sepsis
- Severe Anesthesia Complications
- Shock
- Sickle Cell Disease with Crisis
- Temporary Tracheostomy
- Ventilation

¹Literature Source: Centers for Disease Control and Prevention. Reproductive Health. Retrieved from: <https://www.cdc.gov/reproductivehealth/maternalinfanthealth/severematernalmorbidity.html>

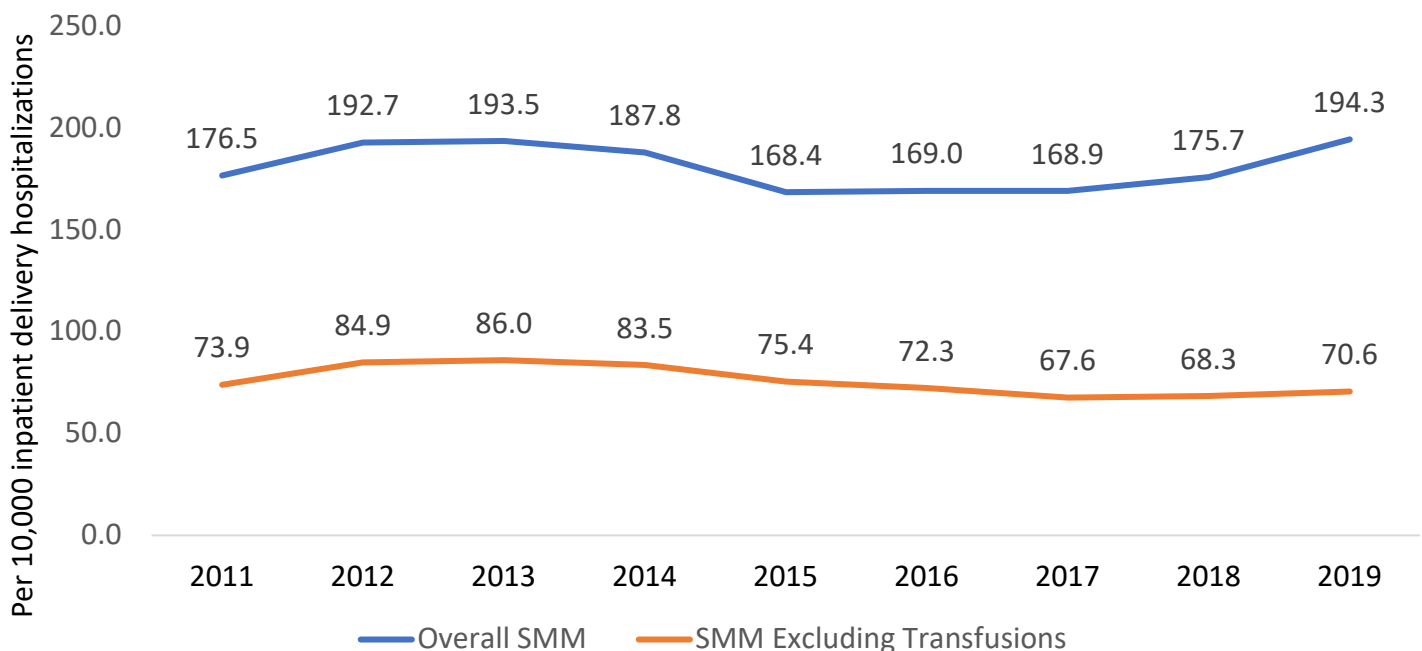
²Data Source for all data in report: Michigan Resident Inpatient Files created by the Division for Vital Records and Health Statistics, Bureau of Epidemiology and Population Health, Michigan Department of Health and Human Services, using data from the Michigan Inpatient Database obtained with permission from the Michigan Health and Hospital Association Service Corporation (MHASC).

Severe Maternal Morbidity, 2011-2019

Michigan's SMM rate fluctuated between 2011 and 2019 (Figure 1). The SMM rate increased from 2011 to 2012 and then remained relatively stable until 2015 when it decreased below that of the 2011 rate. The decreased rate remained relatively stable until 2018 where it began to increase again. In 2019, the rate increased to the highest seen in the time period monitored. This increase was primarily driven by an increase in transfusion-related events.

SMM excluding transfusions excludes cases where transfusion is the only SMM qualifier. When looking at SMM excluding transfusions, the rate follows a similar trend as the overall SMM rate. The same percent increase from 2018 to 2019 is not seen because the cases with only transfusions are excluded.

Figure 1. SMM and SMM Excluding Transfusions,
Michigan 2011-2019



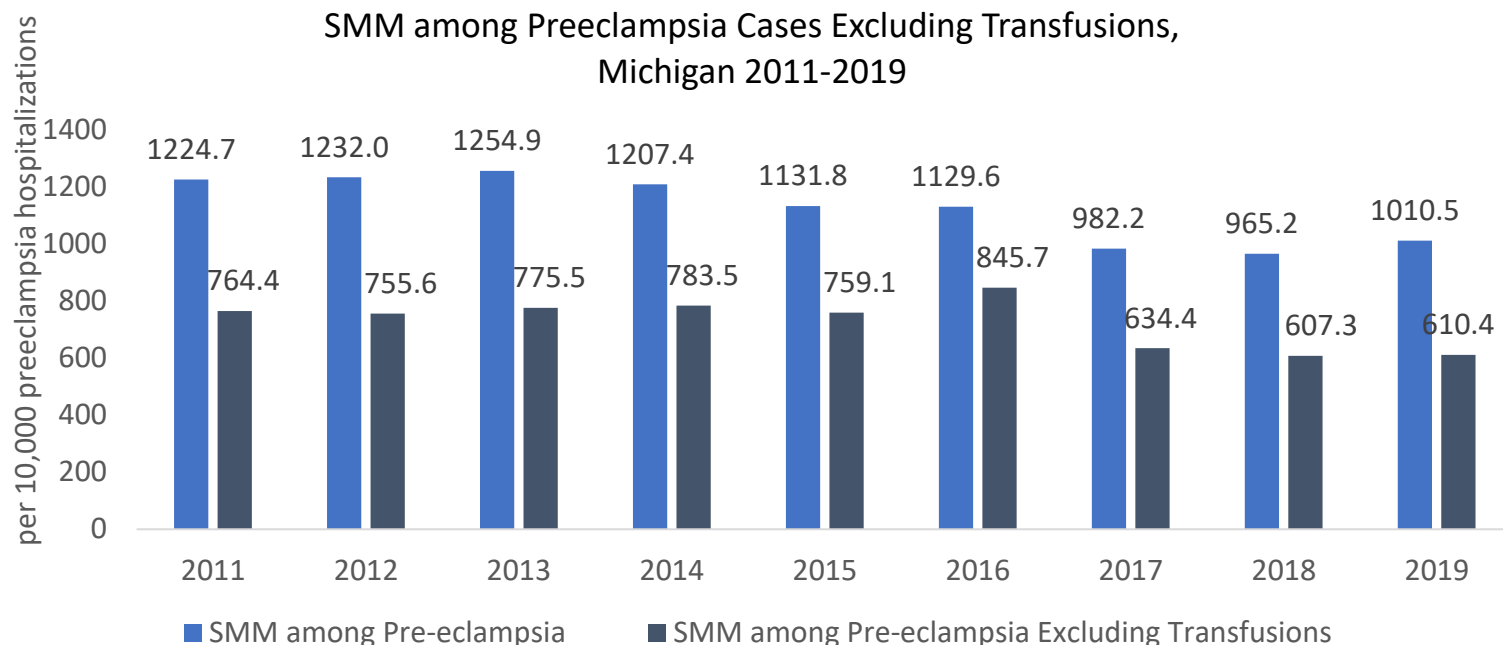
Severe Maternal Morbidity and Pre-eclampsia

Figure 2 displays the SMM and SMM excluding transfusions^a rates among pre-eclampsia inpatient delivery hospitalizations. The denominator includes inpatient delivery hospitalizations with pre-eclampsia, HELLP syndrome (Hemolysis, Elevated Liver enzymes and Low Platelets) or eclampsia diagnoses codes.

The rate of SMM among pre-eclampsia cases began to decrease in 2014 and this continued until 2019 when there was an increase in the rate. The SMM rate among pre-eclampsia cases in 2019 continues to be lower than rates reported on 2011 through 2016.

The rate of SMM among pre-eclampsia cases excluding transfusions fluctuated between 2011 and 2018^b. In 2016, there was a rate increase higher than seen in previous years, but the rate decreased again in 2017 and this decreased rate remained relatively stable for the next few years.

Figure 2. SMM among Preeclampsia Cases vs. SMM among Preeclampsia Cases Excluding Transfusions, Michigan 2011-2019



^a Excludes cases where transfusion is the only SMM qualifier. Transfusions may still be present in cases that had an additional SMM qualifier.

^b SMM cases are excluded from the numerator if transfusion is the only SMM qualifier present.

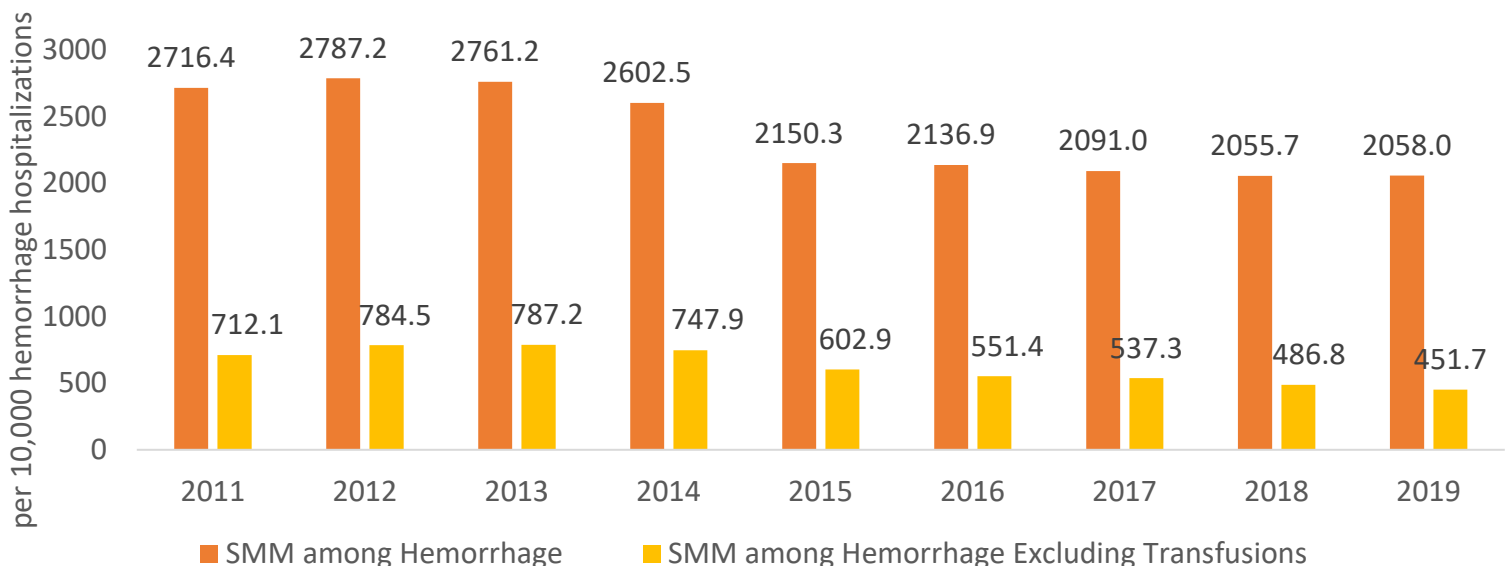
Severe Maternal Morbidity and Hemorrhage

Figure 3 displays the SMM and SMM excluding transfusions^a rates among hemorrhage inpatient delivery hospitalizations. The denominator includes inpatient delivery hospitalizations with hemorrhage and/or transfusion diagnoses codes.

The rate of SMM among hemorrhage cases began to decrease in 2014 and has remained stable over the last five years.

The rate of SMM among hemorrhage cases excluding transfusions^b has consistently decreased since 2014. In 2019, the rate of SMM among hemorrhage cases excluding transfusions was 36.6 percent lower than the rate seen in 2011 for the hemorrhage population.

Figure 3. SMM among Hemorrhage Cases vs. SMM among Hemorrhage Cases excluding Transfusions, Michigan 2011-2019



^a Excludes cases where transfusion is the only SMM qualifier. Transfusions may still be present in cases that had an additional SMM qualifier.

^b SMM cases are excluded from the numerator if transfusion is the only SMM qualifier present.

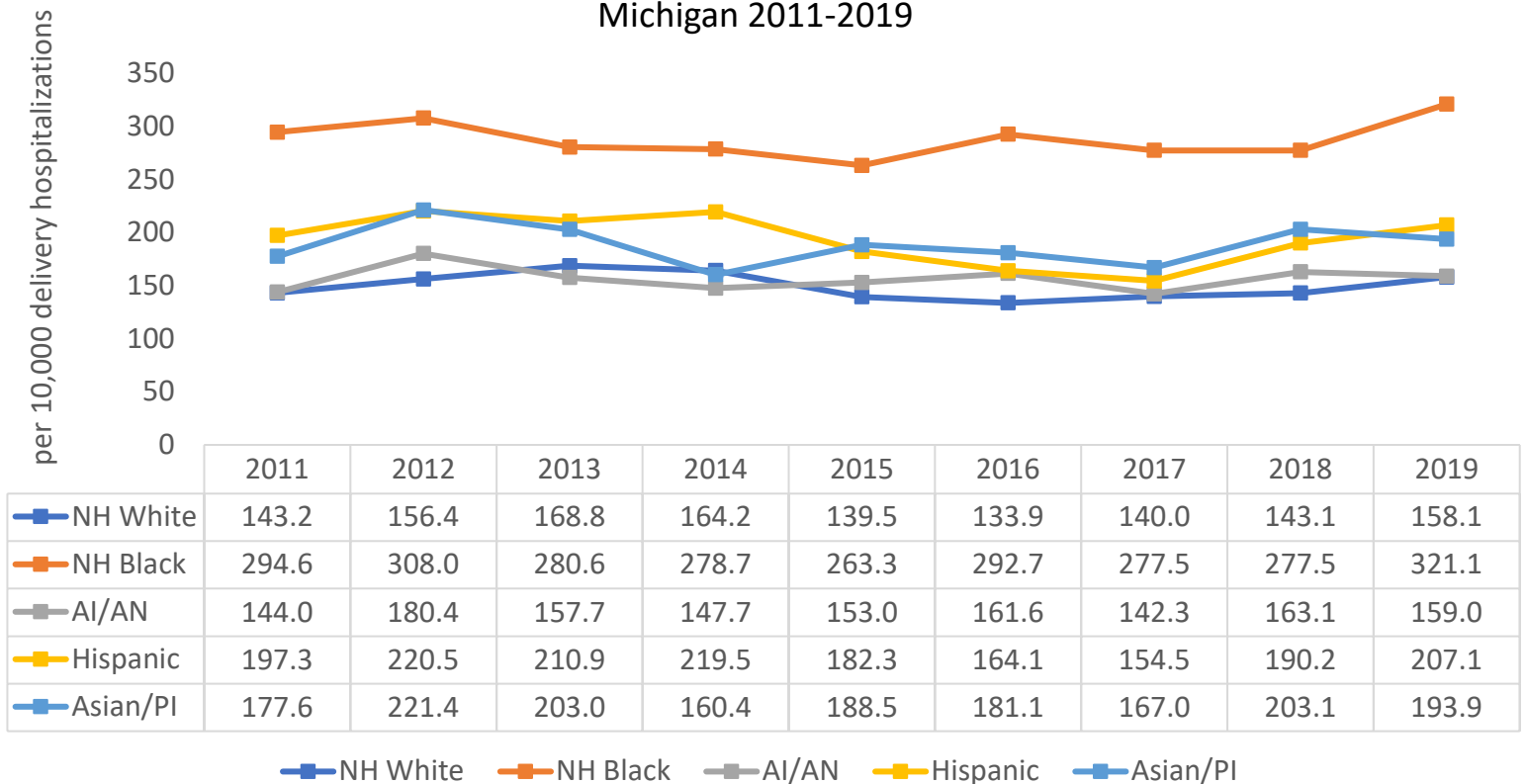
Severe Maternal Morbidity by Race, Michigan 2011-2019

Non-Hispanic (NH) Black mothers have consistently higher rates of SMM compared to mothers of other races and ethnicities (figure 4). In 2019, the rate of SMM among NH Black mothers was 2.0 times the rate among NH white mothers.

Hispanic and Asian Pacific Islander mothers also experienced consistently higher rates of SMM with rates 1.3 and 1.2 times higher than NH white mothers, respectively.

The rates of SMM have fluctuated throughout this time period for all races and ethnicities monitored.

Figure 4. Severe Maternal Morbidity by Race, Michigan 2011-2019

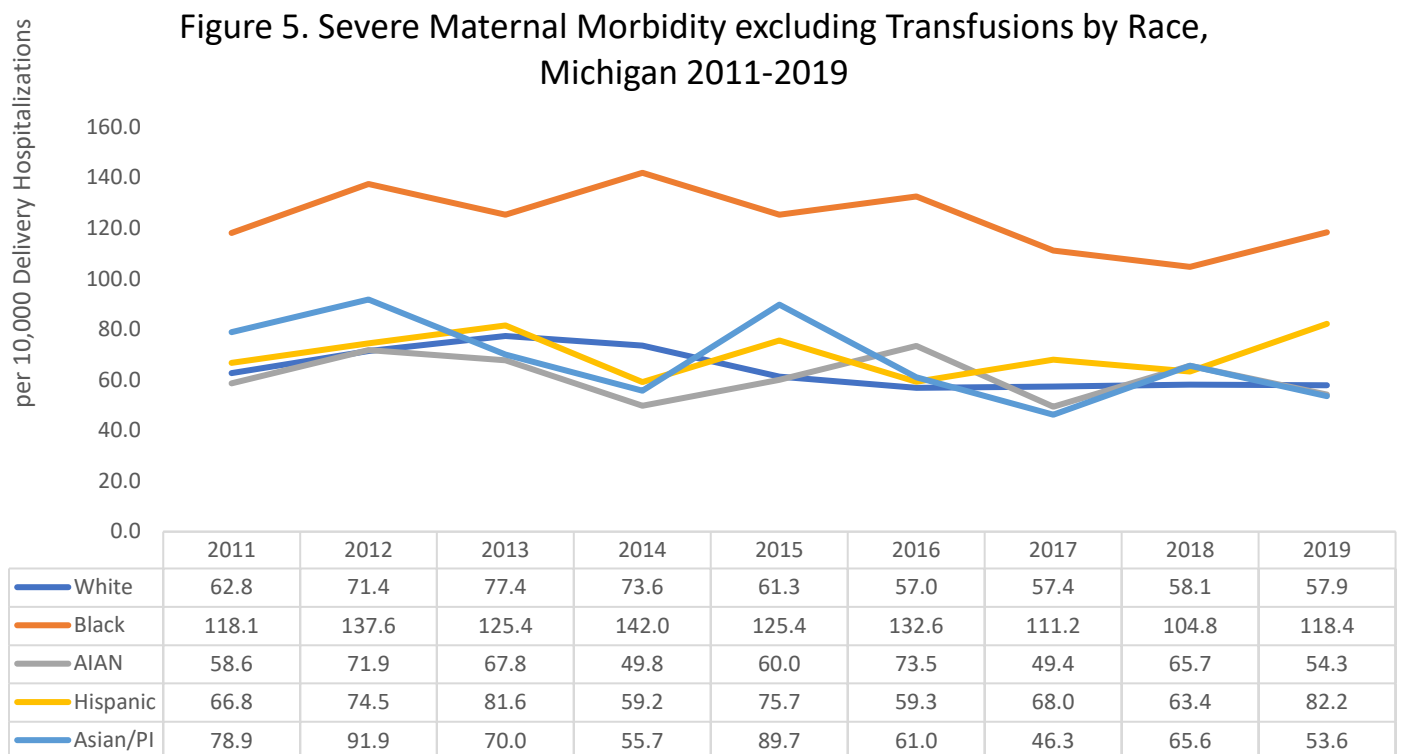


Severe Maternal Morbidity Excluding Transfusions by Race

Similarly to SMM, NH Black mothers have consistently higher rates of SMM excluding transfusions compared to mothers of other races and ethnicities (figure 5). In 2019, the rate of SMM excluding transfusions among NH Black mothers was 2.0 times the rate among NH white mothers.

Except for in 2014, Hispanic mothers also consistently experienced higher rates of SMM excluding transfusions. In 2019, Hispanic mothers experienced a 1.4 times higher rate of SMM excluding transfusions as compared to NH white mothers.

The rates of SMM excluding transfusions have fluctuated throughout this time period for all races and ethnicities monitored.



Severe Maternal Morbidity Causes, 2019

Table one shows the 2019 SMM category rates. Transfusions were the most prevalent SMM qualifier. Acute Renal Failure, Disseminated Intravascular Coagulation, Shock and Respiratory Distress are other leading causes. NH Black mothers experienced higher rates of SMM compared to NH white mothers for all categories that were reportable. Mothers of races other than white and Black experienced higher rates of SMM and SMM subcategories for many indicators compared to NH white mothers.

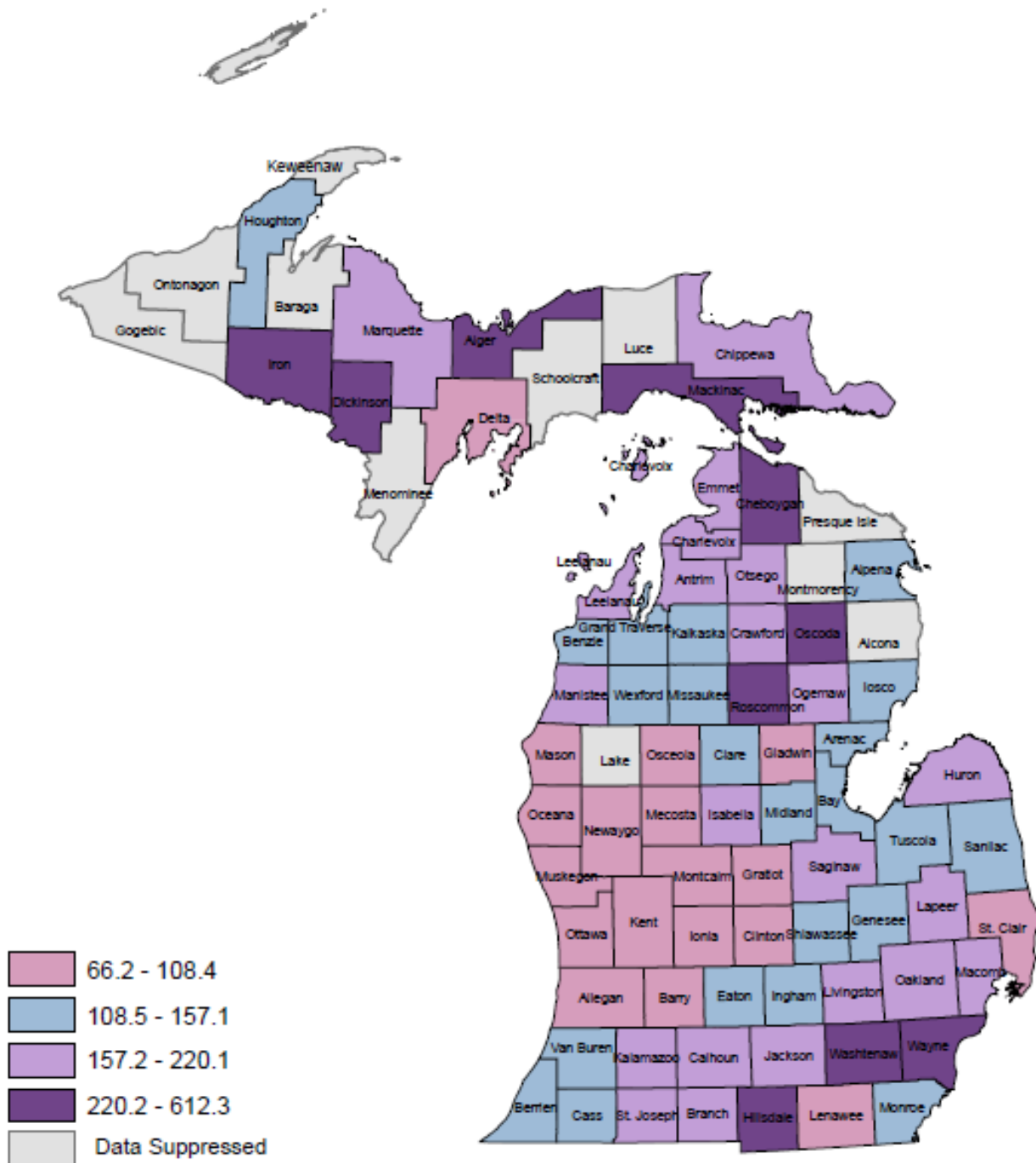
Table 1. SMM and SMM category count and rate per 10,000 Inpatient Delivery Hospitalizations, Michigan 2019

	Total		NH White		NH Black		Other	
	Count	Rate	Count	Rate	Count	Rate	Count	Rate
SMM	2026	194.3	1070	158.1	651	321.1	305	186.7
Transfusions	1454	139.4	753	111.3	474	233.8	227	139.0
SMM excluding transfusions	736	70.6	392	57.9	240	118.4	104	63.7
Acute renal failure	168	16.1	73	10.8	66	32.6	29	17.8
Disseminated intravascular coagulation	143	13.7	91	13.4	32	15.8	20	12.2
Shock	105	10.1	55	8.1	28	13.8	22	13.5
Respiratory distress	123	11.8	61	9.0	50	24.7	12	7.3
Eclampsia	81	7.8	41	6.1	34	16.8	6	3.7
Sepsis	89	8.5	45	6.6	29	14.3	15	9.2
Hysterectomy	72	6.9		6.4		7.9		8.0
Pulmonary edema	97	9.3	48	7.1	39	19.2	10	6.1
Ventilation	59	5.7		4.9		9.9		3.7
Puerperal Cerebrovascular Disorders	41	3.9	18	2.7	17	8.4	6	3.7
Air and thrombotic embolism	22	2.1	suppress	1.6	suppress	4.4	suppress	suppress
Conversion of cardiac rhythm	15	1.4	8	1.2	suppress	suppress	suppress	suppress
Sickle cell with crisis	12	1.2	0	0.0	12	5.9	0	0.0
Cardiac arrest/Ventricular fibrillation	12	1.2	suppress	suppress	suppress	suppress	suppress	suppress
Anesthesia Complications	7	0.7	suppress	suppress	suppress	suppress	0	0.0
Acute Myocardial Infarction	9	0.9	suppress	suppress	suppress	suppress	suppress	suppress

Date note: observations less than 6 are suppressed. Counts are suppressed in race categories if it makes identification of a suppressed count possible.

Severe Maternal Morbidity by Residence County, 2015-2019

Severe Maternal Morbidity Rate per 10,000 Delivery Hospitalizations, Michigan 2015-2019



Data note: Observations less than 6 are suppressed

This map displays SMM rate for 2015-2019 combined by residence county. Counties with the highest rates of SMM are found in [State of Michigan Prosperity Regions 1, 3, 9 and 10.](#)

Literature and Resources

What to Watch for During Pregnancy and in the Year After Delivery

Did you know some problems due to pregnancy can happen up to a year after delivery? Be aware of urgent maternal warning signs and symptoms during pregnancy and in the year after delivery. To view the symptoms, please visit www.safehealthcareforeverywoman.org . If you have any of these symptoms during or after pregnancy, contact your health care provider and get help right away. If you can't reach your provider, go to the emergency room.

For more messaging about urgent maternal warning signs please visit The Centers for Disease Control and Prevention Hear Her campaign: <https://www.cdc.gov/hearher/index.html>

For additional federal severe maternal morbidity data resources visit: <https://www.cdc.gov/reproductivehealth/maternalinfanthealth/severematernalmorbidity.html>

For additional data on maternal health in the United States visit: https://www.cdc.gov/reproductivehealth/data_stats/index.htm

For additional data on maternal outcome surveillance in Michigan visit: Michigan.gov/Mmms

For additional Michigan resources and services visit: Michigan.gov/MIHEIP

The Michigan Department of Health and Human Services will not exclude from participation in, deny benefits of, or discriminate against any individual or group because of race, sex, religion, age, national origin, color, height, weight, marital status, gender identification or expression, sexual orientation, partisan considerations, or a disability or genetic information that is unrelated to the person's eligibility.