

# Severe Maternal Morbidity

2013 - 2015

Utah Department of Health  
Maternal and Child Health Bureau  
Perinatal Mortality Review Program

**PROJECT TEAM**

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# Severe Maternal Morbidity Utah, 2013-2015

## Executive Summary

### Key Findings

- The leading indicators for severe maternal morbidity (SMM) were blood transfusions, disseminated intravascular coagulation, sepsis, heart failure during surgery or operation, and hysterectomy.
- The rate of SMM increased from 2013 to 2014 and then decreased from 2014 to 2015.
- Women 40 years of age and older had the highest rates of SMM compared to women of other age ranges.
- Hawaiian and/or Pacific Islander women had the highest rate of SMM compared to women of other races.
- Obese women had high rates of SMM, with the highest rates among women with a BMI greater than 35 (Class III).
- Women who experience excessive or inadequate gestational weight gain had higher rates of SMM compared to women who experienced adequate gestational weight gain.
- Women who had six or more prior births had higher rates of SMM compared to women with five or less.
- Women who delivered very preterm (32 weeks or less) had higher rates of SMM; the rate of SMM decreased as women delivered closer to term.
- Hospital charges increased almost two-fold with each increase in number of SMM indicators.

### Recommendations

- Case reviews of SMM events should be conducted by hospital staff to understand the associated factors in their facilities.
- The implementation of patient safety bundles can help standardize care provided to pregnant women and provide hospitals with necessary protocols to address severe maternal morbidities and mortality.
- It is recommended that capacity be developed in hospitals to recognize the signs of acute stress after severe maternal events and develop resources for supporting patients, families, and staff.
- Preconception health, including eating a healthy diet, getting adequate physical activity, and implementing family planning methods, should be promoted as this can have a positive impact on future pregnancy outcomes.

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## Background/Significance

In the U.S., more than 4 million women give birth every year and the majority of these births occur in hospitals, making delivery one of the most common hospitalizations for women(1). During labor and delivery, women may suffer from unexpected health outcomes, or severe maternal morbidities, that can have mild to long-lasting effects on their health(2). These outcomes include hemorrhage, eclampsia, renal failure, acute myocardial infarction, and other severe complications(2).

Severe maternal morbidity (SMM) occurs more commonly than maternal mortality and surveillance of SMM provides an opportunity for public health improvement. In 1987, the U.S. maternal mortality rate was 7.2 maternal deaths per 100,000 live births, then increased to 17.3 maternal deaths per 100,000 live births in 2013(3). For SMM, the rate was 47.5 per 10,000 cases (474.6 per 100,000) in 1993-1994 then increased to 141.5 per 10,000 cases (1415.5 per 100,000) in 2013-2014(2). Racial and ethnic disparities also exist between minority women and Caucasian women by rates of SMM(4).

Severe maternal morbidities are a result of a combination of system-level factors, provider-level factors, and patient-level factors. As such, there is a need to understand and address each of these factors in order to reduce SMM(5). To date, there is no systemic collection of data or reporting on SMM in the U.S. The first step in addressing this issue in Utah is to improve surveillance of SMM it causes, identify high-risk populations, develop clinical protocols to prevent SMM, and effectively measure the impact of SMM programs(1).

## Methodology

### Data

**Inpatient Hospital Data:** The Utah Department of Health Office of Health Care Statistics collects information on discharges from all licensed hospitals in Utah. The inpatient hospital data contains information on the patient's length of stay; International Classification of Diseases, 9th Revision, Clinical Modification diagnostic and procedural codes (ICD-9-CM); and hospital charges. More information on hospital discharge data can be found at <http://stats.health.utah.gov/>.

**Birth Certificates:** The Utah Department of Health Office of Vital Records and Statistics registers all birth events filed by hospitals, midwives, or other individuals who may deliver a child in Utah. Birth certificates contain information about the child; demographic information on the mother (parent 1) and father (parent 2) such as age, education, and race/ethnicity; pregnancy information such as whether prenatal care was received, parity, method of delivery, etc.; and select medical conditions. More information on birth certificates can be found at <https://vitalrecords.utah.gov/>.

In order to assess the state of SMM in Utah, inpatient hospital data from 2013 to 2015 was linked to 2013 to 2015 birth data. The last three months (October to December) of 2015 in both hospital discharge data and birth data were excluded due to hospital system changes from ICD-9-CM to ICD-10-CM. Pregnancies that did not result in a live birth, such as ectopic/molar pregnancies, spontaneous abortions and stillbirths, were excluded from both the linkage and analysis. There were a total of 139,525 pregnancy-associated hospitalizations found in the hospital data and 120,110 (86.1%) were matched to a birth certificate record. A pregnancy-associated hospitalization includes both deliveries and postpartum readmissions.

## Analysis

Cases of SMM were identified using an algorithm developed by researchers at the U.S. Centers for Disease Control and Prevention. This algorithm identifies 25 indicators for SMM, with 18 indicators coming from ICD-9-CM diagnosis codes and seven indicators from ICD-9-CM procedural codes(1). A full list of diagnoses and procedures can be found in the Appendix.

Additionally, a severity recalculation was applied to non-procedural conditions based on the following criteria:

- The mother's length of stay being equal to or greater than the 90th percentile by delivery method.
- The mother was transferred before or after delivery to a different healthcare facility.
- The mother died during delivery hospitalization.
- At least one of the seven procedural indicators was present.

The data in this report is based on maternal morbidity indicators adjusted for severity. All SMM rates reported are calculated per 10,000 pregnancy-associated hospitalizations unless otherwise indicated.

The statistical method used for analysis is the chi-squared test to determine associations between maternal characteristics and SMM and its indicators. Analysis was conducted using SAS version 9.4.

## Limitations

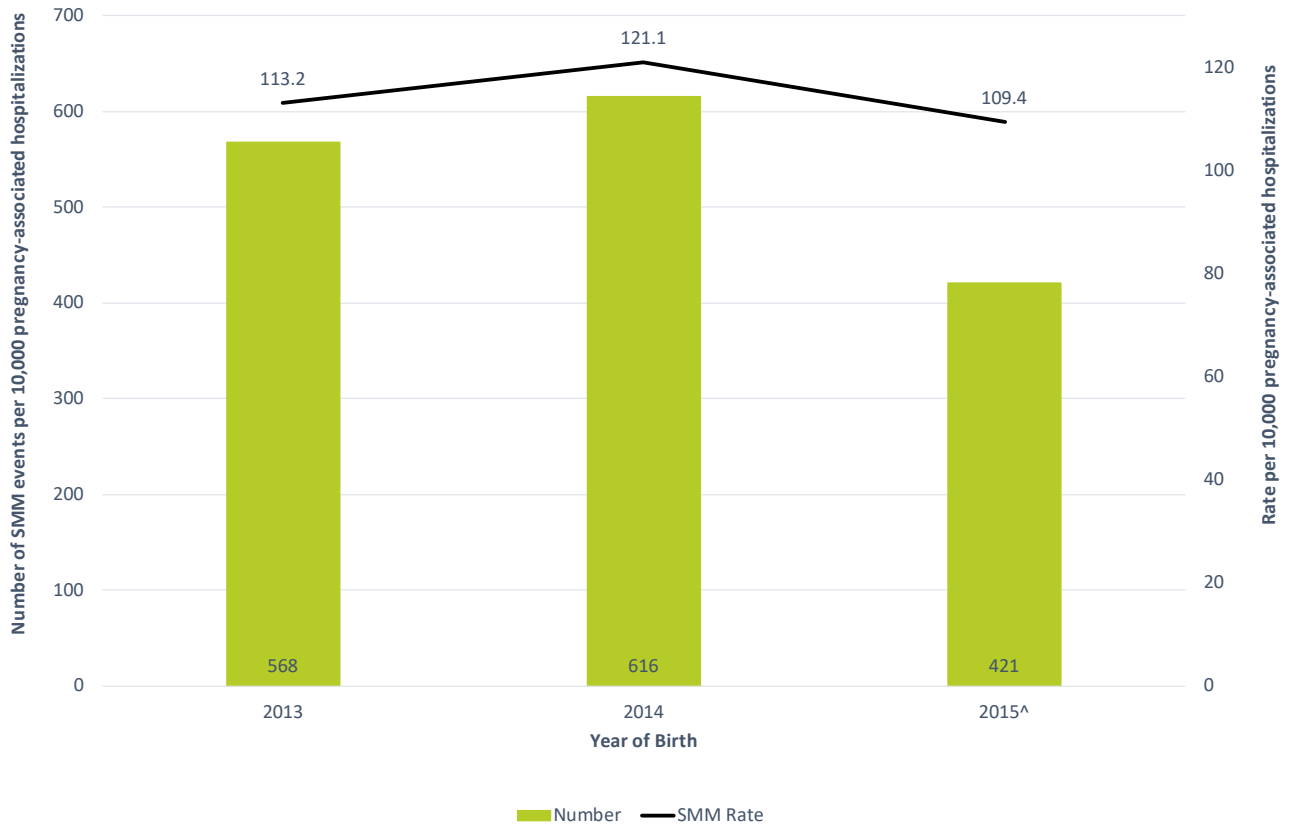
One limitation of the data in this report is that we were unable to link 100% of the datasets. As 13.9% of the dataset was not linked, information based on birth data such as race and ethnicity, trial of labor (TOL), body mass index (BMI), parity, gestational week, and local health districts are missing among these pregnancy-associated hospitalizations. To assess how representative the linked data is of all cases of SMM, a comparison of maternal morbidity rates between the linked data set and the inpatient hospital discharge data was conducted. The results of the analysis showed the rates of SMM were similar between the linked data set and the unlinked data set. Similarities in rates of SMM supports the use of the linked data set as a representative sample of all cases of SMM found in the inpatient hospital discharge data.

Another limitation of the data is that births occurring outside of an inpatient hospital facility were not included. In 2013-2015, 3.1% of Utah births occurred in an out-of-hospital setting and those births were not represented in this sample. Postpartum readmissions may be underestimated for the 2015 births as the data for 2016 was not included in this analysis. Lastly, blood transfusion data in the hospital discharge data does not indicate how many units of blood were used and it is not possible to account for the severity of blood loss.

# Results

From 2013-2015, the overall SMM rate was 115 per 10,000 pregnancy-associated hospitalizations.

**Figure 1: Trend of Severe Maternal Morbidity by Year, Utah, 2013-2015.**



^January 1, 2015 to September 30, 2015 only.

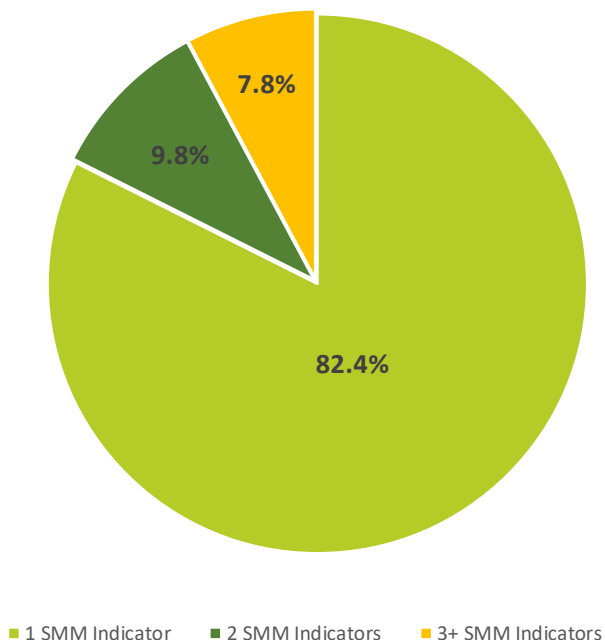
**Table 1: Severe Maternal Morbidity by year, Utah, 2013-2015.**

	2013	2014	2015^	All Years
<b>Number of SMM cases</b>	<b>568</b>	<b>616</b>	<b>421</b>	<b>1,605</b>
<b>All pregnancy-associated hospitalizations</b>	<b>50,180</b>	<b>50,880</b>	<b>38,465</b>	<b>139,525</b>
<b>SMM rate per 10,000 pregnancy-associated hospitalizations</b>	<b>113.2</b>	<b>121.1</b>	<b>109.4</b>	<b>115.0</b>

^January 1, 2015 to September 30, 2015 only.

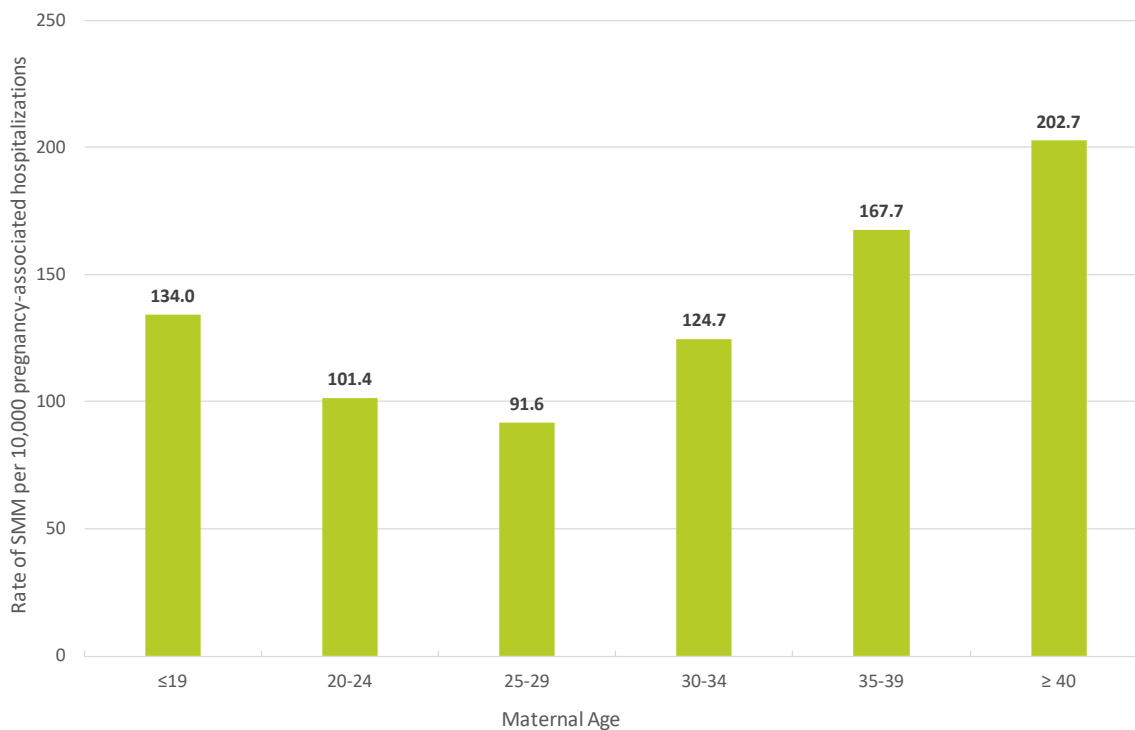
- The SMM rate increased from 113.2 per 10,000 pregnancy-associated hospitalizations in 2013 to 121.1 in 2014. In 2015, the rate dropped to 109.4 per 10,000 pregnancy-associated hospitalizations.

**Figure 2: Distribution of Severe Maternal Morbidity Indicators among Women with at Least One Indicator, Utah, 2013-2015.**



- The majority of hospitalizations (82.4%) with associated SMMs had one indicator, while 9.8% had two indicators and 7.8% had three or more indicators.

**Figure 3: Severe Maternal Morbidity by Maternal Age\*, Utah, 2013-2015.**

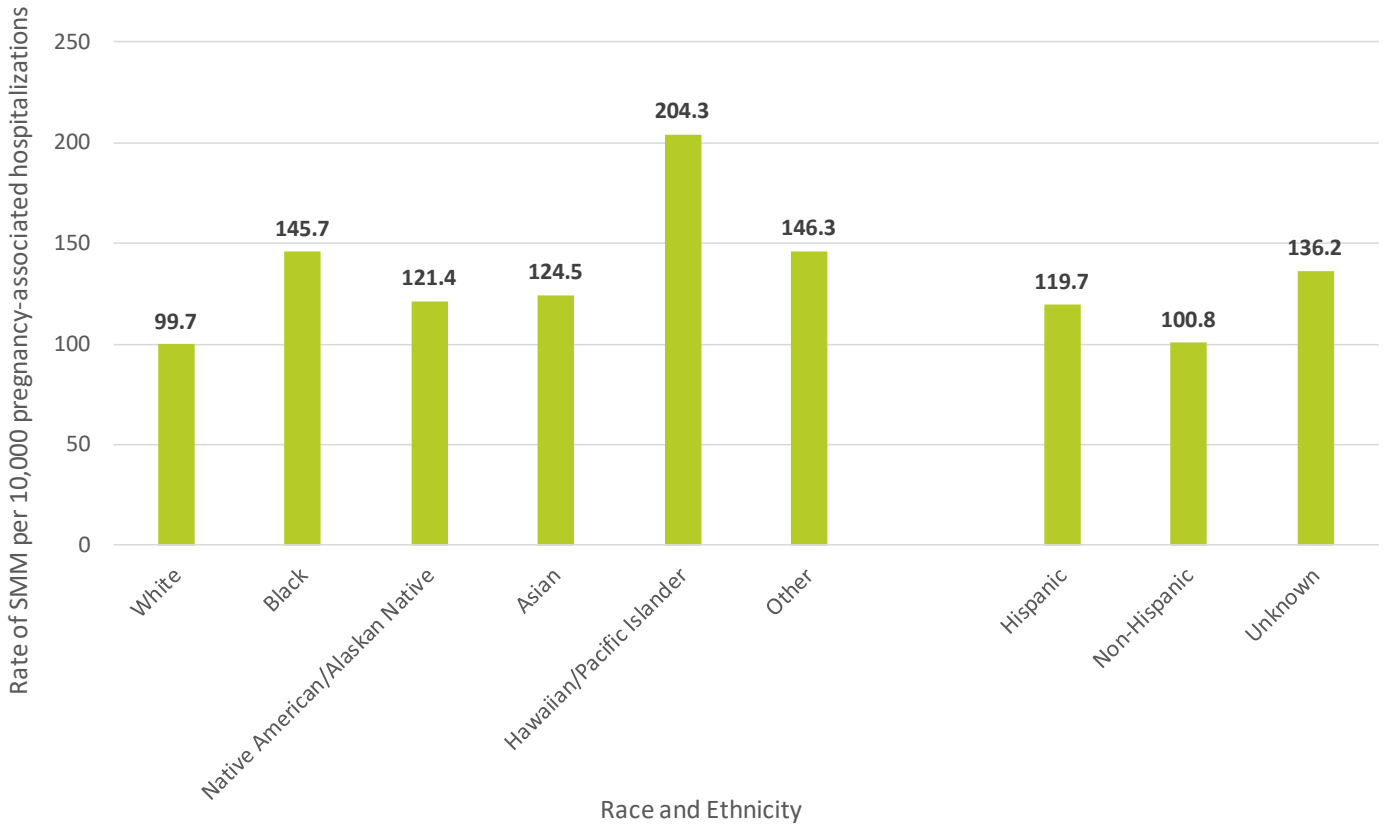


\*Statistically significant (p-value <0.05)

- Women aged 40 and older had the highest rate of SMM at 202.7 per 10,000 pregnancy-associated hospitalizations. The lowest rate was among women aged 25 to 29 years old at 91.6 per 10,000 per pregnancy-associated hospitalizations.



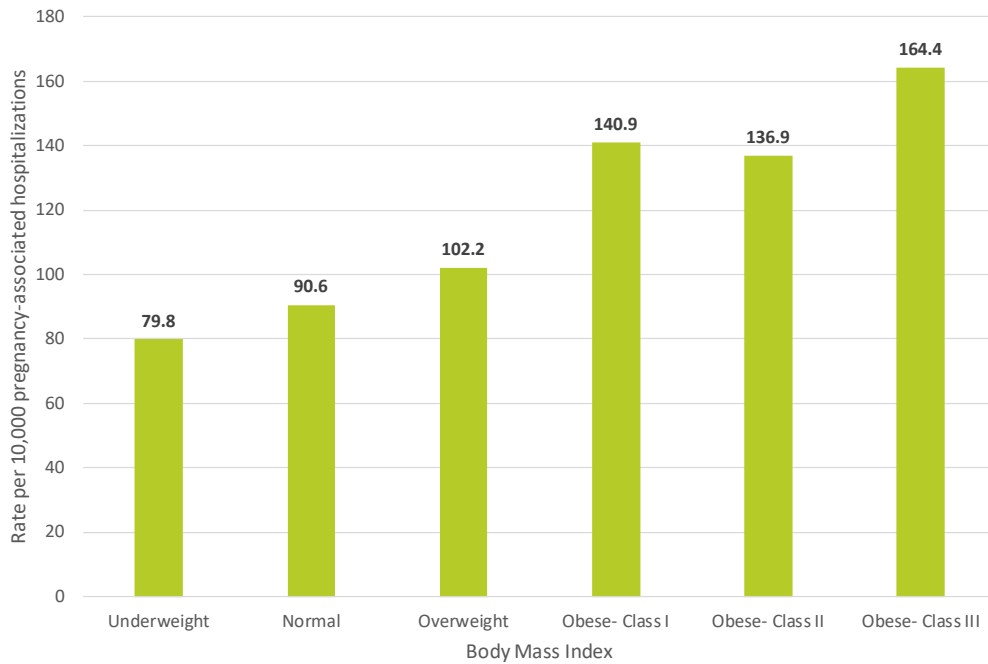
**Figure 4: Severe Maternal Morbidity by Race\* and Ethnicity\*, Utah, 2013-2015.**



\*Statistically significant (p-value <0.05)

- The highest rate of SMM was among Hawaiian/Pacific Islander women at 204.3 per 10,000 pregnancy-associated hospitalizations and the lowest rate was among White women at 99.7 per 10,000 pregnancy-associated hospitalizations.
- The rate of SMM among Hispanic women was 119.7 per 10,000 pregnancy-associated hospitalizations compared to non-Hispanic women at 100.8 per 10,000 pregnancy-associated hospitalizations.

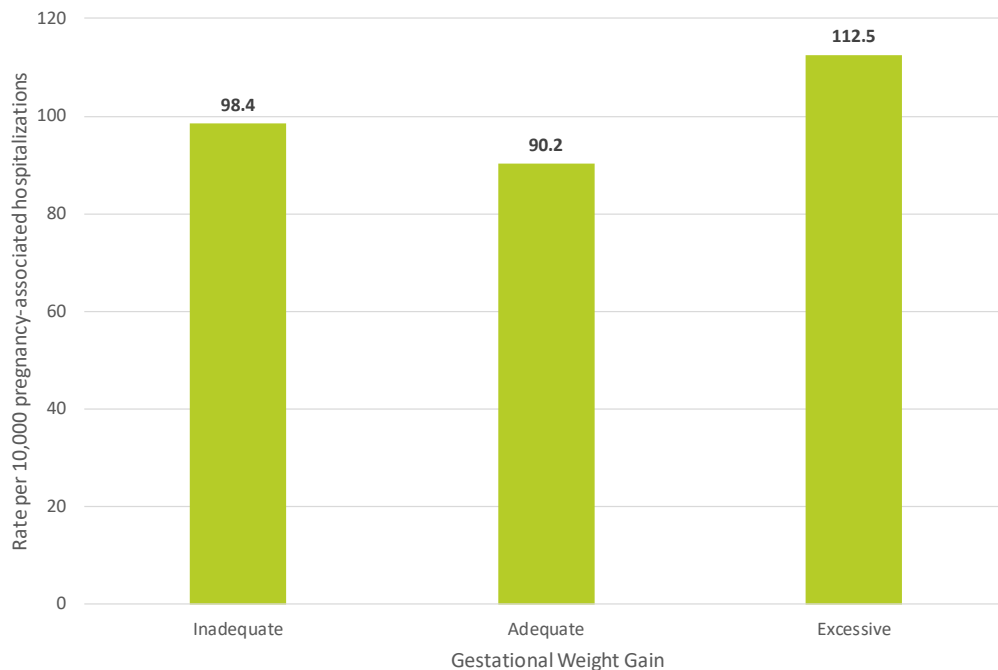
**Figure 5: Severe Maternal Morbidity by Pre-pregnancy Body Mass Index (BMI)\*, Utah, 2013-2015.**



\*Statistically significant (p-value <0.05)

- Rates of SMM by pre-pregnancy BMI category was highest among women with class III obesity at 164.4 per 10,000 pregnancy-associated hospitalizations and lowest among women a pre-pregnancy BMI category of underweight at 79.8 per 10,000 pregnancy-associated hospitalizations.
- The trend indicates that SMM rates rose with increasing pre-pregnancy BMI category except class II obesity.

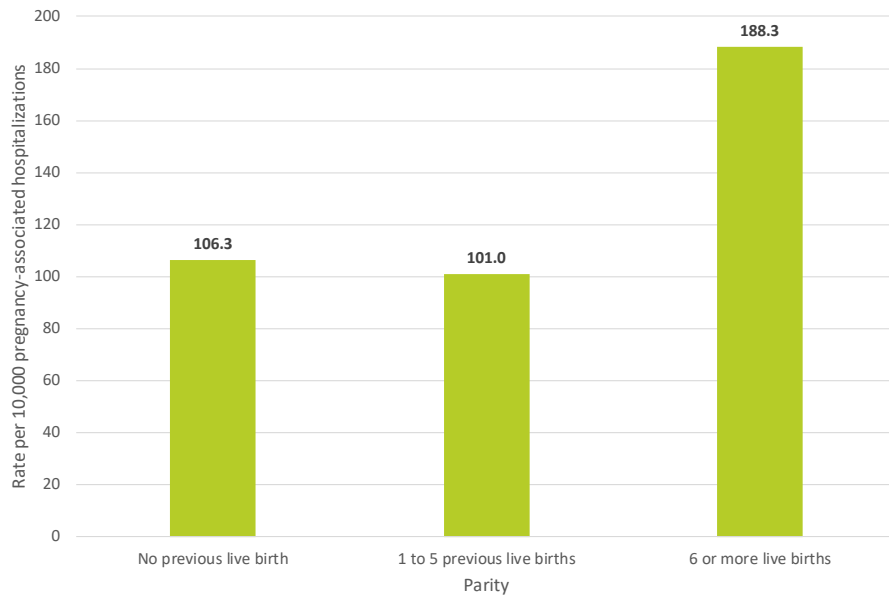
**Figure 6: Severe Maternal Morbidity by Gestational Weight Gain\*, Utah, 2013-2015.**



\*Statistically significant (p-value <0.05)

- The highest rate of SMM was among women who experienced excessive gestational weight gain during pregnancy at 112.5 per 10,000 pregnancy-associated hospitalization while the lowest rate was among women with adequate gestational weight gain during pregnancy at 90.2 per 10,000 pregnancy-associated hospitalizations.

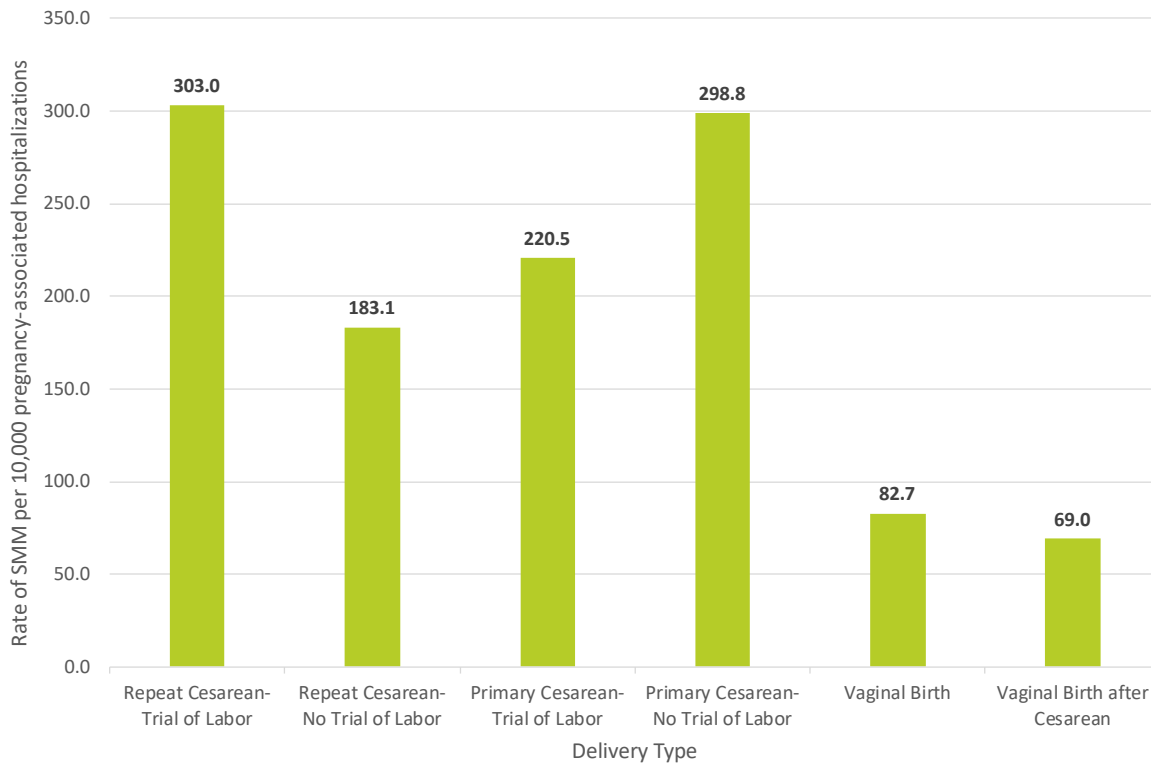
**Figure 7: Severe Maternal Morbidity by Number of Previous Live Births\*, Utah, 2013-2015.**



\*Statistically significant (p-value <0.05)

- The highest rate of SMM was found among women with six or more previous live births at 188.3 per 10,000 pregnancy-associated hospitalizations. The lowest rate was among women with one to five at 101.0 per 10,000 pregnancy-associated hospitalizations.

**Figure 8: Severe Maternal Morbidity by Delivery Type\*, Utah, 2013-2015.**



\*Statistically significant (p-value <0.05)

- The highest rate of SMM was found among women who had a repeat Cesarean with trial of labor at 303.0 per 10,000 pregnancy-associated hospitalizations. The lowest rate was among women who had successful vaginal birth after a Cesarean.

**Table 2: Frequency and Rate of Severe Maternal Morbidity by Local Health District of Maternal Residence\*, Utah, 2013-2015.**

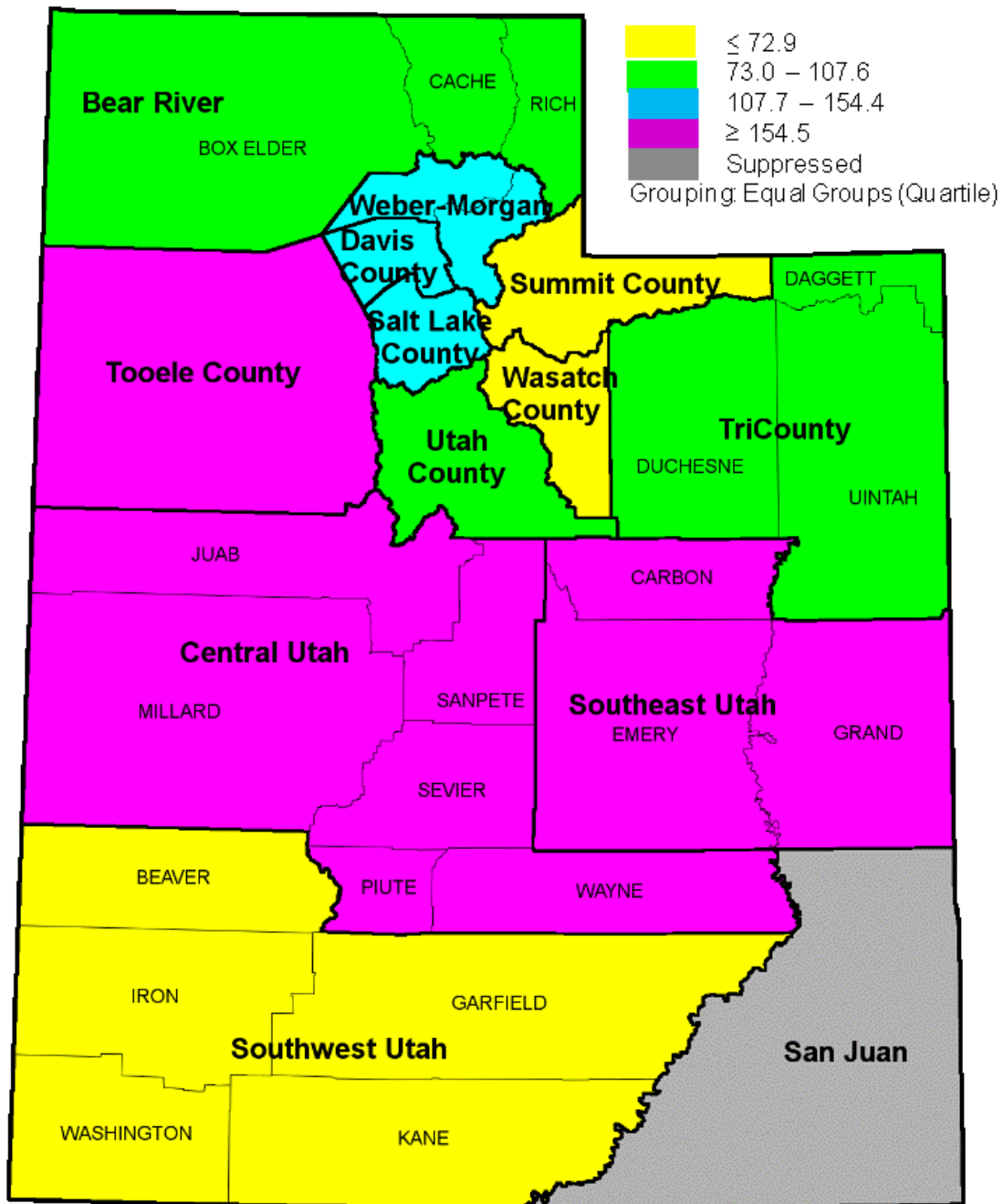
	<b>Number of SMM-associated hospitalizations</b>	<b>Number of pregnancy-associated hospitalizations</b>	<b>SMM rate per 10,000 pregnancy-associated hospitalizations</b>
<b>Bear River</b>	61	7,885	77.4
<b>Central</b>	37	2,355	157.1
<b>Davis</b>	169	14,473	116.8
<b>Salt Lake</b>	444	406,744	109.2
<b>Southeast</b>	24	1,285	186.8
<b>Southwest</b>	43	7,623	56.4
<b>Summit</b>	6	877	68.4**
<b>Tooele</b>	43	2,464	174.5
<b>TriCounty</b>	27	2,542	106.2
<b>Utah</b>	235	28,679	81.9
<b>Wasatch</b>	6	991	60.5**
<b>Weber</b>	151	9,941	151.9
<b>San Juan</b>	***	***	***

\*Statistically significant (p-value <0.05)

\*\*Use caution in interpreting; the estimate has a relative standard error greater than 30% and does not meet UDOH standards for reliability.

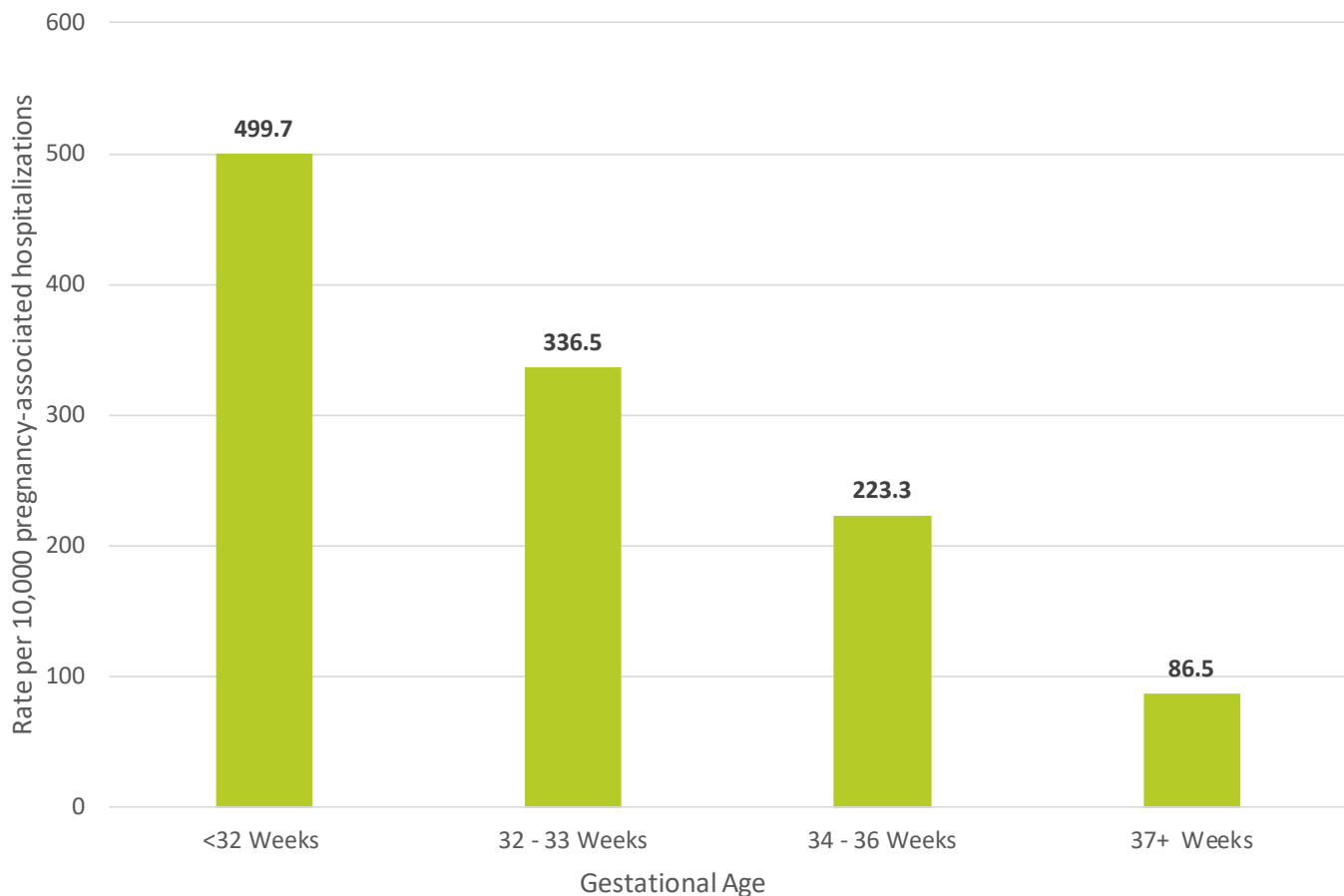
\*\*\* The estimate has been suppressed because 1) the relative standard error is greater than 50% or cannot be determined, 2) the observed number of events is very small and not appropriate for publication.

**Figure 8: Map of Severe Maternal Morbidity Rate by Local Health District of Maternal Residence, 2013-2015.**



- The highest rate of SMM was found among residents of Southeast Utah Health District (186.8 per 10,000 pregnancy-associated hospitalizations) and the lowest rate was among residents of Southwest Utah Health District (56.4 per 10,000 pregnancy-associated hospitalizations).

**Figure 9: Severe Maternal Morbidity by Gestational Age\*, Utah, 2013-2015.**



\*Statistically significant (p-value <0.05)

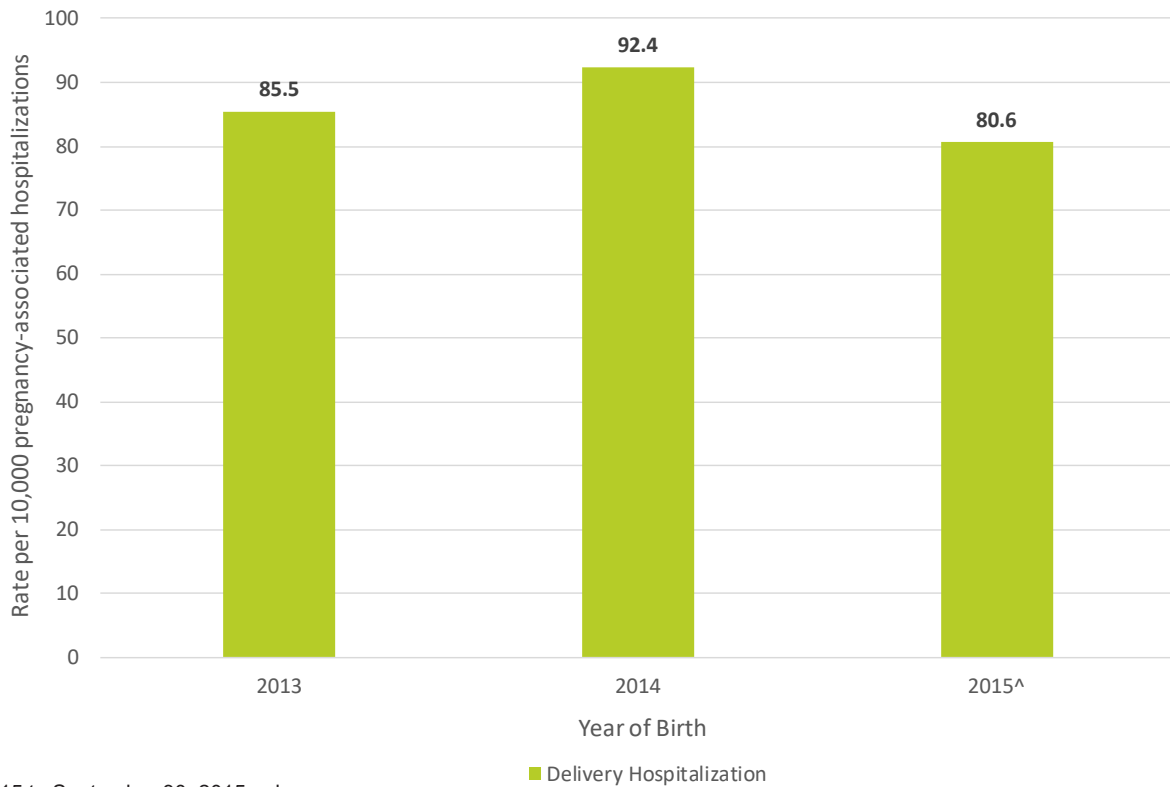
- The highest rate of SMM was found among women who delivered very preterm (less than 32 weeks) at 499.7 per 10,000 pregnancy-associated hospitalizations while the lowest rate was among women who delivered at term (37+ weeks) at 86.5 per 10,000 pregnancy-associated hospitalizations.
- The trend shows a decrease in the rate of SMM as women deliver closer to term.

**Table 3: Distribution of Severe Maternal Morbidity Cases among Delivery Hospitalizations by Year, Utah, 2013-2015.**

	2013	2014	2015+	All Years
<b>Number of SMM Cases</b>	425	464	306	1195
<b>Delivery hospitalizations</b>	49,553	50,240	37,957	137,750
<b>Rate per 10,000 delivery hospitalizations</b>	85.8	92.4	80.6	86.7

+January 1, 2015 to September 30, 2015 only.

**Figure 10: Severe Maternal Morbidity among Delivery Hospitalizations by Year, Utah, 2013-2015.**



<sup>^</sup>January 1, 2015 to September 30, 2015 only.

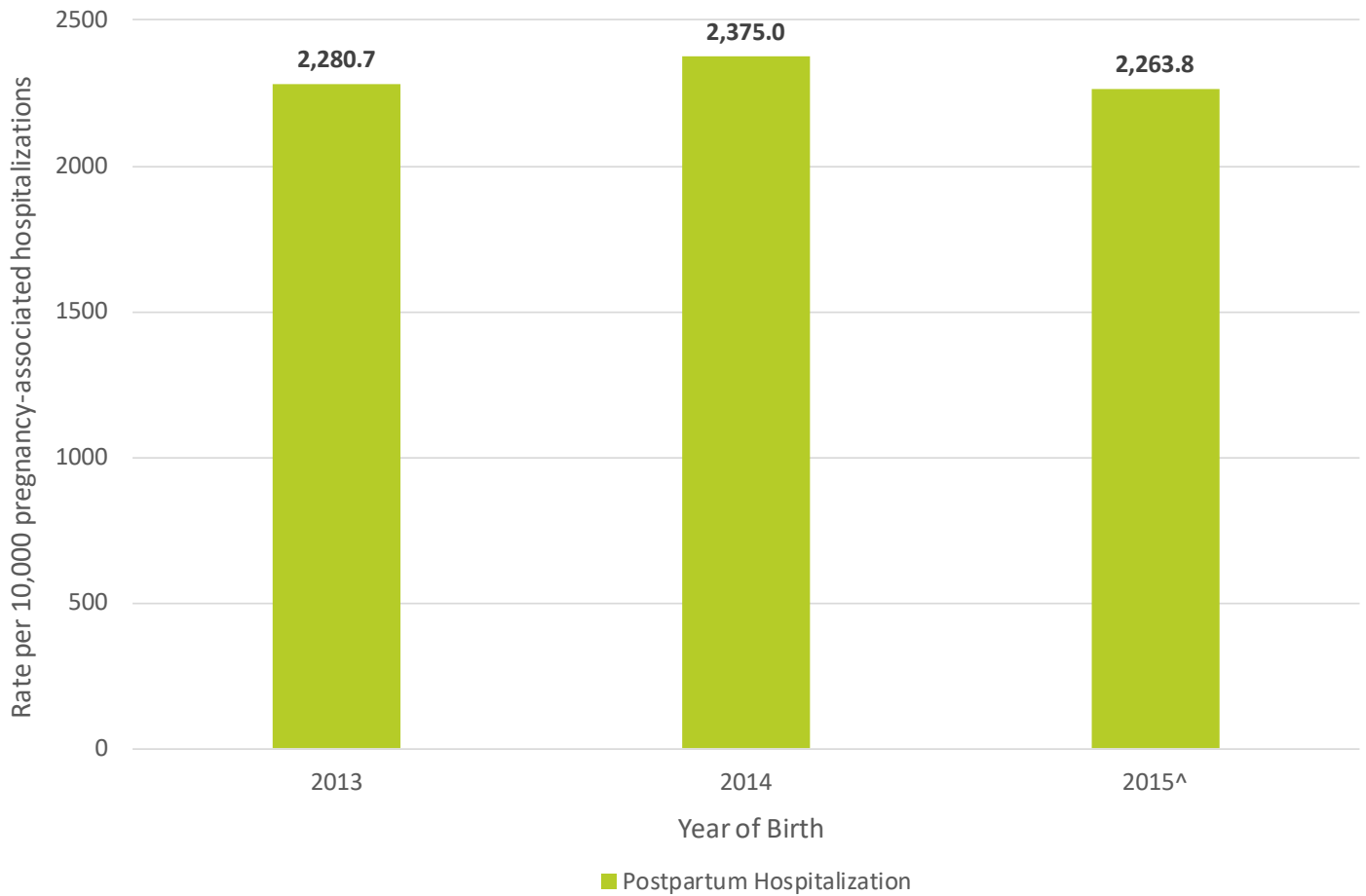
- Approximately 75% of all severe maternal morbidities occurred during delivery-specific hospitalizations.
- The rates of SMM among deliveries show similar trends compared to overall SMM rates with an increase between 2013 and 2014 and then a decrease in 2015.

**Table 4: Distribution of Severe Maternal Morbidity Cases among Postpartum Hospitalizations by Year, 2013-2015.**

	2013	2014	2015 <sup>^</sup>	All Years
<b>Number of SMM Cases</b>	143	152	115	410
<b>Postpartum hospitalizations</b>	627	640	508	1775
<b>Rate per 10,000 postpartum hospitalizations</b>	2280.7	2375.0	2263.8	2309.9

<sup>^</sup>January 1, 2015 to September 30, 2015 only.

**Figure 11: Severe Maternal Morbidity among Postpartum Hospitalizations by Year, Utah, 2013-2015.**



<sup>^</sup>January 1, 2015 to September 30, 2015 only.

- Approximately 25% of all severe maternal morbidities occurred during postpartum-specific hospitalizations.
- The rates of SMM among deliveries showed similar trends compared to overall and delivery SMM rates with an increase between 2013 and 2014 and then a decrease in 2015.



**Table 5: Frequency of Indicators of Severe Maternal Morbidity among Hospitalizations, Utah, 2013-2015.**

Severe Maternal Morbidity Indicators	Number of SMM-associated hospitalizations	SMM rate per 10,000 pregnancy-associated hospitalizations
Blood transfusion	389	27.9
Disseminated intravascular coagulation	311	22.3
Sepsis	189	13.5
Heart failure during procedure or surgery	154	11.0
Hysterectomy	154	11.0
Adult respiratory distress syndrome	136	9.7
Acute renal failure	125	9.0
Shock	123	8.8
Operations on the heart and pericardium	120	8.6
Thrombotic embolism	95	6.8
Puerperal cerebrovascular disorders	76	5.4
Eclampsia	66	4.7
Ventilation	65	4.7
Pulmonary edema	25	1.8
Cardiac arrest	22	1.6
Severe anesthesia complications	15	1.1
Internal injuries of the thorax, abdomen, and pelvis	14	1.0
Acute myocardial infarction	8	0.6**
Amniotic fluid embolism	7	0.5**
Temporary tracheostomy	7	0.5**

Other indicators examined, but not reported here as the observed number of events is very small and not appropriate for publication include aneurysm, conversion of cardiac rhythm, intracranial injuries, cardio monitoring, and sickle cell anemia with crisis.

\*\*Use caution in interpreting; the estimate has relative standard error greater than 30% and does not meet UDOH standards for reliability.

- The top five leading indicators among all pregnancy-associated hospitalizations were blood transfusions, disseminated intravascular coagulation, sepsis, heart failure during procedure or surgery, and hysterectomy.
- These findings are similar to published data on SMM in the U.S. from 2010-2011 where the top five leading indicators for SMM were blood transfusion, disseminated intravascular coagulation, heart failure during a procedure or surgery, hysterectomy, and operations on the heart of pericardium(6).

**Table 6: Frequency of Indicators of Severe Maternal Morbidity among Delivery Hospitalizations, Utah, 2013-2015.**

Severe Maternal Morbidity Indicators	Number of SMM-associated hospitalizations	SMM rate per 10,000 pregnancy-associated hospitalizations
Blood transfusion	357	26.3
Disseminated intravascular coagulation	269	19.8
Heart failure during procedure or surgery	148	10.9
Hysterectomy	134	9.9
Operations on the heart and pericardium	84	6.2
Shock	72	5.3
Adult respiratory distress syndrome	68	5.0
Acute renal failure	68	5.0
Sepsis	56	4.1
Eclampsia	48	3.5
Puerperal cerebrovascular disorders	41	3.0
Ventilation	41	3.0
Thrombotic embolism	32	2.4
Cardiac arrest	19	1.4
Pulmonary edema	17	1.2
Severe anesthesia complications	14	1.0
Internal injuries of the thorax, abdomen, and pelvis	8	0.6**
Amniotic fluid embolism	5	0.4**

Other indicators examined, but not reported here as the observed number of events is very small and not appropriate for publication include aneurysm, conversion of cardiac rhythm, intracranial injuries, cardio monitoring, sickle cell anemia with crisis, temporary tracheostomy, and acute myocardial infarction.

\*\* Use caution in interpreting; the estimate has a relative standard error greater than 30% and does not meet UDOH standards for reliability

- The top five leading indicators among delivery hospitalizations were blood transfusion, disseminated intravascular coagulation, heart failure during procedure or surgery, hysterectomy, and operations on the heart and pericardium.

**Table 7: Frequency of Indicators of Severe Maternal Morbidity among Postpartum Hospitalizations, Utah, 2013-2015.**

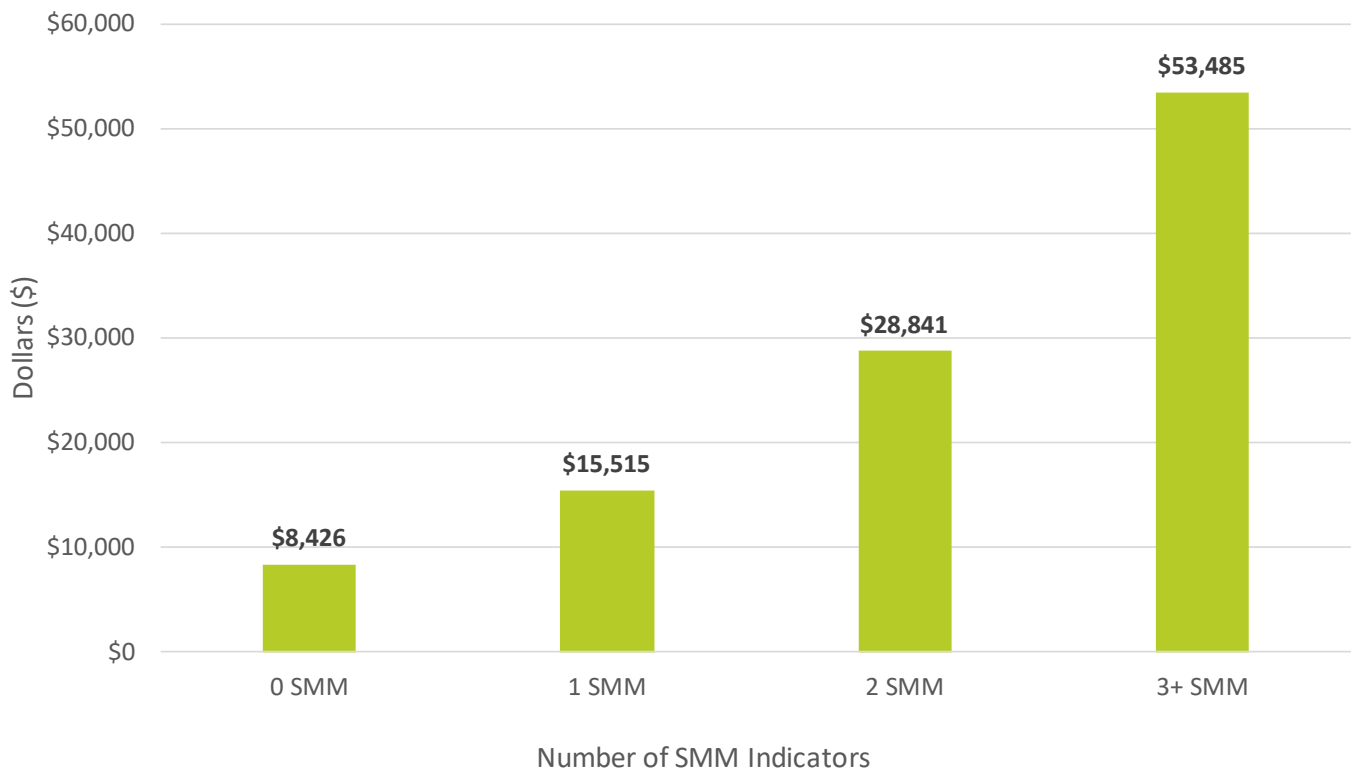
<b>Severe Maternal Morbidity Indicators</b>	<b>Number of SMM-associated hospitalizations</b>	<b>SMM rate per 10,000 pregnancy-associated hospitalizations</b>
Sepsis	133	749.0
Adult respiratory distress syndrome	68	383.0
Thrombotic embolism	63	354.9
Acute renal failure	57	321.1
Shock	51	287.3
Disseminated intravascular coagulation	42	236.6
Operations on the heart and pericardium	36	202.8
Puerperal cerebrovascular disorders	35	197.2
Blood transfusion	32	180.3
Ventilation	24	135.2
Hysterectomy	20	112.7
Eclampsia	18	101.4
Acute myocardial infarction	8	45.1**
Pulmonary edema	8	45.1**
Heart failure during procedure or surgery	6	33.8**
Internal injuries of the thorax, abdomen, and pelvis	6	33.8**

Other indicators examined, but not reported here as the observed number of events is very small and not appropriate for publication include temporary tracheostomy, cardiac arrest, amniotic fluid embolism, aneurysm, intracranial injuries, cardio monitoring, severe anesthesia complications, conversion of cardiac rhythm and sickle cell anemia with crisis.

\*\* Use caution in interpreting; the estimate has a relative standard error greater than 30% and does not meet UDOH standards for reliability.

- The top five leading indicators among postpartum hospitalizations were sepsis, adult respiratory distress syndrome, thrombotic embolism, acute renal failure, and shock.

**Figure 12: Median Hospital Charges by Number of Severe Maternal Morbidity Indicators, 2013-2015.**



- The median charge of pregnancy-associated hospitalizations with no SMMs was \$8,425.95 between 2013 and 2015. However, median charges increased almost two-fold with each increase in SMM indicator.
- Increasing rates of SMM also resulted in higher utilization of health services and charges for long-term rehabilitation, which are not reflected in these charges(1).

## Recommendations

The Council on Patient Safety in Women's Health Care, the American College of Obstetricians and Gynecologists, and the Society for Maternal-Fetal Medicine encourage all cases of SMM to be reviewed(7, 8). This review process offers facilities quality improvement opportunities. Case identification criteria are pregnant, peripartal, or postpartum women who receive four or more units of blood products, who are admitted to an intensive care unit, or who have an unexpected and severe maternal event as defined by the facility. Once the cases that meet criteria for review are identified, the case should be reviewed as close as possible to the time of the SMM event and recommendations should be made for future prevention. A sample case review form can be found at the Council on Patient Safety in Women's Health Care website (<http://safehealthcareforeverywoman.org/patient-safety-tools/summary-after-a-severe-maternal-event/>). For smaller facilities which may not have the resources to conduct these reviews, it is recommended that collaborating with a larger facility to conduct the review may be a solution.

Recognizing the need to address maternal mortality and SMM, the Alliance for Innovation on Maternal Health (AIM) was launched in 2014. AIM is a national data-driven maternal safety and quality improvement initiative based on proven implementation approaches to improving maternal safety and outcomes in the U.S.(9). AIM works through state teams to implement patient safety bundles in hospitals and birth centers. These safety bundles are evidence-based interventions designed to be implemented together resulting in improved outcomes. Three of the safety bundles - hemorrhage, hypertension in pregnancy, and venous thromboembolism - address the leading causes of maternal mortality in the U.S. Utah joined AIM in 2016. All hospitals and birth centers are welcome to collaborate on this project. For more information on AIM in Utah, contact the Utah Department of Health Maternal and Infant Health Program at 801-273-2871.

A 2014 study examining the relationship between SMM and the incidence of post-traumatic stress disorder (PTSD) symptoms found that women with severe maternal morbidities reported higher rates of PTSD symptoms(10). Recognizing the need for mental health and follow up care for women experiencing a severe event, the Council on Patient Safety in Women's Health Care developed a safety bundle called, "Patient, Family, and Staff Support after a Severe Maternal Event" (<http://safehealthcareforeverywoman.org/wp-content/uploads/2016/09/Patient-Family-and-Staff-Support-Bundle-111315.pdf>). This safety bundle recognizes that a severe maternal event affects the staff who care for women and incorporates recommendations for staff care. It is recommended that hospital administrators build their capacity to recognize signs of acute stress among staff after severe maternal events.

While not every poor outcome can be predicted or prevented, there are individual health factors that may contribute to poor pregnancy outcomes that are potentially modifiable. As shown in this analysis, higher body mass index correlates with higher SMM rates. Encouraging optimal preconception/interconception health among women may decrease the risks of severe complications. Women should be counseled on appropriate weight, physical activity, reducing alcohol and tobacco use, managing chronic health conditions, and taking a multivitamin with folic acid as a way to improve birth outcomes. The Utah Department of Health "Power Your Life" campaign provides tips for women on how to be their healthiest before becoming pregnant.

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## Appendix

### Complete List of Severe Maternal Morbidity Indicators and Associated ICD-9-CM Codes (1) (11)

Severe Maternal Morbidity Indicators	Description	ICD-9-CM Codes
<b>Diagnosis</b>		
Acute myocardial infarction	Heart attack	410.xx
Acute renal failure	Kidney failure	584.x, 669.3x
Adult respiratory distress syndrome	Respiratory failure	518.5x, 518.81, 518.82, 518.84, 799.1
Amniotic fluid embolism	Condition where amniotic fluid or fetal material enters the mother's bloodstream causing systemic collapse of organ functions	673.1x
Aneurysm	Abnormal widening of a blood vessel which may cause rupture and acute blood loss	441.xx
Cardiac arrest or ventricular fibrillation	Failure of the heart to pump blood	427.41, 427.42, 427.5
Heart failure or arrest during surgery or procedure	Complications of obstetrical surgery and procedures, including cardiac complications	669.4x, 997.1
Disseminated intravascular coagulation	Interruption of blood clotting mechanism leading to bleeding	286.6, 286.9, 666.3x
Eclampsia	Onset of seizures during pregnancy	642.6x
Internal injuries of the thorax, abdomen, and pelvis	Injuries to internal organs, including lungs, uterus, liver, and kidneys	860.xx – 869.xx
Intracranial injuries	Injuries to the skull and brain	800.xx, 801.xx, 803.xx, 804.xx, 851.xx – 854.xx
Puerperal cerebrovascular disorders	Stroke	430, 431, 432.x, 433.xx, 434.xx, 436, 437.x, 671.5x, 674.0x, 997.2, 999.2
Pulmonary edema	Excessive fluid in the lungs not allowing for oxygenation of tissues	428.1, 518.4
Sepsis	Whole body response to an infection causing collapse and lack of organ function	038.xx, 995.91, 995.92
Severe anesthesia complications	Complications resulting from pain control procedures	668.0x, 668.1x, 668.2x
Shock	Condition where organs are not getting enough blood flow	669.1x, 785.5x, 995.0, 995.4, 998.0x
Sickle cell anemia with crisis	Episodes of acute pain in a person with sickle cell anemia	282.62, 282.64, 282.69
Thrombotic embolism	Blood clot	415.1x, 673.0x, 673.2x, 673.3x, 673.8x
<b>Procedure</b>		
Blood transfusion	Transfusion of whole blood and other blood products	99.0x
Cardio monitoring	Monitoring of cardiac output and blood pressure and gases	89.6x
Conversion of cardiac rhythm	Procedure that restores an irregular heartbeat to normal rhythm	99.6x
Hysterectomy	Removal of the uterus	68.3x – 68.9
Operations on the heart and pericardium	Operations on the heart and membrane enclosing the heart	35.xx, 36.xx, 37.xx, 39.xx
Temporary tracheostomy	Procedure where an alternate breathing route is provided through the trachea (windpipe)	31.1
Ventilation	Assisted breathing	93.90, 96.01 - 96.05, 96.7x