

## Severe Maternal Morbidity

### *What is severe maternal morbidity?*

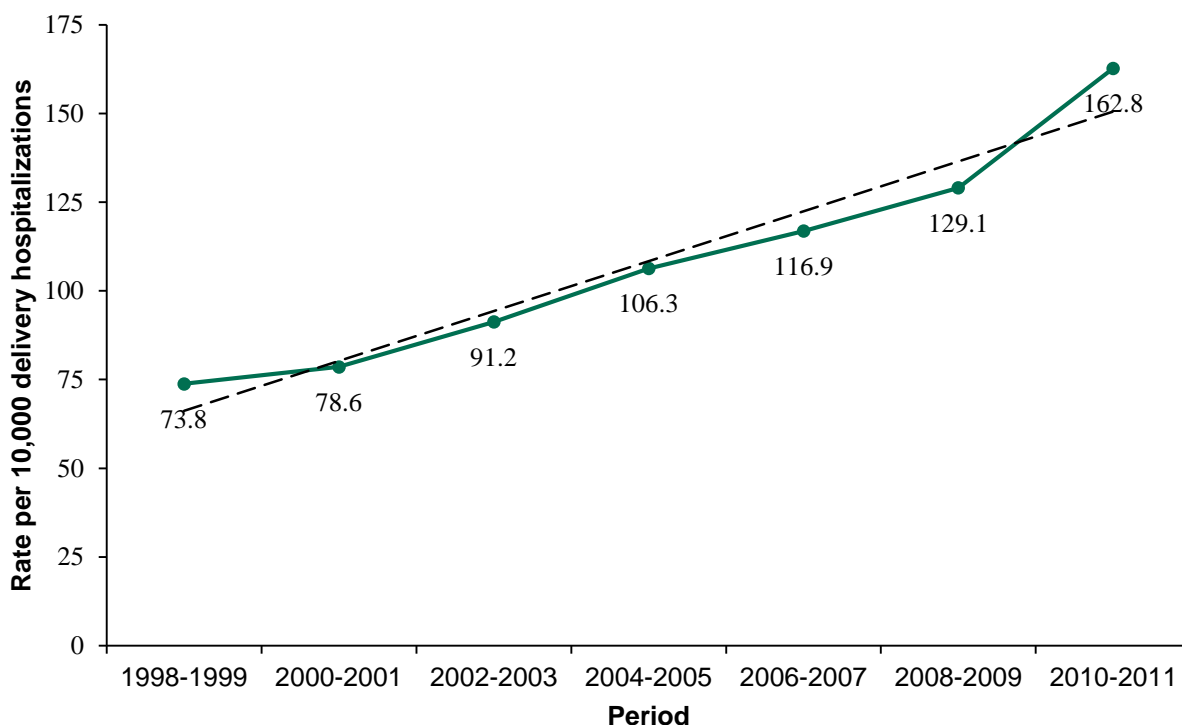
Maternal morbidity includes physical and psychological conditions that result from or are aggravated by pregnancy and have adverse effects on women's health.<sup>1</sup> The most severe complications of pregnancy, generally referred to as severe maternal morbidity (SMM) generally occur and are managed in a hospital setting, affect more than 50,000 women in the United States every year.<sup>2</sup>

### *Why is it important to measure severe maternal morbidity?*

Based on recent trends, the burden of SMM has been steadily increasing.<sup>2</sup> For every 10,000 delivery hospitalizations during the 2010-2011 period there were 163 delivery hospitalizations with at least one SMM indicator. This represents a 26.1% increase in the US SMM rate from the previous 2008-2009 period (Figure 1).<sup>1</sup>

Blood transfusion was the most common indicator of SMM in the US during 1998-2011. For the 2010-2011 period, blood transfusion was an SMM indicator for 117 per 10,000 delivery hospitalizations, followed by disseminated intravascular coagulation (32 per 10,000), heart failure during a procedure or surgery (18 per 10,000), hysterectomy (9 per 10,000), and operations on the heart or pericardium (7 per 10,000).<sup>1</sup>

**Figure 1. Trends in severe maternal morbidity in the United States, 1998-2011.**



**Notes:** Modified from Centers for Disease Control and Prevention. Severe maternal morbidity in the United States. Retrieved May 26, 2015 from <http://www.cdc.gov/reproductivehealth/MaternalInfantHealth/SevereMaternalMorbidity.html>. The severe maternal morbidity rate is estimated as the number delivery hospitalizations with at least one severe maternal morbidity indicator per 10,000 delivery hospitalizations. The dashed trend line indicates a statistically significant increasing trend ( $P=0.014$ ) in severe maternal morbidity between 1998-1999 and 2010-2011.

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### *How is severe maternal morbidity measured?*

To define SMM, the CDC uses delivery hospitalization data and the International Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9-CM) diagnosis and procedure codes that indicate a potentially life-threatening maternal condition or complication.<sup>2</sup> The California Maternal Quality Care Collaborative (CMQCC) reporting system, leaders developing perinatal quality measures, has validated and incorporated this measure to their reporting system.<sup>3</sup> A similar measure has been proposed by The Joint Commission (TJC) and is under consideration by American College of Obstetricians and Gynecologists (ACOG).<sup>4</sup> Delivery hospitalizations are identified using a published algorithm that incorporates diagnostic codes for an outcome of delivery, diagnosis-related group delivery codes, and procedure codes for selected delivery-related procedures.<sup>5</sup> Delivery hospitalizations with SMM are identified using another published algorithm<sup>2</sup> that includes 25 specific ICD-9-CM diagnosis and procedure codes and captures indicators of organ-system failure that likely represent specific, well-defined, severe events. Irrespective of the pregnancy outcome, women who have any ICD-9-CM code that indicates such a potentially severe event are designated as having SMM (Table 1).

**Table 1. Severe maternal morbidity indicators.**

<b>Diagnostic Codes</b>	<b>ICD-9-CM Codes</b>
1. Acute myocardial infarction	410.xx
2. Acute renal failure	584.x, 669.3x
3. Adult respiratory distress syndrome	518.5, 518.81, 518.82, 518.84, 799.1
4. Amniotic fluid embolism	673.1x
5. Aneurysm	441.xx
6. Cardiac arrest/ventricular fibrillation	427.41, 427.42, 427.5
7. Disseminated intravascular coagulation	286.6, 286.9, 666.3x
8. Eclampsia	642.6x
9. Heart failure during procedure or surgery	669.4x, 997.1
10. Internal injuries of thorax, abdomen, and pelvis	860.xx—869.xx
11. Intracranial injuries	800.xx, 801.xx, 803.xx, 804.xx, 851.xx-854.xx
12. Puerperal cerebrovascular disorders	430, 431, 432.x, 433.xx, 434.xx, 436, 437.x, 671.5x, 674.0x, 997.2, 999.2
13. Pulmonary edema	428.1, 518.4
14. Severe anesthesia complications	668.0x, 668.1x, 668.2x
15. Sepsis	038.xx, 995.91, 995.92
16. Shock	669.1x, 785.5x, 995.0, 995.4, 998.0
17. Sickle cell anemia with crisis	282.62, 282.64, 282.69
18. Thrombotic embolism	415.1x, 673.0x, 673.2x, 673.3x, 673.8x
<b>Procedure Codes</b>	<b>ICD-9-CM Codes</b>
19. Blood transfusion	99.0x
20. Cardio monitoring	89.6x
21. Conversion of cardiac rhythm	99.6x
22. Hysterectomy	68.3x-68.9
23. Operations on heart and pericardium	35.xx, 36.xx, 37.xx, 39.xx
24. Temporary tracheostomy	31.1
25. Ventilation	93.90, 96.01-96.05, 96.7x

**Notes:** Modified from Reference 1. ICD-9-CM, International Classification of Diseases, Ninth Revision, Clinical Modification.

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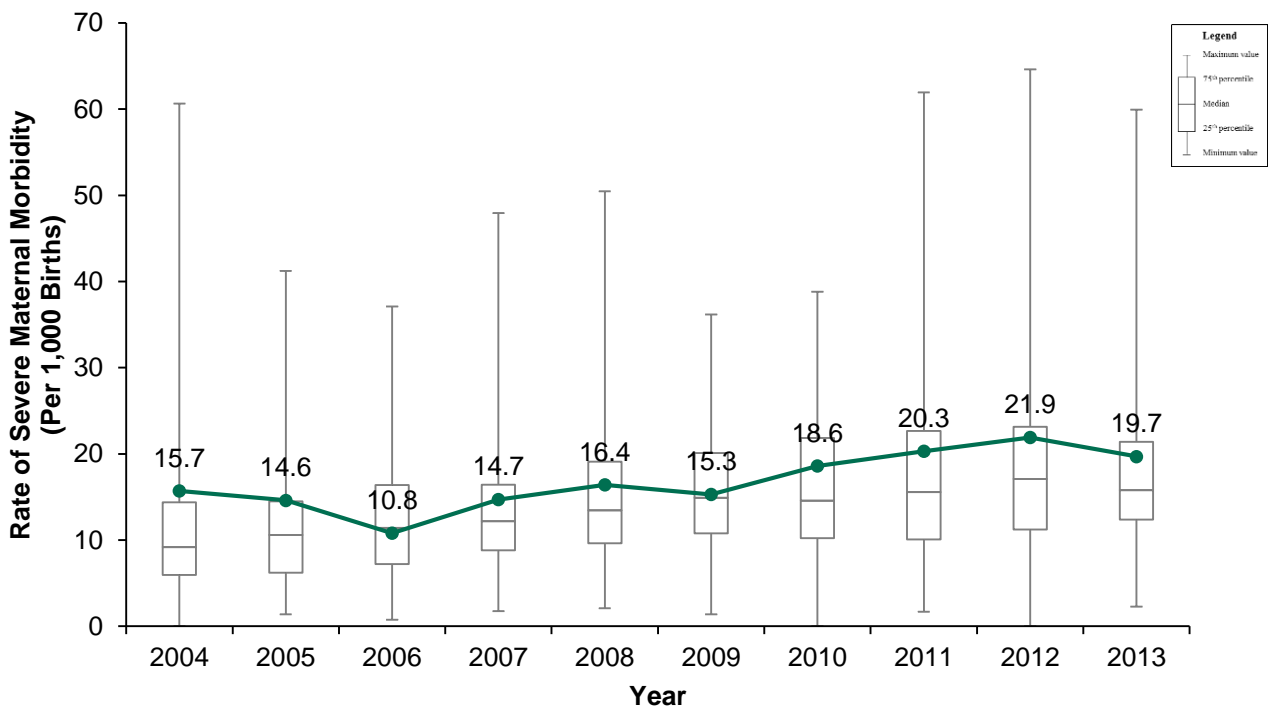
## What are the limitations of measuring severe maternal morbidity?

The SMM indicator relies on ICD-9-CM codes to estimate rates of obstetric complications. For some obstetric complications, these codes may have low sensitivity, low positive predictive values, or have not been validated in hospital discharge data.<sup>5</sup> Moreover, these codes do not allow the full assessment of the conditions severity.<sup>2</sup> The source of data for state SMM estimates is the linked birth certificate and discharge records data set. Since the hospital discharge data set is primarily used for billing, it is also subject to errors of omission and commission by medical coders, as well as changes over time in coding practices.<sup>2</sup> Limitations aside, standardizing a measure of SMM has been on the research agenda, with the flexibility to adapt to changing obstetric practices.<sup>4</sup>

## How can we improve quality based on this indicator?

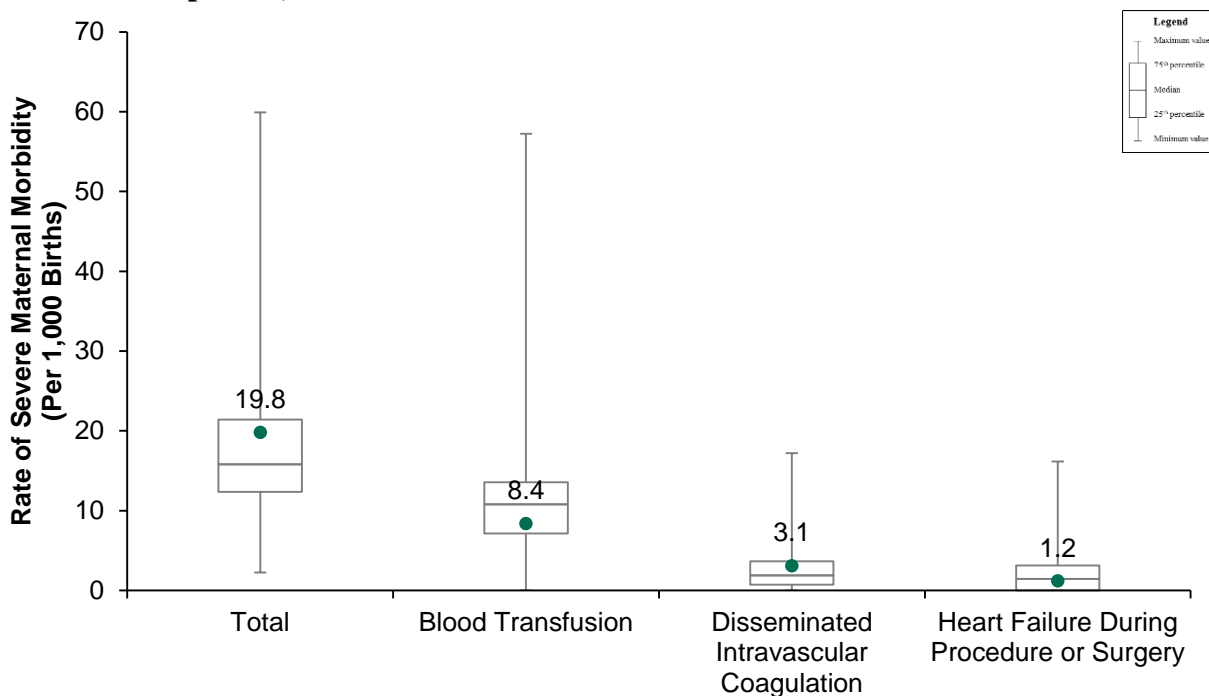
Rises in SMM are likely driven by a combination of factors, including increases in maternal age,<sup>7</sup> pre-pregnancy obesity,<sup>8,9</sup> preexisting chronic medical conditions,<sup>10,11</sup> and cesarean delivery.<sup>7,12</sup> The consequences of the increasing SMM prevalence are wide-ranging and include higher health service use, higher direct medical costs, extended hospitalization stays, and long-term rehabilitation.<sup>2</sup> The review of SMM cases, using either the CDC measure<sup>1</sup> or TJC case-by-case proposal,<sup>4</sup> provides an opportunity to identify points of intervention for quality improvements in maternal care. Tracking SMM will help monitor the effectiveness of such interventions.<sup>1</sup>

**Figure 2. Rates of severe maternal morbidity in Florida - Hospital X, 2004-2013.**

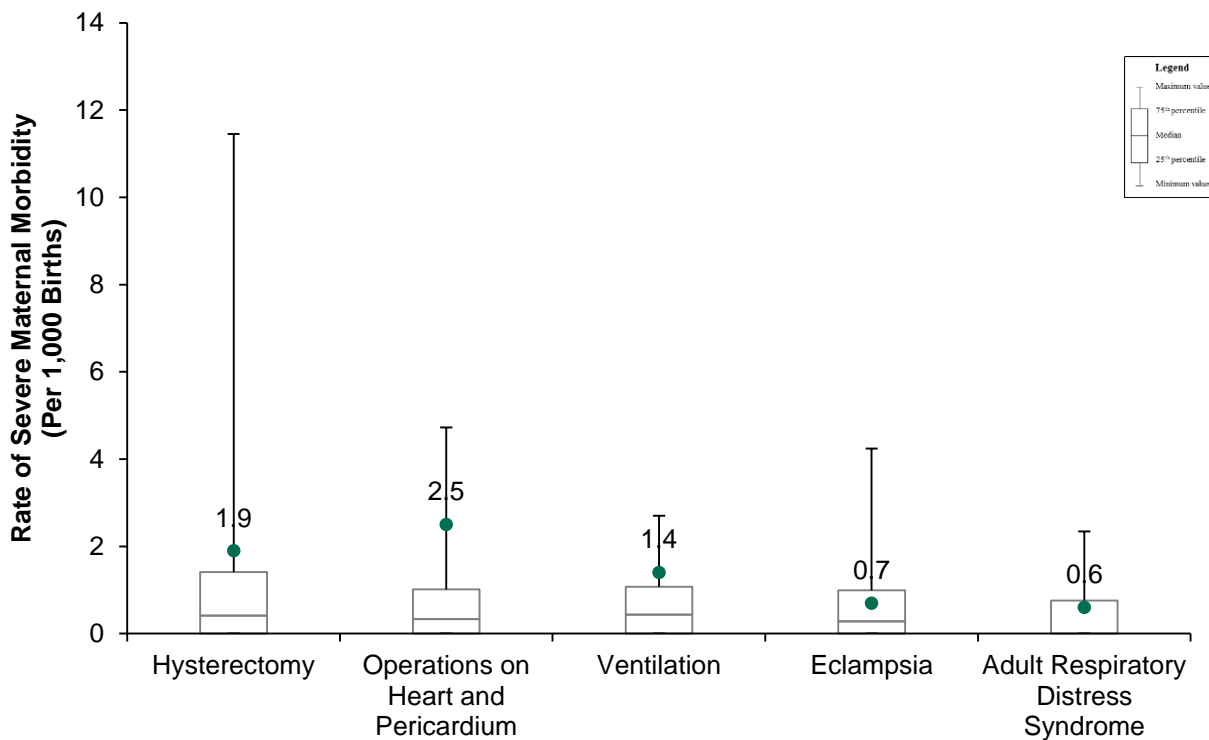


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**Figure 3.** Total rates of severe maternal morbidity and top three diagnoses and procedures in Florida - Hospital X, 2013.



**Figure 4.** Rates of severe maternal morbidity by top fourth to eighth diagnoses and procedures in Florida - Hospital X, 2013.



### References

## Severe Maternal Morbidity

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