Assessing Prenatal Risk Screening and Severe Maternal Morbidity in Florida 2010-2014

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Presentation Outline

- Background
- Study Questions
- Data Source and Methods
- Results
- Limitations
- Conclusions
- Public Health Implications
- References
Severe maternal morbidity (SMM) is associated with a high rate of preventability, similar to that of maternal mortality. It also can be considered a near miss for maternal mortality.

SMM affected more than 65,000 women in the United States in 2016.

SMM includes unexpected outcomes of labor and delivery that result in significant short-or long-term consequences to a woman’s health.
To identify delivery hospitalizations with SMM, CDC uses administrative hospital discharge data and International Classification of Diseases (ICD) diagnosis and procedure codes.³

Between 2010 and 2013, the rate of SMM in Florida was 162.4 per 10,000 delivery hospitalizations, and the US rate for 2010 and 2011 was 162.7⁴
Florida’s Prenatal Risk Screening Instrument is a questionnaire used to identify women at risk for preterm or low birth weight, or other high risk conditions.

Florida law mandates that all women be offered the Prenatal Risk Screen at their first prenatal visit.

A score on the screen of 6 or more indicates that the pregnant woman is at risk for a poor birth outcome, and is automatically referred to Care Coordination.
Help your baby have a healthy start in life!

Please answer the following questions to find out if anything in your life could affect your health or your baby’s health. Your answers are confidential. You may qualify for free services from the Healthy Start Program or the Healthy Families Program, no matter what your income level is! (Please complete in ink.)

**Today’s Date:**

1. Have you graduated from high school or received a GED? **Yes** **No**
2. Are you married now? **Yes** **No**
3. Are there any children at home younger than 5 years old? **Yes** **No**
4. Are there any children at home with medical or special needs? **Yes** **No**
5. Is this a good time for you to be pregnant? **Yes** **No**
6. In the last month, have you felt down, depressed or hopeless? **Yes** **No**
7. In the last month, have you felt alone when feeling problems? **Yes** **No**
8. Have you ever received mental health services or counseling? **Yes** **No**
9. In the last year, have someone you know tried to hurt you or threaten you? **Yes** **No**
10. Do you have trouble paying your bills? **Yes** **No**

**Name:**
**First:**
**Last:**
**P.U.L.:**
**Social Security Number:**
**Date of Birth:**
**Age:**
**Sex:**

**Street address (department name or number):**

**City:**
**State:**
**Zip Code:**

**Primary Language Spoken:**

**Patient Signature:**
**Date:**

**Please initial:**

**Yes** **No**

**I also authorize specific health information to be exchanged as described above, which includes any of my mental health, TB, sexually transmitted disease (STD), or HIV/AIDS information.**

**If you do not wish to participate in the screening process, please complete the patient information section only and sign below:**

**Signature:**
**Date:**

**LUP (last day/yyyy):**
**BMI (kg/m²):**

**Pre-Pregnancy Weight:**
**Height:**
**Weight:**
**BMI:**

**Adverse Health:**

**Debilitating Health:**

**Emotional Health:**

**Disability:**

**Significant Other:**

**Healthy Start Screening Score:**

**Check One:**

- Referred to Healthy Start. Use score of 2.
- Not Referred to Healthy Start.

**Provider’s Name:**
**Provider’s Phone Number:**
**Provider’s County:**
**Provider’s Address:**

**Provider’s Signature and Title:**
**Date:**

**Florida Health**
Study Questions

• What is the association between the prenatal risk screening score and SMM in women residing in Florida who had a singleton live birth during 2010-2014?

• What other risk factors are associated with SMM in Florida for the period 2010-2014?
Data Source and Methods

Predictor Measure: Prenatal Risk Screening Score from Florida Department of Health (Maternal and Child Health Section).

- A score on the screen of 6 or more indicates that the pregnant woman is at risk for a poor birth outcome.

- Other Risk Factors: Variables From Birth Certificate data, Florida Department of Health.
Data Source and Methods

Outcome measure: Severe Maternal Morbidity

- Delivery hospitalizations: Hospital discharge data from the Agency for Health Care Administration (Florida’s Medicaid Agency) were linked to birth certificate data and prenatal screening data.

- Delivery hospitalizations with ≥1 SMM identified using 25 ICD-9-CM code-based categories and 24 ICD-9-CM code-based categories.

- A cross-sectional study design was used.

- Stata/SE 14.2 was used for the analysis.
## Data Source and Methods

<table>
<thead>
<tr>
<th>Data Source and Methods</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Florida hospital discharge data (2010-2014)</strong></td>
<td></td>
</tr>
<tr>
<td>Florida residents: hospital discharge data linked to births records</td>
<td>N = 979,669 (99.7%)</td>
</tr>
<tr>
<td>Delivery hospitalizations identified</td>
<td>N = 972,128 (99.0%)</td>
</tr>
<tr>
<td>Florida residents: hospital discharge, births records, and prenatal screening linkage</td>
<td>N = 746,846 (76.0%)</td>
</tr>
<tr>
<td>Florida residents: hospital discharge, births records, and prenatal screening linkage for singletons</td>
<td>N = 722,912 (74.0%)</td>
</tr>
</tbody>
</table>
Results

Maternal Morbidity Trend Analysis 25 Conditions, FL 2010-2014

SMM 25 conditions
2010=144.0
2011=149.0
2012=153.5
2013=150.7
2014=165.0
Overall Rate=152.4

Maternal Morbidity Trend Analysis 24 Conditions, FL 2010-2014

SMM 24 conditions
2010=58.3
2011=58.6
2012=58.9
2013=56.3
2014=57.6
Overall Rate=57.9
Results: Severe Maternal Morbidity Rates By Demographic and Maternal Characteristics, FL 2010-2014 (25 Conditions)
Results: Severe Maternal Morbidity Rate By Demographic and Maternal Characteristics, FL 2010-2014 (24 Conditions)
## Results

**Frequency and Rates of Five Most Common SMM Indicators, FL 2010-2014**

<table>
<thead>
<tr>
<th>Name (#) 25 Conditions</th>
<th>Rate per 10,000 Delivery Hosp.</th>
<th>Name (#) 24 Conditions</th>
<th>Rate per 10,000 Delivery Hosp.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blood transfusion (7,248)</td>
<td>100.26</td>
<td>Heart failure during procedure/surgery (662)</td>
<td>9.16</td>
</tr>
<tr>
<td>Heart failure during procedure/surgery (662)</td>
<td>9.16</td>
<td>Operation on heart and pericardium (562)</td>
<td>7.77</td>
</tr>
<tr>
<td>Operation on heart and pericardium (562)</td>
<td>7.77</td>
<td>Disseminate intravascular coagulation (537)</td>
<td>7.43</td>
</tr>
<tr>
<td>Disseminate intravascular coagulation (537)</td>
<td>7.43</td>
<td>Hysterectomy (530)</td>
<td>7.33</td>
</tr>
<tr>
<td>Hysterectomy (530)</td>
<td>7.33</td>
<td>Ventilation</td>
<td>5.59</td>
</tr>
</tbody>
</table>
## Results

### Severe Maternal Morbidity (25 Conditions)$^1$

<table>
<thead>
<tr>
<th>Risk Screening Score</th>
<th>Crude Risk Ratio (CRR) (95% CI)</th>
<th>Adjusted Risk Ratio (ARR) (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>(6-9)</td>
<td>1.6 (1.5-1.7)*</td>
<td>1.2 (1.1-1.2)*</td>
</tr>
<tr>
<td>(10 or more)</td>
<td>2.4 (2.2-2.5)*</td>
<td>1.5 (1.4-1.6)*</td>
</tr>
</tbody>
</table>

1/ Model 1 25 conditions, adjusted by race/ethnicity, maternal age, maternal education, smoke during pregnancy, body mass index, hypertension, diabetes, payer. * P<0.05
## Results

### Severe Maternal Morbidity (24 Conditions)

<table>
<thead>
<tr>
<th>Risk Screening Score (6-9)</th>
<th>Crude Risk Ratio (CRR) (95% CI)</th>
<th>Adjusted Risk Ratio (CRR) (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1.5 (1.4-1.7)*</td>
<td>1.3 (1.2-1.4)*</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Risk Screening Score (10 or More)</th>
<th>Crude Risk Ratio (CRR) (95% CI)</th>
<th>Adjusted Risk Ratio (CRR) (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2.8 (2.5-3.1)*</td>
<td>1.9 (1.7-2.2)*</td>
</tr>
</tbody>
</table>

2/ Model 24 conditions, adjusted by race/ethnicity, maternal age, marital status, smoke during pregnancy, parity, hypertension, diabetes, payer. * P < 0.05
Results

Other Factors and Severe Maternal Morbidity

<table>
<thead>
<tr>
<th>Demographics</th>
<th>CPR (95% CI) 25 Conditions</th>
<th>APR (95% CI) 25 Conditions</th>
<th>CPR (95% CI) 24 Conditions</th>
<th>APR (95% CI) 24 Conditions</th>
</tr>
</thead>
<tbody>
<tr>
<td>NH Black /Ref: NH White</td>
<td>2.1 (2.1-2.3)*</td>
<td>1.7 (1.6-1.8)*</td>
<td>2.0 (1.9-2.2)*</td>
<td>1.6 (1.5-1.8)*</td>
</tr>
<tr>
<td>Hispanic /Ref: NH White</td>
<td>1.3 (1.2-1.4)*</td>
<td>1.2 (1.2-1.3)*</td>
<td>1.2 (1.1-1.3)*</td>
<td>1.2 (1.1-1.3)*</td>
</tr>
<tr>
<td>NH Other /Ref: NH White</td>
<td>1.3 (1.2-1.4)*</td>
<td>1.2 (1.1-1.3)*</td>
<td>1.3 (1.1-1.5)*</td>
<td>1.2 (1.0-1.4)*</td>
</tr>
<tr>
<td>Less than 18 Years /Ref: 18-34</td>
<td>1.3 (1.1-1.4)*</td>
<td>0.9 (0.8-1.0)</td>
<td>0.8 (0.6-1.0)</td>
<td>0.7 (0.6-0.9)*</td>
</tr>
<tr>
<td>35 Years or Older /Ref:18-34</td>
<td>1.4 (1.3-1.4)*</td>
<td>1.4 (1.3-1.5)*</td>
<td>1.9 (1.7-2.0)*</td>
<td>1.7 (1.6-1.9)*</td>
</tr>
<tr>
<td>Less than High School /Ref: HS</td>
<td>1.1 (1.1-1.2)*</td>
<td>1.1 (1.0-1.1)*</td>
<td>0.9 (0.8-1.0)</td>
<td>-</td>
</tr>
<tr>
<td>More than High School /Ref: HS</td>
<td>0.8 (0.8-0.8)*</td>
<td>0.9 (0.9-1.0)*</td>
<td>0.9 (0.8-1.0)*</td>
<td>-</td>
</tr>
<tr>
<td>Single /Ref: Married</td>
<td>1.3 (1.3-1.4)*</td>
<td>-</td>
<td>1.0 (1.0-1.1)</td>
<td>0.9 (0.8-1.0)*</td>
</tr>
</tbody>
</table>
## Results

### Other Factors and Severe Maternal Morbidity

<table>
<thead>
<tr>
<th>Health and Social</th>
<th>CRR (95% CI) 25 Conditions</th>
<th>ARR (95% CI) 25 Conditions</th>
<th>CRR (95% CI) 24 Conditions</th>
<th>ARR (95% CI) 24 Conditions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Underweight /Ref: Normal Weight</td>
<td>1.2 (1.1-1.3)*</td>
<td>1.2 (1.1-1.3)*</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Overweight /Ref: Normal Weight</td>
<td>1.1 (1.0-1.1)*</td>
<td>-</td>
<td>1.2 (1.1-1.3)*</td>
<td>-</td>
</tr>
<tr>
<td>Obese /Ref: Normal Weight</td>
<td>1.2 (1.1-1.2)*</td>
<td>0.9 (0.8-0.9)*</td>
<td>1.5 (1.4-1.6)*</td>
<td>-</td>
</tr>
<tr>
<td>Smoke Yes /Ref: No</td>
<td>0.8 (0.8-0.9)*</td>
<td>0.8 (0.8-0.9)*</td>
<td>0.9 (0.8-0.9)*</td>
<td>0.9 (0.8-1.0)*</td>
</tr>
<tr>
<td>Previous Live Birth /Ref: First LB</td>
<td>1.1 (1.0-1.1)*</td>
<td>-</td>
<td>1.2 (1.1-1.3)*</td>
<td>1.1 (1.0-1.2)*</td>
</tr>
<tr>
<td>Medicaid-Medicare /Ref: Private</td>
<td>1.4 (1.4-1.5)*</td>
<td>1.2 (1.2-1.3)*</td>
<td>1.2 (1.1-1.2)*</td>
<td>1.1 (1.0-1.2)*</td>
</tr>
<tr>
<td>Self Pay /Ref: Private</td>
<td>1.2 (1.0-1.3)*</td>
<td>-</td>
<td>-</td>
<td>0.8 (0.6-1.0)*</td>
</tr>
<tr>
<td>Other Insurance/Ref: Private</td>
<td>1.3 (1.2-1.5)*</td>
<td>1.3 (1.1-1.4)*</td>
<td>-</td>
<td>1.2 (1.0-1.5)*</td>
</tr>
</tbody>
</table>
## Results

### Other Factors and Severe Maternal Morbidity

<table>
<thead>
<tr>
<th>Health</th>
<th>CRR (95% CI) 25 Conditions</th>
<th>ARR(^1) (95% CI) 25 Conditions</th>
<th>CRR (95% CI) 24 Conditions</th>
<th>ARR(^2) (95% CI) 24 Conditions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chronic Hypertension /Ref: No HPT</td>
<td>2.4 (2.2-2.7)*</td>
<td>1.9 (1.7-2.1)*</td>
<td>3.6 (3.1-4.1)*</td>
<td>2.4 (2.1-2.8)*</td>
</tr>
<tr>
<td>Gestational Hypertension /Ref: No HPT</td>
<td>2.6 (2.4-2.7)*</td>
<td>2.5 (2.3-2.6)*</td>
<td>3.4 (3.1-3.7)*</td>
<td>3.1 (2.8-3.4)*</td>
</tr>
<tr>
<td>Chronic Diabetes /Ref: No Diabetes</td>
<td>2.1 (1.8-2.4)*</td>
<td>1.5 (1.3-1.8)*</td>
<td>3.2 (2.7-3.9)*</td>
<td>1.9 (1.6-2.3)*</td>
</tr>
<tr>
<td>Gestational Diabetes /Ref: No Diabetes</td>
<td>1.2 (1.1-1.3)*</td>
<td>1.1 (1.0-1.2)*</td>
<td>1.6 (1.4-1.7)*</td>
<td>1.2 (1.1-1.3)*</td>
</tr>
</tbody>
</table>

1. Model 1 25 conditions, adjusted by race/ethnicity, maternal age, maternal education, smoke during pregnancy, body mass index, hypertension, diabetes, payer.  
2. Model 2 24 conditions, adjusted by race/ethnicity, maternal age, marital status, smoke during pregnancy, parity, hypertension, diabetes, payer. *P<0.05
Conclusions

• For 25 conditions, a statistical significant increased trend in severe maternal morbidity was observed for the period 2010-2014.

• When excluding blood transfusions (24 conditions), a non-significant trend was observed for the period 2010-2014.

• Women with a screening score of 6 or more were more likely to have a severe maternal morbidity (24 or 25 conditions). The relationship was stronger in women with a screening score of 10 or more.
Conclusions

- Being non-Hispanic Black, 35 years or more, or having chronic or gestational hypertension, chronic or gestational diabetes were associated with a high probability of severe maternal morbidity (24 or 25 conditions).
Limitations

- The ICD-9-CM could be subject to underestimating the prevalence of SMM.
- Hospital discharge records that could not be linked to birth records.
- Hospital and birth records that could not be linked to prenatal screening records.
- These findings may not be generalizable to all women.
Public Health Implications

• All providers should explain to their pregnant patients the benefits of the prenatal risk screen as a predictor for low birth weight and preterm births and the relationship with maternal morbidity prevention.

• Increase education and public awareness about the risk factors associated with health conditions that women can face during the reproductive years, especially for women 35 years of age or greater.


Thank You!

Contact information:
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