Montana Maternal Health: By the Numbers

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MOMS Research & Evaluation
Learning Objectives

Understand
- Understand how maternal mortality and morbidity are measured

Describe
- Describe health equity and racial disparities in health

Assess
- Assess burden of maternal morbidity and mortality for different groups
Table of Contents

- Contextualizing the Data
- Maternal Mortality
- Severe Maternal Morbidity
- Pregnancy Risk Factors & Conditions
- Conclusions & Recommendations
Contextualizing Data

Behind the Numbers
Considerations for data interpretation

• Data illustrate patterns and trends in the population
  • We speak in averages; there are always exceptions, outliers, and extremes

• Avoid drawing individual-level conclusions from population-level data (ecological fallacy)
  • These data should inform policy, not individual clinical decisions

• Each of these numbers represent a real patient with a story, a family, and a community

• Data can describe that variations exist; it cannot fully explain why
Racial disparities are the most dramatic population-level factors in maternal health.

CDC recommends against treating race as a confounder to be controlled for in an analysis

- This can mask higher risks for racial minorities

Instead, stratify by racial categories

- Racism is the risk factor, not race¹
- Race as a biological risk factor has long been disproven, but is still widely believed (e.g. firewater myth², thick skin myth³)
- Race variable is a proxy measure for exposure to racism
- Racism acts through complex causal pathways, including interpersonal bias, institutional racism, structural racism, historical trauma⁴
How to proceed with data-driven discussions?

• Compare groups to focus resources and interventions, not to stigmatize or stereotype

• Honor the sacredness of motherhood...
  • Likewise, acknowledge the tragic history of motherhood in native communities in Montana

• Continue to study and report racial disparities to prevent invisibility of this public health crisis

• Remember that there is more variation within groups than between groups; treat patients as individuals

*Sun Worship in Montana*, Charlie Russell, 1907
Maternal Mortality

Trends & Comparisons
## Maternal Mortality Measures

<table>
<thead>
<tr>
<th>Maternal Mortality Measures</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Pregnancy-related death</strong></td>
<td>Death while pregnant or within 1 year of the end of a pregnancy—regardless of the outcome, duration, or site of the pregnancy—from any cause related to or aggravated by the pregnancy or its management, excluding accidental or incidental causes.</td>
</tr>
<tr>
<td><strong>Pregnancy-related mortality ratio</strong></td>
<td>Pregnancy-related deaths per 100,000 live births (CDC Pregnancy Mortality Surveillance System).</td>
</tr>
<tr>
<td><strong>Maternal death</strong></td>
<td>A death while pregnant or within 42 days of the end of pregnancy, from any cause related to or aggravated by the pregnancy or its management, but not from accidental or incidental causes.</td>
</tr>
<tr>
<td><strong>Maternal mortality rate</strong></td>
<td>Maternal deaths per 100,000 live births (CDC National Vital Statistics System, World Health Organization).</td>
</tr>
</tbody>
</table>
National increase in pregnancy-related deaths


Pregnancy-related deaths per 100,000 live births

Year


7.2 9.4 9.8 10 10.3 10.8 11.1 11.3 11.3 12 12.9 12.9 13.2 14.1 14.7 14.5 16.8 15.2 15.4 15.7 14.9 15.5 17.8 16.7 17.8 15.9 17.3 18 17.2 16.9 17.3
Racial pregnancy-related death health disparities


- Non-Hispanic Black: 41.7
- Non-Hispanic American Indian or Alaska Native: 28.3
- Non-Hispanic Asian or Pacific Islander: 13.8
- Non-Hispanic White: 13.4
- Hispanic or Latino: 11.6
Maternal Mortality Measurement Challenges

- Rare events: Small numbers mean wide confidence intervals and rate instability
  - Hard to measure change over time at the state level
- Per CDC, Maternal Mortality Review Committees are the gold standard in measuring maternal mortality
  - Multi-disciplinary investigations better identify pregnancy-relatedness
  - Montana does not yet have MMRC
- Montana’s maternal mortality rate and pregnancy-related death rate, and associated rankings, are **not** good measures of maternal health in Montana at this time
Montana pregnancy-related mortality

- America’s Health Rankings (2013-2017)\(^8\)
  - 40.7 pregnancy-related deaths per 100,000 live births
  - 6\(^{th}\) highest rate in the United States

- However...
  - This rate is based on CDC Wonder Database: Underlying Cause of Death, Multiple Cause of Death files
  - This is not CDC gold standard in measuring maternal mortality

- But we can conclude that maternal mortality is a significant problem in our state.
Severe Maternal Morbidity

Hospital-based deliveries in Montana, 2016-2018
Preliminary Analysis
Severe Maternal Morbidity (SMM)

• **Definition**
  - The unintended outcomes of the process of labor and delivery that result in significant short-term or long-term consequences for women’s health\(^5\)

• **Operationalization**
  - 21 indicators based on diagnosis and procedure codes from the International Classification of Disease (ICD)\(^6\)
  - Standardized rate reported per 10,000 hospitalized deliveries

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### Maternal Health Disparities: National Context

<table>
<thead>
<tr>
<th>Race</th>
<th>Rurality</th>
</tr>
</thead>
<tbody>
<tr>
<td>• AI/AN SMM rate 206.0 per 10,000 vs. non-</td>
<td>• Patients from rural communities have 9% greater probability of SMM and</td>
</tr>
<tr>
<td>Hispanic white SMM rate 139.2 per 10,000⁹</td>
<td>maternal mortality⁹</td>
</tr>
<tr>
<td>• There would be a 43.9% reduction in SMM</td>
<td>• Risk varies by degree of rurality¹²</td>
</tr>
<tr>
<td>and maternal mortality among AI/AN</td>
<td>• Overall, obstetric outcomes at Critical Access Hospitals (CAH) are</td>
</tr>
<tr>
<td>individuals if AI/AN patients experienced</td>
<td>worse than those at high-volume hospitals¹³</td>
</tr>
<tr>
<td>SMM at the same rate as non-Hispanic white</td>
<td>• CAHs perform comparably to non-CAH among low-risk populations¹³</td>
</tr>
<tr>
<td>patients¹⁰</td>
<td></td>
</tr>
</tbody>
</table>
Montana Severe Maternal Morbidity Study

• De-identified data compiled from the Montana Hospital Discharge Data System (MHDDS), administered by the Montana Hospital Association (MHA)

• Study Population:
  • Included: all hospitalized deliveries to Montana residents at health facilities that participated in the MHDDS from January 1, 2016 to December 31, 2018
    • Represents 83.5% of all births in Montana 2016-2018 compared to vital records
  • Excluded: non-facility births, births at non-participating hospitals (IHS), miscarriages, births to non-Montana residents

• Used CDC definition of Severe Maternal Morbidity (SMM)
Study patient characteristics among hospitalized deliveries in Montana 2016-2018, N= 29,681

- Source: Montana Hospital Discharge Data System
- Rurality categories based on the 2013 National Center for Health Statistics Urban-Rural Classification
  - Small metro: County with at least one urbanized area of 50,000
  - Micropolitan: County with at least one urban cluster of 10,000-49,999
  - Noncore: Rural, no urban cluster
- Large population of missing race data; will be proposing data match to complete this set

<table>
<thead>
<tr>
<th>Patient Characteristics</th>
<th>N (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Payer</strong></td>
<td></td>
</tr>
<tr>
<td>Medicaid</td>
<td>13,335 (44.9)</td>
</tr>
<tr>
<td>Non-Medicaid</td>
<td>16,346 (55.1)</td>
</tr>
<tr>
<td><strong>Age</strong></td>
<td></td>
</tr>
<tr>
<td>&lt;20 years</td>
<td>1,596 (5.4)</td>
</tr>
<tr>
<td>20-34 years</td>
<td>23,862 (80.4)</td>
</tr>
<tr>
<td>≥35 years</td>
<td>4,223 (14.2)</td>
</tr>
<tr>
<td><strong>Patient rurality</strong></td>
<td></td>
</tr>
<tr>
<td>Small metro</td>
<td>10,206 (34.4)</td>
</tr>
<tr>
<td>Micropolitan</td>
<td>9,679 (32.6)</td>
</tr>
<tr>
<td>Noncore</td>
<td>9,796 (33.0)</td>
</tr>
<tr>
<td><strong>Race</strong></td>
<td></td>
</tr>
<tr>
<td>White</td>
<td>16,516 (55.7)</td>
</tr>
<tr>
<td>American Indian/Alaska Native</td>
<td>2,034 (6.9)</td>
</tr>
<tr>
<td>Other</td>
<td>1,462 (4.9)</td>
</tr>
<tr>
<td>Declined/Missing</td>
<td>9,669 (32.6)</td>
</tr>
</tbody>
</table>
### Most common indicators of SMM by risk category among hospitalized deliveries in Montana, 2016-2018 N= 29,681

<table>
<thead>
<tr>
<th>Patient Characteristics</th>
<th>Most common</th>
<th>Second most common</th>
<th>Third most common</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Payer</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Non-Medicaid</td>
<td>Blood transfusion</td>
<td>Hysterectomy</td>
<td>Acute renal failure</td>
</tr>
<tr>
<td>Medicaid</td>
<td>Blood transfusion</td>
<td>Hysterectomy</td>
<td>Eclampsia, puerperal cerebrovascular disorders, pulmonary edema</td>
</tr>
<tr>
<td><strong>Patient rurality</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Small metro</td>
<td>Blood transfusion</td>
<td>Hysterectomy</td>
<td>Puerperal cerebrovascular disorders</td>
</tr>
<tr>
<td>Micropolitan</td>
<td>Blood transfusion</td>
<td>Eclampsia</td>
<td>Pulmonary edema</td>
</tr>
<tr>
<td>Noncore</td>
<td>Blood transfusion</td>
<td>Hysterectomy</td>
<td>Pulmonary edema, severe anesthesia complications, ventilation</td>
</tr>
<tr>
<td><strong>Race</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>White</td>
<td>Blood transfusion</td>
<td>Hysterectomy</td>
<td>Eclampsia</td>
</tr>
<tr>
<td>American Indian/ Alaska Native</td>
<td>Blood transfusion</td>
<td>Hysterectomy</td>
<td>Acute renal failure, puerperal cerebrovascular disorders, severe anesthesia complications, air and thrombotic embolism, ventilation</td>
</tr>
<tr>
<td>Other</td>
<td>Blood transfusion</td>
<td>Hysterectomy</td>
<td>Acute renal failure</td>
</tr>
</tbody>
</table>
### Relative Risk for SMM by Patient Characteristic

**Patients for whom Medicaid was the primary payer had 1.3 times greater risk of SMM than those who did not have Medicaid.**

**Compared to residents of small metro areas, noncore patients had 1.9 times greater risk of SMM.**

**Compared to white patients, AI/AN patients had 3.0 times greater risk of SMM.**

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**Bivariate analysis (crude) by patient characteristic among hospitalized deliveries in Montana 2016-2018 N=29,681**

<table>
<thead>
<tr>
<th>Patient Characteristics</th>
<th>Relative Risk (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Payer</strong></td>
<td></td>
</tr>
<tr>
<td>Non-Medicaid</td>
<td>Ref</td>
</tr>
<tr>
<td>Medicaid</td>
<td>1.3* (1.0 – 1.6)</td>
</tr>
<tr>
<td><strong>Patient rurality</strong></td>
<td></td>
</tr>
<tr>
<td>Small metro</td>
<td>Ref</td>
</tr>
<tr>
<td>Micropolitan</td>
<td>1.1 (0.8-1.5)</td>
</tr>
<tr>
<td>Noncore</td>
<td>1.9* (1.5-2.5)</td>
</tr>
<tr>
<td><strong>Race</strong></td>
<td></td>
</tr>
<tr>
<td>White</td>
<td>Ref</td>
</tr>
<tr>
<td>American Indian/ Alaska Native</td>
<td>3.0* (2.1-4.2)</td>
</tr>
<tr>
<td>Other</td>
<td>1.4 (0.8-2.4)</td>
</tr>
</tbody>
</table>

*p < .05; **p < .01; ***p < .001

Source: Montana Hospital Discharge Data System
Pregnancy Risk Factors

Montana Birth Records Analysis, 2014-2019
Racial disparities in risk factors at delivery

Racial Disparities in Delivery Risk Factors (% of Live Births, 2014-2019), N=72,272

- Gestational Diabetes
  - White: 4.3%
  - AI/AN: 0.8%
  - Other/Unknown: 6.4%
  - Total: 7.9%

- Pre-pregnancy Diabetes
  - White: 0.8%
  - AI/AN: 4.5%
  - Other/Unknown: 6.9%
  - Total: 11.5%

- Gestational Hypertension
  - White: 6.4%
  - AI/AN: 6.6%
  - Other/Unknown: 3.3%
  - Total: 6.6%

- Pre-pregnancy Hypertension
  - White: 0.9%
  - AI/AN: 1.0%
  - Other/Unknown: 1.2%
  - Total: 1.5%

- Previous Preterm Birth
  - White: 5.4%
  - AI/AN: 3.1%
  - Other/Unknown: 3.3%
  - Total: 3.1%

- Previous Poor Outcomes
  - White: 1.9%
  - AI/AN: 2.5%
  - Other/Unknown: 2.6%
  - Total: 2.5%

- Previous Cesarean
  - White: 13.3%
  - AI/AN: 14.0%
  - Other/Unknown: 14.3%
  - Total: 14.0%

- Any Risk Factor
  - White: 28.1%
  - AI/AN: 31.5%
  - Other/Unknown: 33.3%
  - Total: 31.5%
Geographic disparities in risk factors at delivery

Risk Factors by NCHS Urban/Rural Classification (% of Live Births, 2014-2019), N=72,272

- **Gestational Diabetes**: 4.6%, 4.9%, 4.5%, 4.3%
- **Pre-pregnancy Diabetes**: 0.9%, 1.0%, 0.9%, 0.8%
- **Gestational Hypertension**: 6.0%, 6.9%, 6.4%, 6.0%
- **Pre-pregnancy Hypertension**: 1.0%, 1.0%, 1.0%, 1.0%
- **Previous Preterm Birth**: 2.6%, 3.6%, 3.3%, 3.2%
- **Previous Poor Outcomes**: 1.9%, 2.0%, 2.0%, 2.0%
- **Previous Cesarean**: 12.4%, 14.1%, 14.0%, 15.3%
- **Any Risk Factor**: 26.3%, 28.0%, 28.1%, 29.6%
Montana’s Pregnancy Risk Assessment Monitoring System (PRAMS)

- Random, population-based survey about maternal behaviors and experiences before, during, and after pregnancy
- Respondents are mailed a survey 3-6 months after delivering, telephone follow-up
- Collaborative effort with CDC
- Montana has conducted PRAMS survey since 2017
- DPHHS Staff:
  - Dr. Miriam Naiman-Sessions, PI and Project Director
  - Carol Hughes, Data Manager
Diagnosed health conditions during pregnancy (Self report, N=806)

- Gestational diabetes: 5.5%
- High blood pressure: 10.2%
- Depression: 16.9%
- Health disparities:
  - Race: No significant difference
  - Rurality: No significant difference
Postpartum Depression

**SINCE NEW BABY WAS BORN, HOW OFTEN HAVE YOU HAD LITTLE INTEREST OR PLEASURE IN DOING THE THINGS YOU USUALLY ENJOYED? (MT PRAMS 2018, N=799)**

<table>
<thead>
<tr>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Always</td>
<td>1.4</td>
</tr>
<tr>
<td>Often/Almost Always</td>
<td>8.2</td>
</tr>
<tr>
<td>Sometimes</td>
<td>20.6</td>
</tr>
<tr>
<td>Rarely</td>
<td>34.5</td>
</tr>
<tr>
<td>Never</td>
<td>35.4</td>
</tr>
</tbody>
</table>

**SINCE NEW BABY WAS BORN, HOW OFTEN HAVE YOU FELT DOWN, DEPRESSED, OR HOPELESS? (MT PRAMS 2018, N=786)**

<table>
<thead>
<tr>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Always</td>
<td>8.0</td>
</tr>
<tr>
<td>Often/Almost Always</td>
<td>25.8</td>
</tr>
<tr>
<td>Sometimes</td>
<td>38.3</td>
</tr>
<tr>
<td>Rarely</td>
<td>27.0</td>
</tr>
<tr>
<td>Never</td>
<td></td>
</tr>
</tbody>
</table>
Conclusions & Recommendations

Maternal Mortality
- Montana must invest in MMRC to establish more valid pregnancy-related mortality rate
- Investigations will identify pregnancy relatedness of suicide and substance-related deaths

Severe Maternal Morbidity
- Blood transfusion and hysterectomy is most common SMM subtype in MT
- Rate of eclampsia higher in Montana than the national rate (3.7 per 10,000 vs. 2.0 per 10,000 hospital deliveries)
- National studies on rurality indicate CAH can safely handle low risk patients; higher rate of SMM in rural MT patients indicates need for risk appropriate care

Pregnancy Risk Factors & Conditions
- Racial disparities are more pronounced than geographic disparities indicating need for targeted resources and interventions by and for AI/AN communities
- Depression during pregnancy (16.9%) and in the postpartum period


8. CDC Wonder, 2019 report of 5-year (2013-17) pregnancy-related death rate estimate; Rankings by America’s Health Rankings, United Health Foundation


Appendix
CDC SMM Measurement

Denominator:

- Hospitalized Delivery: Number of hospitalized deliveries
  - Defined as: a vaginal delivery, cesarean delivery, or a delivery outcome.
  - All miscarriages are excluded
  - All non-facility births excluded
    - Non-facility births only made up 4.1% of all births in Montana from 2016-2018.\textsuperscript{12}

Severe Maternal Mortality Indicator: Numerator

1. Acute myocardial infarction
2. Aneurysm
3. Acute renal failure
4. Adult respiratory distress syndrome
5. Amniotic fluid embolism
6. Cardiac arrest/ventricular fibrillation
7. Conversion of cardiac rhythm
8. Disseminated intravascular coagulation
9. Eclampsia
10. Heart failure/arrest during surgery or procedure
11. Puerperal cerebrovascular disorders
12. Pulmonary edema/Acute heart failure
13. Severe anesthesia complications
14. Sepsis
15. Shock
16. Sickle cell disease with crisis
17. Air and thrombotic embolism
18. Blood products transfusion
19. Hysterectomy
20. Temporary tracheostomy
21. Ventilation