Infant and Maternal Health Mortality

Susan Castellano, Maternal and Child Health Section Manager
Child and Family Health Division
Trends Impacting Perinatal Health
The Increasing diversity of Minnesota

Percent of Total Population Projected to Be Nonwhite or Latino, by Year

Data Source: Minnesota State Demographic Center
Nationally, the rate of babies born with NAS per 1,000 hospital births was 1.2 in 2000, 1.5 in 2003, 1.96 in 2006, 3.39 in 2009 and 5.8 in 2012. The rate of maternal opiate use per 1,000 hospital births was 1.19 in 2000, 1.26 in 2003, 2.52 in 2006, and 5.63 in 2009.

STDs in Minnesota
Rate per 100,000 by Year of Diagnosis, 2007-2017

Rate of Chlamydia
Rate of Gonorrhea
Rate of P&S* Syphilis

* P&S = Primary and Secondary

Source: Sexually Transmitted Disease (STD) Surveillance Report, MN Dept. of Health, 2017
Deaths in MN from Suicide, Homicide, Alcohol and Drug Overdose, 2000-2016

DEATHS FROM SUICIDE, ALCOHOL, AND DRUG OVERDOSES HAVE BEEN STEADILY INCREASING OVER THE LAST 16 YEARS.

SOURCE: MINNESOTA DEPARTMENT OF HEALTH, INJURY AND VIOLENCE PREVENTION UNIT
Infant Mortality
Key Fetal/Infant MN Statistics: 2016

• Live Births: 69,835

• Number of infant deaths (Infants aged < 1 year): 357
  • Number of neonatal deaths (Infants aged < 28 days): 242
  • Number of post neonatal deaths (Infants aged 28 days to < 1 year): 115

• Fetal (Stillbirth) deaths (20+ weeks gestation): 420

• Infant mortality rate per 1,000 live births: 5.1

• Fetal mortality rate per 1,000 live births + fetal deaths: 5.3
What Is the Infant Mortality Rate?

1. The infant mortality rate (IMR) is expressed as the number of infant deaths per 1,000 live births.

2. **IMR Calculation Example**: In 2014, there were 346 infant deaths and 69,916 live births in Minnesota. What was the infant mortality rate?
   - \( \frac{346}{69,916} \times 1,000 = 4.9 \) infant deaths per 1,000 live births

   **Interpretation**: In 2014, the **IMR in Minnesota** was **4.9 infant deaths per 1,000 live births**.
Infant Mortality Rates for Selected OECD Countries

Infant Mortality Rates 1996-2015: Minnesota and U.S.

Rate per 1,000 Live Births


US

Minnesota

Healthy People 2020 Target

Source: National Center for Health Statistics
Infant Mortality Rates by Race/Ethnicity of Mother, Minnesota 2000-2016

*Hispanic can be of any race
5-year averages
Source: Minnesota Department of Health, Linked Birth/Infant Death File
## Leading Causes of Infant Mortality in Minnesota, 2012-2016

### Table: Leading Causes of Infant Mortality by Race/Ethnicity

<table>
<thead>
<tr>
<th>Race/Ethnicity</th>
<th>First</th>
<th>Second</th>
<th>Third</th>
<th>Fourth</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td><strong>Congenital Anomalies (26.0%)</strong></td>
<td><strong>Prematurity (24.7%)</strong></td>
<td><strong>Obstetric Conditions (12.6%)</strong></td>
<td><strong>SUID (12.5%)</strong></td>
</tr>
<tr>
<td>Black/African American</td>
<td>Prematurity (26.4%)</td>
<td>Congenital Anomalies (23.0%)</td>
<td>SUID (16.3%)</td>
<td>Obstetric Conditions (12.4%)</td>
</tr>
<tr>
<td>American Indian</td>
<td>Obstetric Conditions (31.3%)</td>
<td>#</td>
<td>#</td>
<td>#</td>
</tr>
<tr>
<td>Asian/Pacific Islander</td>
<td>Prematurity (34.0%)</td>
<td>Congenital Anomalies (26.7%)</td>
<td>Obstetric Conditions (15.3%)</td>
<td>#</td>
</tr>
<tr>
<td>Hispanic*</td>
<td>Congenital Anomalies (25.4%)</td>
<td>Prematurity (23.8%)</td>
<td>#</td>
<td>#</td>
</tr>
<tr>
<td>Non-Hispanic White</td>
<td>Congenital Anomalies (27.9%)</td>
<td>Prematurity (23.0%)</td>
<td>SUID/SIDS (12.6%)</td>
<td>Obstetric Conditions (11.0%)</td>
</tr>
</tbody>
</table>

*Hispanic can be of any race

# indicates unstable proportions; fewer than 20 cases

SUID includes SIDS and other sleep-related deaths

Source: Minnesota Department of Health. Linked Birth/Death File

1/16/2019
In 2013, the U.S. fetal mortality rate was 6.0 compared to 4.9 in Minnesota.

Data Source: Minnesota Department of Health, Minnesota Resident Final Fetal Death File
Stillbirth rates by race/ethnicity Minnesota 2006-2016

Data Source: Minnesota Department of Health, Minnesota Resident Final Fetal Death File
Once a day =

Many are preventable
Fetal and Infant Mortality Review
History of FIMR in Minnesota

- Statutory authority and resources no longer exists
- Previous statewide American Indian Infant Mortality Review conducted
What is a Fetal and Infant Mortality Review?

Ultimate goal: avert preventable fetal and infant deaths by improving education, services and community resources via a broad range of policies and interventions

Community Action Team charged with developing and implementing solutions to address systems- and community-level problems

Conduct systematic, scientific, and objective review of cases to identify underlying causes, contributing factors and systems-level issues, monitoring trends and changes over time

Case summaries reviewed by an interdisciplinary team, develops recommendations based on themes or patterns in the information

Maternal health
Minnesota teen pregnancy rate 1990-2016

Data Source: Minnesota Resident Final Birth File & US Census Bureau

Minnesota teen pregnancy rate 1990-2016
Teen Birth by Race/Ethnicity

Minnesota Teen Birth Rate by Race/Ethnicity

Data Source: Minnesota Resident Final Birth File & US Census Bureau, American Community Survey
Percent Preterm Births by Race/Ethnicity of Mother
Minnesota, 2017

<table>
<thead>
<tr>
<th>Race/Ethnicity</th>
<th>Percent (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Black/African American</td>
<td>9.7</td>
</tr>
<tr>
<td>American Indian</td>
<td>15.2</td>
</tr>
<tr>
<td>Asian/Pacific Islander</td>
<td>8.4</td>
</tr>
<tr>
<td>Hispanic*</td>
<td>9.6</td>
</tr>
<tr>
<td>White</td>
<td>8.6</td>
</tr>
<tr>
<td>Other/Unknown</td>
<td>12.5</td>
</tr>
<tr>
<td>MN Total</td>
<td>8.9</td>
</tr>
</tbody>
</table>

Notes:
*Hispanic can be of any race
Preterm births are births that occur before 37 completed weeks of gestation.
The data shown are for the percent (%) of all births that are preterm
Source: Minnesota Department of Health, Birth File
Percent of Unintended Pregnancies, 2013-2015

Data Source: Minnesota PRAMS
Maternal Depression

• Pregnancy – a vulnerable time for depression

• Research has demonstrated maternal depression can have a significant impact on infant development

• Prevalence of depression in pregnant and post-partum women range from 5%-25% depending on the source of the information and degree of severity. Can be:

  • Mild - Baby Blues, 50% - 80%
  • Moderate - Postpartum Depression, 10% - 20%
  • Severe - Postpartum Psychosis, 0.1% - 0.2%

Determinants of Health

- Social and Economic Factors: 40%
- Health Behaviors: 30%
- Clinical Care: 10%
- Physical Environment: 10%
- Genes and Biology: 10%

Factors that Influence on Health

[Diagram showing various factors influencing health, including general socio-economic, cultural and environmental conditions, living and working conditions, social and community networks, individual lifestyle factors, age, sex, and constitutional factors.]

Source: Dahlgren and Whitehead, 1991
Experiences During Pregnancy
Stressors by Race/Ethnicity for pregnant women
Minnesota, 2009-2013

Source: PRAMS Survey
Hispanic Ethnicity may include other racial categories
### Stressful Life Events

Percentage of mothers who reported experiencing housing related stressors 12 months before the baby was born by race/ethnicity: Minnesota, 2012-2015

<table>
<thead>
<tr>
<th>Categories of Stressful Events</th>
<th>U.S.-born Black</th>
<th>American Indian</th>
<th>Hispanic*</th>
<th>White</th>
<th>Other</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Moved</td>
<td>41.6</td>
<td>49.6</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Homelessness</td>
<td>26.0</td>
<td>29.8</td>
<td>25.2</td>
<td>12.1</td>
<td>0.1</td>
<td>10.6</td>
</tr>
<tr>
<td>Problems paying the rent, mortgage, or other bills</td>
<td>28.8</td>
<td>32.3</td>
<td>21.6</td>
<td>16.1</td>
<td>15.3</td>
<td>17.3</td>
</tr>
</tbody>
</table>

*Hispanic can be of any race

Data not shown when there are fewer than 30 cases

Source: Minnesota Pregnancy Risk Assessment Monitoring System (PRAMS), Minnesota Department of Health, Division of Community and Family Health, Maternal and Child Health.

Funding for MN PRAMS is made possible by grant number: SU51DP006217-03 from the Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion
### Percentage of mothers who reported experiencing employment related stressors 12 months before the baby was born by race/ethnicity: Minnesota, 2012-2015

<table>
<thead>
<tr>
<th>Category of Stressful Events</th>
<th>U.S.-born Black</th>
<th>American Indian</th>
<th>Hispanic*</th>
<th>White</th>
<th>Other</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Husband/Partner lost job</td>
<td>15.9</td>
<td>16.6</td>
<td>13.4</td>
<td>7.5</td>
<td>7.9</td>
<td>8.5</td>
</tr>
<tr>
<td>Lost job but wanted to go on working</td>
<td>20.7</td>
<td>14.3</td>
<td>5.2</td>
<td>6.6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Husband/Partner or I had cut in work hours or pay</td>
<td>20.5</td>
<td>25.2</td>
<td>14.2</td>
<td>13.5</td>
<td>15.5</td>
<td></td>
</tr>
</tbody>
</table>

*Hispanic can be of any race

Data not shown when there are fewer than 30 cases

Source: Minnesota Pregnancy Risk Assessment Monitoring System (PRAMS), Minnesota Department of Health, Division of Community and Family Health, Maternal and Child Health.

Funding for MN PRAMS is made possible by grant number: 5U01DP006217-03 from the Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion.
First Trimester Prenatal Care

Early access:

- Healthy People 2020 goal: 77.9% of pregnant women to begin prenatal care in the first trimester
- Only non-Hispanic whites are above this HP goal

Source: Center for Health Statistics, Minnesota Department of Health 2010-2015
Adequacy of Prenatal Care, Minnesota 2010-2016

Source: Vital Records, Minnesota Department of Health, 2010-2016

Note: Race includes people identifying as single race; Hispanic includes any race; *Kotelchuck Index used to calculate adequacy and includes the number of prenatal care visits from time care began until delivery.
Percent Reporting No Prenatal Care First Trimester Minnesota, 2012-2015

- Healthy People 2020 goal: 77.9%

*Hispanic can be of any race

Source: Minnesota Pregnancy Risk Assessment Monitoring System (PRAMS), Minnesota Department of Health, Division of Community and Family Health, Maternal and Child Health.

Funding for MN PRAMS is made possible by grant number: SU01DP006217-03 from the Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion.
Barriers to Prenatal Care

Percentage of mothers who reported experiencing the following barriers when trying to access prenatal care in Minnesota, 2012-2015

- Did not know I was pregnant
- Didn't have enough money or insurance to pay for my visits
- Didn't have any transportation to get to the clinic/doctor's office

*Note: Hispanic can be of any race
Source: Minnesota Pregnancy Risk Assessment Monitoring System (PRAMS), Minnesota Department of Health, Division of Community and Family Health, Maternal and Child Health
Infant Mortality disparities persist despite first Trimester Prenatal Care Initiation, Minnesota 2009-2013

*Can be of any race
Source: Minnesota Department of Health, Center for Health Statistics
Experiences after the baby was born
Percentage of mothers who reported that they had the following types of social support after their baby was born by race/ethnicity: Minnesota, 2012-2015

*Hispanic can be of any race

Source: Minnesota Pregnancy Risk Assessment Monitoring System (PRAMS), Minnesota Department of Health, Division of Community and Family Health, Maternal and Child Health. Funding for MN PRAMS is made possible by grant number: 5U01DP006217-03 from the Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion.
### Social Support After Pregnancy

Percentage of mothers who reported that they had the following types of social support after their most recent pregnancies months by race/ethnicity: Minnesota, 2012-2015

<table>
<thead>
<tr>
<th>Categories of Stressful Events</th>
<th>U.S.-born Black</th>
<th>American Indian</th>
<th>Hispanic*</th>
<th>White</th>
<th>Other</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Someone to take care of my baby</td>
<td>81.4</td>
<td>85.3</td>
<td>82.6</td>
<td>93.7</td>
<td>85.5</td>
<td>94.2</td>
</tr>
<tr>
<td>Someone to help me if I were tired and feeling frustrated with my new baby</td>
<td>79.1</td>
<td>86.7</td>
<td>81.0</td>
<td>90.5</td>
<td>81.0</td>
<td>90.9</td>
</tr>
</tbody>
</table>

*Hispanic can be of any race

Source: Minnesota Pregnancy Risk Assessment Monitoring System (PRAMS), Minnesota Department of Health, Division of Community and Family Health, Maternal and Child Health.

Funding for MN PRAMS is made possible by grant number: 5U01DP006217-03 from the Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion.
Maternal Mortality

* Note: Number of pregnancy related deaths per 100,000 live births

Data Source: CDC, Pregnancy Mortality Surveillance System
Maternal Mortality Definitions

• ACOG and CDC definitions

  ▪ *Pregnancy-associated death:* The death of a woman while pregnant or within 1 year of termination of pregnancy, irrespective of cause.

  ▪ *Pregnancy-related death:* The death of a woman while pregnant or within 1 year of termination of pregnancy, irrespective of the duration and site of the pregnancy, from any cause related to or aggravated by her pregnancy or its management, but not from accidental or incidental causes.

<table>
<thead>
<tr>
<th>Causes of Pregnancy-Related Mortality</th>
<th>Percentage of All Pregnancy-Related Deaths</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cardiovascular Diseases</td>
<td>15.2%</td>
</tr>
<tr>
<td>Non-Cardiovascular Diseases</td>
<td>14.7%</td>
</tr>
<tr>
<td>Infection or Sepsis</td>
<td>12.8%</td>
</tr>
<tr>
<td>Hemorrhage</td>
<td>11.5%</td>
</tr>
<tr>
<td>Cardiomyopathy</td>
<td>10.3%</td>
</tr>
<tr>
<td>Thrombotic Pulmonary Embolism</td>
<td>9.1%</td>
</tr>
<tr>
<td>Cerebrovascular Accidents</td>
<td>7.4%</td>
</tr>
<tr>
<td>Hypertensive Disorders of Pregnancy</td>
<td>3.8%</td>
</tr>
<tr>
<td>Amniotic Fluid Embolism</td>
<td>5.5%</td>
</tr>
<tr>
<td>Anesthesia Complications</td>
<td>0.3%</td>
</tr>
</tbody>
</table>

*Note: The cause of death is unknown for 6.5% of all 2011-2014 pregnancy-related deaths.*

Data Source: CDC, Pregnancy Mortality Surveillance System
Causes of Death, 2011-2017

- Obstetric complications: 18%
- Unintentional Poisoning: 11%
- Violence: 9%
- Non-Obstetric complications: 9%
- Motor Vehicle Crash: 8%
- Suicide: 7%
- Cancer: 6%
- Heart & circulatory System: 5%
- Nervous System: 3%
- Respiratory System: 2%
- Other/Misclassified/Unknown: 6%
- Cancer: 5%
- Heart & circulatory System: 3%
- Nervous System: 2%
- Respiratory System: 4%

Data Source: Minnesota Department of Health, Minnesota Resident Maternal Mortality File
Minnesota Maternal Mortality Reviews

• Cases identified: check box on death certificate, clinician reporting and other

• Clinician conducts medical review of each case, develops a summary

• Review team assembles 2-3 times per year to review case summaries, identify causes, contributing factors and trends

• Some state include Morbidity reviews as well, would require statutory authority and resources to include in Minnesota
Minnesota’s Maternal Mortality Rate, 2011-2017

Data Source: Minnesota Department of Health, Minnesota Resident Maternal Mortality File
Disparities in pregnancy-related mortality in the United States, 2011-2014

- White: 12.4
- Black: 40.0
- Other Races: 17.8

*Note: Number of pregnancy related deaths per 100,000 live births

Data Source: CDC, Pregnancy Mortality Surveillance System
MN Maternal Mortality Rates by Race/Ethnicity 2011-2017

Data Source: Minnesota Department of Health, Minnesota Resident Maternal Mortality File
Maternal Mortality in Minnesota, 2011-2017

Data Source: Minnesota Department of Health, Minnesota Resident Maternal Mortality File
MN Place of Maternal Death, 2011-2017

**Geographic Location**

<table>
<thead>
<tr>
<th>Location</th>
<th>Proportion of Deaths</th>
<th>Proportion of Births</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hennepin County</td>
<td>27%</td>
<td>24%</td>
</tr>
<tr>
<td>Ramsey County</td>
<td>9%</td>
<td>11%</td>
</tr>
<tr>
<td>Suburbs*</td>
<td>17%</td>
<td>22%</td>
</tr>
<tr>
<td>Greater Minnesota</td>
<td>47%</td>
<td>43%</td>
</tr>
</tbody>
</table>

*Suburbs include: Anoka, Carver, Dakota, Scott, Washington

**Physical Location**

- Inpatient Hospital 40%
- Hospital E.R. / Outpatient 17%
- At Home 26%
- Interstate/Hwy/Road 6%
- In transport to Hospital 1%
- Other 10%

Data Source: Minnesota Department of Health, Minnesota Resident Maternal Mortality File
Thank you

Susan Castellano | Maternal and Child Health Section Manager
Joan Brandt | Child and Family Health Division Director
Mira Grice Sheff | State MCH Epidemiologist, PRAMS PI
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Michelle Chiezah | Infant Mortality Specialist
Molly Meyer | Senior Research Scientist

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