Pre-Pregnancy Weight and Gestational Weight Gain: Findings from the California Pregnancy-Associated Mortality Review

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Outline of the Presentation

• Background maternal mortality in CA
• Methodology of the California Pregnancy-Associated Mortality Review
• Findings and impact of obesity and overweight
• Next steps
Maternal Mortality Rate, California; 1970-2009


Moving Average of Maternal Mortality Rates, California Residents; 1999-2009

Source: State of California, Department of Public Health, California Birth and Death Statistical Master Files, 1999-2009. Maternal mortality for California (deaths ≤ 42 days postpartum) was calculated using ICD-10 cause of death classification (codes A24, O00-O08, O98-O99) for 1999-2008. On average, the mortality rate increased by 4% each year (95% CI: 1.2%, 6.1%; p=0.003; Poisson regression) for a statistically significant increasing trend from 1999-2009 (p<0.001 one-sided Cochran-Armitage). Produced by California Department of Public Health, Center for Family Health; Maternal, Child and Adolescent Health Program, October, 2011.
Maternal Mortality Rates by Race/Ethnicity, California, 1999-2009

Maternal Deaths per 100,000 Live Births


California Pregnancy-Associated Mortality Review (CA-PAMR)

- Initiated in 2004, first case review in 2007
- Public Health Institute, CA Maternity Quality Care Collaborative, CA-PAMR Committee (key partners)
- Goals of understanding cause(s) of rise and to develop programmatic and policy interventions
Key Steps of CA-PAMR

STEP 1: Hospital discharge data linked to birth, death certificates
Identifies women who died within one year postpartum from any cause
(Pregnancy-Associated Cohort)

STEP 2: Additional data gathered for each death
Coroner Reports, Autopsy Results, and additional information from the Death Certificate (e.g., multiple causes of death, recent surgeries, etc) are obtained

STEP 3: Cases selected for CA-PAMR Committee review
Documented (ICD-10 obstetric (“O”) code) and suspected pregnancy-related deaths are prioritized for review

STEP 4: Medical records abstracted and summarized
All available labor and delivery, prenatal, hospitalization, transport, and outpatient and emergency department records are obtained and summarized

STEP 5: Case reviewed by CA-PAMR Committee
Committee determines whether the death was pregnancy-related, the cause of death, contributing factors and quality improvement opportunities

Racial/Ethnic Disparities in Pregnancy-Related Deaths, California 2002-2004

<table>
<thead>
<tr>
<th>Race/Ethnicity</th>
<th>Percentage of Births and Pregnancy-Related Deaths</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hispanic</td>
<td>51%</td>
</tr>
<tr>
<td>White</td>
<td>44%</td>
</tr>
<tr>
<td>African-American</td>
<td>30%</td>
</tr>
<tr>
<td>Asian/Pacific Islander</td>
<td>25%</td>
</tr>
<tr>
<td>American Indian/Alaska Native</td>
<td>12%</td>
</tr>
<tr>
<td>California Birth Cohort</td>
<td>6%</td>
</tr>
<tr>
<td>Pregnancy-Related Deaths</td>
<td>8%</td>
</tr>
</tbody>
</table>

Payer Source Disparities in Pregnancy-Related Deaths, California 2002-2004

Select Characteristics

CA-PAMR Causes of Pregnancy-Related Deaths, after Case Review; 2002-2004

<table>
<thead>
<tr>
<th>Cause</th>
<th>N</th>
<th>(%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cardiovascular Disease</td>
<td>29</td>
<td>(20)</td>
</tr>
<tr>
<td>Cardiomyopathy</td>
<td>19</td>
<td>(13)</td>
</tr>
<tr>
<td>Other cardiovascular</td>
<td>10</td>
<td>(7)</td>
</tr>
<tr>
<td>Preeclampsia/eclampsia</td>
<td>25</td>
<td>(17)</td>
</tr>
<tr>
<td>Obstetric hemorrhage</td>
<td>16</td>
<td>(11)</td>
</tr>
<tr>
<td>Amniotic fluid embolism</td>
<td>15</td>
<td>(10)</td>
</tr>
<tr>
<td>Deep vein thrombosis/ Pulmonary embolism</td>
<td>15</td>
<td>(10)</td>
</tr>
<tr>
<td>Sepsis/infection</td>
<td>10</td>
<td>(7)</td>
</tr>
<tr>
<td>Cerebral Vascular Accidents</td>
<td>9</td>
<td>(6)</td>
</tr>
<tr>
<td>Other</td>
<td>26</td>
<td>(18)</td>
</tr>
<tr>
<td>TOTAL</td>
<td>145</td>
<td></td>
</tr>
</tbody>
</table>
CA-PAMR Pregnancy-Related Deaths and CA Births, Pre-pregnancy BMI Status; 2002-2004

Racial/Ethnic Differences in BMI, CA-PAMR Pregnancy-Related Deaths, 2002-2004
CA-PAMR Pregnancy-Related Deaths, Gestational Weight Gain (GWG); 2002-2004

<table>
<thead>
<tr>
<th>Pre-Pregnancy BMI</th>
<th>N (%)</th>
<th>Recommended IOM Upper Limit for GWG** (pounds)</th>
<th>PAMR GWG Exceeding Guidelines N (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Underweight</td>
<td>3 (4)</td>
<td>40</td>
<td>0</td>
</tr>
<tr>
<td>Normal</td>
<td>36 (33)</td>
<td>35</td>
<td>8 (22)</td>
</tr>
<tr>
<td>Overweight</td>
<td>42 (39)</td>
<td>25</td>
<td>27 (64)</td>
</tr>
<tr>
<td>Obese (all classes)</td>
<td>28 (25)</td>
<td>20</td>
<td>16 (57)</td>
</tr>
<tr>
<td>Total</td>
<td>109</td>
<td>51 (47%)</td>
<td></td>
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</table>

* Unable to calculate weight gain for 36 (25%) of cases due to unavailable data. N=109.
† Note: weight gain not adjusted for gestational age. Thus, estimates of excessive weight gain are likely underestimated, since not all CA-PAMR women delivered at term.
** Institute of Medicine: Weight Gain During Pregnancy: Reexamining the Guidelines, 2009. Note: These guidelines were not in effect at the time of the maternal deaths.

Summary of Findings from CA-PAMR: BMI and GWG and Maternal Mortality

- High amounts of pre-pregnancy overweight or obesity
  - African-Americans (86%), U.S.-born Hispanics (75%)
- High amounts of excessive GWG
  - Most often occurred among already overweight/obese
  - Hispanics highest GWG (46%), Whites 2nd largest GWG (28%)
- Pre-pregnancy obesity or excessive GWG determined to be one of the contributing factors that directly contributed to the maternal death, per CA-PAMR Committee
  - 30 (27%) of 111 women with BMI and GWG data
  - Pre-pregnancy BMI larger contributing factor than GWG
- Top causes of death were among overweight/obese
  - Cardiomyopathy among African Americans
  - Preeclampsia/eclampsia among Hispanics
Obesity is probably a major driver of rising rates of maternal morbidity and mortality

- Obesity is a direct contributor to development of cardiovascular disease
- Obesity is a risk factor for other pregnancy-related morbidity and mortality
  - Preeclampsia
  - Diabetes
  - Infection
  - DVT, pulmonary embolism
  - Obstetrical hemorrhage
- Obesity is a risk factor for obstetrical complications
  - Cesarean Section

Next Steps Maternal Morbidity and Mortality

- Continue CA-PAMR through review of 2007 deaths
- Continue to develop maternal morbidity measures
  - Relationship to mortality
  - Cost, especially Medi-Cal (46% of CA births covered)
- Translate findings from CA-PAMR
  - Public health prevention strategies
    - Preconception Health
    - Primary prevention of obesity and overweight among women of reproductive age
  - Health care quality improvement initiatives