The Contemporary Challenge of Maternal Mortality in the U.S. & its Meaning for Maternity Care

Gene Declercq, PhD
Community Health Sciences Dept.,
Boston University SPH
www.birthbythenumbers.org

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UNDERSTANDING MATERNAL DEATHS IN COLORADO:
Detailed studies of all maternal deaths in the state of Minnesota have been carried out in 1941-1942 and continuously since 1950. All women who died of whatever cause while pregnant or in the following three months are included in these studies. Cases are found through death certificates, reports from hospitals and physicians, from a variety of other occasional sources, and by cross-matching all death certificates of women aged 15 to 45 years with birth certificates. One of a group of three well-trained obstetricians who hold clinical appointments at the U of Minn Med School goes as soon as possible to the site of the death and collects all pertinent data from the physician, hospital, and pathologist concerned and, when necessary, from the patient’s relatives and from other physicians or hospitals. These data are formally put together, summarized, and critically evaluated for the determination of, among other things, accuracy, completeness, reality of cause of death, responsibility for death, and preventability. All of this is then presented to a common meeting of the members of a Maternal Mortality Committee of the Maternal Welfare Committee of the Minnesota State Medical Society. This Maternal Mortality Committee makes final decisions on policy and on such matters as cause of death, responsibility for death, and preventability. A detailed report is published once a year. The three investigators are paid a sufficient amount approximately to defray their expenses. All other personnel serve without remuneration.
Moms are dying as Minnesota health panel dawdles

Unacceptable hiring delay derailed vital work on increase in maternal mortality.

By Editorial Board  Star Tribune  |  JUNE 21, 2019 — 5:32PM
Minnesota Context

- 4<sup>th</sup> lowest age-adjusted death rate overall
- 12<sup>th</sup> lowest overall IMR (2015-2017)
  - 7<sup>th</sup> for white IMR;
  - 4<sup>th</sup> for NHB IMR;
  - 9<sup>th</sup> for Hispanic IMR
- 23<sup>rd</sup> in Home Births
- 32<sup>nd</sup> in births attended by “other” midwives
- 13<sup>th</sup> in CNM Births
- 11<sup>th</sup> lowest cesarean dates
CNM Attendance at Birth, 1990-2018

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CNM Attendance at Birth, 1990-2018

Minneapolis

U.S.
“Other” Midwives Attendance at Birth, 1990-2018
“Other” Midwives Attendance at Birth, 1990-2018

U.S.

Minnesota

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Home Births in the U.S. and Minnesota, 1990-2018

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Home Births in the U.S. and Minnesota, 1990-2018
What we’ll be discussing

1. Some background – how did we get here?
2. The crisis in measuring maternal mortality
3. Five key points concerning maternal mortality
   • The persistence of racial disparities
   • The U.S. in a comparative context
   • Maternal mortality is a public health problem more than a clinical one
   • The problem is much bigger than maternal deaths
   • Potential policy solutions
First, some background
Three Definitions (in the U.S.)

- **Pregnancy Associated Death** – The death of a woman while pregnant or within one year of termination of pregnancy, irrespective of cause. (WHO calls these “pregnancy related”). Starting point for analyses.

- **Maternal Mortality Ratio** – the death of a woman while pregnant or within 42 days of termination of pregnancy, irrespective of the duration and site of the pregnancy, from any cause related to or aggravated by the pregnancy or its management but not from accidental or incidental causes. Typically reported as a ratio per 100,000 births. Used in international comparisons.

- **Pregnancy Related Death** – the death of a woman during pregnancy or within one year of the end of pregnancy from a pregnancy complication, a chain of events initiated by pregnancy, or the aggravation of an unrelated condition by the physiologic effects of pregnancy. Used by CDC for U.S. trends.

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Pregnancy Associated Mortality (1 year)

Clarifying Definitions:

Pregnancy Associated Mortality

All Deaths women of reproductive age pregnancy to 1 year ppm

www.birthbythenumbers.org
Clarifying Definitions:
Pregnancy Related Mortality

Pregnancy Associated Mortality (1 year)

Pregnancy Related Related Mortality (1 year)

All Deaths women during pregnancy, birth and up to 1 year ppm & Related to the pregnancy

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Clarifying Definitions:
Maternal Mortality

- **Pregnancy Associated Mortality (1 year)**
- **Maternal Mortality (42 days)**
- **Pregnancy Related Mortality (1 year)**

All Deaths women during pregnancy, birth and up to 42 days ppm Related to the pregnancy

NOTE: WHO defines pregnancy related term

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Timeline of Maternal Mortality Definitions

Pregnancy

Birth

42 days
PPM

Week after
Birth

42 days PPM to 1 year

WHO Maternal Mortality

CDC Pregnancy Related

Pregnancy Associated

PPM – postpartum – period after the birth

WHO Definition of Maternal Death

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U.S. Maternal Mortality (per 100,000 live births), 1951-2007

1951-1982
89% decline (75.0 to 7.9)

Source: NCHS. Deaths: Final Data. Annual Reports.
U.S. Maternal Mortality (per 100,000 live births), 1951-2007

1982-1998
Basically no change
7.9 to 7.1

Source: NCHS. Deaths: Final Data. Annual Reports.
U.S. Maternal Mortality (per 100,000 live births), 1951-2007

1997-2007
78% increase (7.1 to 12.7)

Source: NCHS. Deaths: Final Data. Annual Reports.

www.birthbythenumbers.org
No official maternal mortality ratio for U.S. since 2007
How did the U.S. get to the point where they stopped publishing a maternal mortality rate?

Efforts to avoid poor case ascertainment led to over-ascertainment.
Table 34. Number of maternal deaths and maternal mortality rates for selected causes, by Hispanic origin and race for non-Hispanic population:
United States, 2007

[Maternal causes are those assigned to categories A34, O00–O95, and O68–O99 of the International Classification of Diseases, Tenth Revision (ICD–10), Second Edition. An increasing number of states use a separate item regarding pregnancy status on the death certificate to help identify these deaths; see "Technical Notes." Rates are per 100,000 live births in specified group; see "Technical Notes." Race and Hispanic origin are reported separately on the death certificate. Persons of Hispanic origin may be of any race. Data for Hispanic persons are not tabulated separately by race; data for non-Hispanic persons are tabulated by race. Data for Hispanic origin should be interpreted with caution because of inconsistencies between reporting Hispanic origin on death certificates and on censuses and surveys; see "Technical Notes".)

<table>
<thead>
<tr>
<th>Cause of death (based on ICD–10, 2004)</th>
<th>All origins(^1)</th>
<th>Hispanic</th>
<th>Non-Hispanic(^2)</th>
<th>Non-Hispanic white(^3)</th>
<th>Non-Hispanic black(^4)</th>
<th>All origins(^1)</th>
<th>Hispanic</th>
<th>Non-Hispanic(^2)</th>
<th>Non-Hispanic white(^3)</th>
<th>Non-Hispanic black(^4)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maternal causes</td>
<td>548</td>
<td>95</td>
<td>453</td>
<td>242</td>
<td>178</td>
<td>12.7</td>
<td>8.9</td>
<td>14.1</td>
<td>10.5</td>
<td>28.4</td>
</tr>
<tr>
<td>Pregnancy with abortive outcome</td>
<td>31</td>
<td>5</td>
<td>26</td>
<td>8</td>
<td>17</td>
<td>0.7</td>
<td>*</td>
<td>0.8</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Ectopic pregnancy</td>
<td>14</td>
<td>1</td>
<td>13</td>
<td>2</td>
<td>11</td>
<td>*</td>
<td>*</td>
<td>*</td>
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<tr>
<td>Spontaneous abortion</td>
<td>9</td>
<td>2</td>
<td>7</td>
<td>3</td>
<td>3</td>
<td>*</td>
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</tr>
<tr>
<td>Medical abortion</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Other abortion</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Other and unspecified pregnancy with abortive outcome</td>
<td>7</td>
<td>2</td>
<td>5</td>
<td>3</td>
<td>2</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Other direct obstetric causes</td>
<td>392</td>
<td>67</td>
<td>295</td>
<td>153</td>
<td>117</td>
<td>8.4</td>
<td>6.3</td>
<td>9.2</td>
<td>6.6</td>
<td>18.7</td>
</tr>
<tr>
<td>Eclampsia and pre-eclampsia</td>
<td>64</td>
<td>13</td>
<td>51</td>
<td>19</td>
<td>29</td>
<td>1.5</td>
<td>*</td>
<td>1.6</td>
<td>*</td>
<td>1.3</td>
</tr>
<tr>
<td>Hemorrhage of pregnancy and childbirth and placenta previa</td>
<td>41</td>
<td>12</td>
<td>29</td>
<td>18</td>
<td>9</td>
<td>0.9</td>
<td>*</td>
<td>0.9</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Complications predominately related to the puerperium</td>
<td>93</td>
<td>15</td>
<td>78</td>
<td>35</td>
<td>31</td>
<td>2.2</td>
<td>*</td>
<td>2.4</td>
<td>*</td>
<td>1.5</td>
</tr>
<tr>
<td>Obstetrical tetanus</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Obstetrical embolism</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Other complications predominately related to the puerperium</td>
<td>60</td>
<td>9</td>
<td>51</td>
<td>23</td>
<td>23</td>
<td>1.4</td>
<td>*</td>
<td>1.6</td>
<td>*</td>
<td>1.0</td>
</tr>
<tr>
<td>All other direct obstetric causes</td>
<td>164</td>
<td>27</td>
<td>137</td>
<td>71</td>
<td>58</td>
<td>3.8</td>
<td>2.5</td>
<td>4.3</td>
<td>3.1</td>
<td>9.2</td>
</tr>
<tr>
<td>Obstetric death of unspecified cause</td>
<td>20</td>
<td>4</td>
<td>18</td>
<td>7</td>
<td>7</td>
<td>0.5</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Indirect obstetric causes</td>
<td>135</td>
<td>19</td>
<td>116</td>
<td>74</td>
<td>37</td>
<td>3.1</td>
<td>*</td>
<td>3.6</td>
<td>*</td>
<td>3.2</td>
</tr>
<tr>
<td>Maternal causes more than 42 days after delivery or termination of pregnancy</td>
<td>221</td>
<td>39</td>
<td>181</td>
<td>92</td>
<td>70</td>
<td>5.1</td>
<td>3.7</td>
<td>5.6</td>
<td>4.0</td>
<td>11.2</td>
</tr>
<tr>
<td>Death from any obstetric cause occurring more than 42 days but less than 1 year after delivery</td>
<td>215</td>
<td>38</td>
<td>178</td>
<td>92</td>
<td>66</td>
<td>5.0</td>
<td>3.6</td>
<td>5.5</td>
<td>4.0</td>
<td>10.5</td>
</tr>
<tr>
<td>Death from sequelae of direct obstetric causes</td>
<td>6</td>
<td>1</td>
<td>5</td>
<td>1</td>
<td>4</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
</tbody>
</table>

PART II (Other significant conditions)
- Enter all diseases or conditions contributing to death that were not reported in the chain of events in Part I and that did not result in the underlying cause of death. See attached examples.
- If two or more possible sequences resulted in death, or if two conditions seem to have added together, report in Part I the one that, in your opinion, most directly caused death. Report in Part II the other conditions or diseases.

CHANGES TO CAUSE OF DEATH
Should additional medical information or autopsy findings become available that would change the cause of death originally reported, the original death certificate should be amended by the certifying physician immediately by reporting the revised cause of death to the State Vital Records Office.

ITEMS 33-34 - AUTOPSY
• 33 - Enter “Yes” if either a partial or full autopsy was performed. Otherwise enter “No.”
• 34 - Enter “Yes” if autopsy findings were available to complete the cause of death; otherwise enter “No.” Leave item blank if no autopsy was performed.

ITEM 35 - DID TOBACCO USE CONTRIBUTE TO DEATH?
Check “yes” if, in your opinion, the use of tobacco contributed to death. Tobacco use may contribute to deaths due to a wide variety of diseases; for example, tobacco use contributes to many deaths due to emphysema or lung cancer and some heart disease and cancers of the head and neck. Check “no” if, in your clinical judgment, tobacco use did not contribute to this particular death.

ITEM 36 - IF FEMALE, WAS DECEassed PREGNANT AT TIME OF DEATH OR WITHIN PAST YEAR?
This information is important in determining pregnancy-related mortality.

ITEM 37 - MANNER OF DEATH
- Always check Manner of Death, which is important: 1) in determining accurate causes of death; 2) in processing insurance claims; and 3) in statistical studies of injuries and death.
- Indicate “Pending Investigation” if the manner of death cannot be determined whether due to an accident, suicide, or homicide within the statutory time limit for filing the death certificate. This should be changed later to one of the other terms.
- Indicate “Could not be Determined” ONLY when it is impossible to determine the manner of death.
To improve case identification:


Checkbox format:

IF FEMALE:
- Not pregnant within past year
- Pregnant at time of death
- Not pregnant, but pregnant within 42 days of death
- Not pregnant, but pregnant 43 days to 1 year before death
- Unknown if pregnant within the past year

Meant to solve 2 problems:
(1) Most states had no such question; and
(2) Different questions used in different states

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The Check Box
Determing Pregnancy Status to Improve Maternal Mortality Surveillance
Andrea P. MacKay, MSPH, Roger Rochat, MD, Jack C. Smith, MS, Cynthia J. Berg, MD, MPH

Objective: More than half of pregnancy-related deaths are not identified through routine surveillance methods. The purpose of this study was to evaluate the effectiveness of the pregnancy check box on death certificates in ascertaining pregnancy-related deaths.

Methods: Data derived from the Centers for Disease Control and Prevention’s ongoing Pregnancy Mortality Surveillance System were used to identify states that included a check box on the death certificate in 1991 and 1992. Death certificates from those states were evaluated to determine the number and proportion of pregnancy-related deaths identified by a marked check box. Characteristics of death were also examined.

Results: Sixteen states and New York City included a check box or question specifically asking about pregnancy of the decedent. Of the 425 pregnancy-related deaths identified in the 17 reporting areas, 124 (29%) were determined to be pregnancy-related deaths only because of the pregnancy status information provided in the check box. The proportion of deaths identified only by a marked check box ranged from less than 5% for four states to 40% or more for seven states.

Conclusions: The availability of pregnancy status information on death certificates is a simple and effective aid in ascertaining a pregnancy-related death, when no other indicators of pregnancy appear on the death certificate. Routine use of the pregnancy check box for all states would lead to substantially increased classification of maternal deaths and more accurate classification of the causes of and risk factors for maternal deaths.


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<table>
<thead>
<tr>
<th>State</th>
<th>Instructions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alabama</td>
<td>Was there a pregnancy in the last 42 days? (Specify Yes, No, or Unknown)</td>
</tr>
<tr>
<td>California</td>
<td>If female, pregnant in last year? Yes No Unknown</td>
</tr>
<tr>
<td>Florida</td>
<td>If female, was there a pregnancy in the past 3 months? Yes No Unknown</td>
</tr>
<tr>
<td>Idaho</td>
<td>42 days of death not pregnant, but pregnant 43 days to 1 year before death</td>
</tr>
<tr>
<td>Illinois</td>
<td>If female, was there a pregnancy in the past three months? Yes No Unknown</td>
</tr>
<tr>
<td>Indiana</td>
<td>Was decedent pregnant or 90 days postpartum? Yes or No</td>
</tr>
<tr>
<td>Iowa</td>
<td>If female, was there a pregnancy in the past 12 months? Specify yes or no</td>
</tr>
<tr>
<td>Kentucky</td>
<td>If female, was there a pregnancy in the past 12 months? Yes No Unknown</td>
</tr>
<tr>
<td>Louisiana</td>
<td>If female, Was decedent pregnant in the past 12 months? Yes No Unknown</td>
</tr>
<tr>
<td>Maryland</td>
<td>Separate fields on dates of death and delivery support capability to compute the other categories in the standard.</td>
</tr>
<tr>
<td>Minnesota</td>
<td>In last 12 months? Yes no unknown</td>
</tr>
<tr>
<td>Mississippi</td>
<td>Had decedent been pregnant within 90 days prior to death? Yes No Unknown</td>
</tr>
<tr>
<td>Missouri</td>
<td>If deceased was female 10–49, was she pregnant in the last 90 days? Yes No Unknown</td>
</tr>
<tr>
<td>Montana</td>
<td>Unknown if pregnant within past year</td>
</tr>
<tr>
<td>Nebraska</td>
<td>If female, was there a pregnancy in the past 3 months? Yes No Unknown</td>
</tr>
<tr>
<td>New Jersey</td>
<td>If female, was she pregnant at death, or any time 90 days prior to death? Yes No</td>
</tr>
<tr>
<td>New Mexico</td>
<td>Was decedent pregnant within last 6 weeks? Yes No Unknown</td>
</tr>
<tr>
<td>New York City</td>
<td>Also have date of outcome, so could compute intervals if needed.</td>
</tr>
<tr>
<td>New York State</td>
<td>Also have date of delivery, so could compute intervals if needed.</td>
</tr>
<tr>
<td>North Dakota</td>
<td>Was deceased pregnant within 18 months of death? Yes No</td>
</tr>
<tr>
<td>Texas</td>
<td>Was decedent pregnant at time of death Yes No Unknown</td>
</tr>
<tr>
<td>Virginia</td>
<td>If female, was there a pregnancy in the past 3 months? Yes No Unknown</td>
</tr>
</tbody>
</table>


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## Delays in Adoption of the U.S. Standard Pregnancy Question among States

<table>
<thead>
<tr>
<th>Year</th>
<th>New Adopters*</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>2003</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>2004</td>
<td>7</td>
<td>11</td>
</tr>
<tr>
<td>2005</td>
<td>7</td>
<td>18</td>
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<td>2006</td>
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<td>2007</td>
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<td>2008</td>
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<td>2016</td>
<td>1</td>
<td>50</td>
</tr>
<tr>
<td>2017</td>
<td>1</td>
<td>51</td>
</tr>
</tbody>
</table>

### Specific State

<table>
<thead>
<tr>
<th>State</th>
<th>Year/Date</th>
</tr>
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<tbody>
<tr>
<td>California</td>
<td>2003</td>
</tr>
<tr>
<td>New Hampshire</td>
<td>4/2004</td>
</tr>
<tr>
<td>Connecticut</td>
<td>2005</td>
</tr>
<tr>
<td>Minnesota</td>
<td>3/2011</td>
</tr>
<tr>
<td>Wisconsin</td>
<td>9/2013</td>
</tr>
<tr>
<td>Massachusetts</td>
<td>9/2014</td>
</tr>
</tbody>
</table>

* Note: Some states adopted change in the middle of the calendar year.
Our Analysis

We did an analysis that examined data by state, modeled for whether or not they were using the new item, and came up with national estimates.

Not enough cases to do single state analyses, but could look at some of the larger states.
RESULTS: The estimated maternal mortality rate (per 100,000 live births) for 48 states and Washington, DC (excluding California and Texas, analyzed separately) increased by 26.6%, from 18.8 in 2000 to 23.8 in 2014. California showed a declining trend, whereas Texas had a sudden increase in 2011–2012. Analysis of the measurement change suggests that U.S. rates in the early 2000s were higher than previously reported.

(Obstet Gynecol 2016;128:447-55)
Grouping the States

- **Group 1** – 24 states & D.C. that did not have an unrevised pregnancy question and adopted the U.S. standard question by January 2013

- **Group 2** – 14 states that had an unrevised pregnancy question with a timeframe longer than the U.S. standard

- **Group 3** – 7 states that had not revised by late 2013 with either no pregnancy question or a nonstandard pregnancy question on their unrevised death certificate.

- **Group 4** – 3 states that had an unrevised pregnancy question consistent with the U.S. standard.

*California and Texas are unique – each in their own ways*
Group 1 states (had no question & added Standard)

Correction Factor: 1.93

Was this a more accurate representation of state ratios or an overestimation?

Note: Includes 24 states that did not have a pregnancy question on their unrevised death certificate and which adopted the U.S. standard question upon revision: Arkansas, Arizona, Connecticut, Delaware, Georgia, Idaho, Kansas, Maine, Michigan, Montana, New Hampshire, Nevada, Ohio, Oklahoma, Oregon, Pennsylvania, Rhode Island, South Carolina, South Dakota, Tennessee, Utah, Vermont, Washington, and Wyoming.

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14 Group 2 states (had different question & then standardized)

Note: Includes 13 states that had a pregnancy question asking about a longer timeframe on their unrevised death certificate and which adopted the U.S. standard question upon revision: Florida, Illinois, Indiana, Idaho, Kentucky Louisiana, Mississippi, Minnesota, Missouri, Nebraska, New Jersey, New York, and North Dakota.

Correction Factor: 2.07

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Group 3 (7 states—no question & no revision by 2013) & Group 4 (3 states no revision & had same question)

Note: Group 3 includes 8 states who did not have a pregnancy question on their unrevised death certificate (Alaska, Colorado, Hawaii, North Carolina, Massachusetts, West Virginia, and Wisconsin) or who had a pregnancy question with a longer timeframe (Virginia) and had not revised as of late 2013. Wisconsin revised in late 2013 and their data were excluded from the 2013 data point.) Group 4 includes 3 states (Alabama, Maryland, and New Mexico) who had an unrevised pregnancy question consistent with the U.S. standard.

Analysis group 3; slope=0.19
Analysis group 4; slope=0.42

No Correction Factor

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Texas revised to the U.S. standard pregnancy question in 2006. The unrevised question asked about pregnancies within the past 12 months. Analysis group 2 correction factor was used to adjust unrevised data.
Is the Problem Over Ascertainment??

• Research into the cause of death category finds much of the increase is coming from *less specific ICD-10 codes*.

• Other specified pregnancy-related conditions (O26.8)

• Other obstetric complications (O21–022, 024–041.0, 041.8–043.1, 043.8–043.9, 047–066, 068–070, 071.2, 071.5, 071.6, 071.8, 071.9, 073–075.2, 075.4–075.9, 087–090, 092)

• Other specified diseases and conditions (O99.8)

• Obstetric death of unspecified cause (O95)
Assessing the impact of ill-defined causes on maternal deaths and mortality rates by cause of death, 27 states and DC, 2008-2009 to 2013-2014

<table>
<thead>
<tr>
<th>Underlying cause of death (ICD-10 category)</th>
<th>2008-9</th>
<th>2013-14</th>
<th>Percent change 2008-9 to 2013-14</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total maternal (A34, O00-O05, O98-O99)</td>
<td>780</td>
<td>907</td>
<td>23.3</td>
</tr>
<tr>
<td>Ill-defined causes (O26.8, O95, O99.8)</td>
<td>266</td>
<td>371</td>
<td>47.9</td>
</tr>
<tr>
<td>Total maternal minus ill-defined causes (Remainder)</td>
<td>514</td>
<td>536</td>
<td>10.6</td>
</tr>
<tr>
<td>Total direct obstetric (A34, O00-O92)</td>
<td>527</td>
<td>595</td>
<td>19.7</td>
</tr>
<tr>
<td>Other specified pregnancy-related conditions (O26.8)</td>
<td>130</td>
<td>212</td>
<td>73.0</td>
</tr>
<tr>
<td>Total direct obstetric minus O26.8 (Remainder)</td>
<td>397</td>
<td>383</td>
<td>2.3</td>
</tr>
<tr>
<td>Total indirect causes (O98-O99)</td>
<td>202</td>
<td>294</td>
<td>54.4</td>
</tr>
<tr>
<td>Other specified diseases and conditions (O99.8)</td>
<td>85</td>
<td>141</td>
<td>75.9</td>
</tr>
<tr>
<td>Total indirect causes minus O99.8 (Remainder)</td>
<td>117</td>
<td>153</td>
<td>38.7</td>
</tr>
</tbody>
</table>
Over-ascertainment Results of a 4 state study (Georgia, Louisiana, Michigan, and Ohio)

Pregnancy Checkbox Accuracy

- Pregnant: 72%
- Not Pregnant: 21%
- Unable to confirm: 7%

In 28% of cases with pregnancy checkbox checked, not certain woman was pregnant


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Impact of the Checkbox – Better and Worse Ascertainment

• While the checkbox contributed to errors, the Four Committee data show that the checkbox also improved identification of pregnancy-related deaths. Without the pregnancy checkbox, approximately:

• 50% of pregnancy-related deaths that occurred during pregnancy

• 11% of pregnancy-related deaths that occurred within 42 days of the end of pregnancy, and

• 8% of pregnancy-related deaths that occurred within 43 days to 1 year of the end of pregnancy would have been missed.

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So has there been any way to monitor maternal death since 2007?

CDC and Pregnancy Related Mortality
Three Sources of U.S. Maternal Death Data

**National Vital Statistics System (NVSS).** This is the source of the official maternal mortality ratio for the United States and is based on “…information from death certificates filed in the 50 states and the District of Columbia that are subsequently compiled into national data….. Physicians, medical examiners, and coroners are responsible for completing the medical portion of the death certificate.” These state data are compiled by NCHS into a national data system.

**Pregnancy Mortality Surveillance System (PMSS).** This system was established by CDC. It is based on reports from 52 areas (50 states, Washington, D.C. and New York city) which submits to CDC “… deidentified copies of death certificates for females 12–55 years who died during or within 1 year of pregnancy from any cause; when available, linked birth or fetal death certificates are also sent. Additional sources include computerized searches of Lexis Nexis, reports by public health agencies, including state-based maternal mortality review committees, professional organizations, and individual health care providers.” The records are reviewed by specially trained clinicians to determine whether or not a death was pregnancy related.

**Maternal Mortality Review Information Application (MMRIA).** State interdisciplinary committees do case reviews of maternal deaths. CDC building a data system to compile data from MMRCs. Project got a major boost in recent federal legislation.
Pregnancy Mortality Surveillance System

When did CDC start conducting national surveillance of pregnancy-related deaths?

CDC initiated national surveillance of pregnancy-related deaths in 1986 because more clinical information was needed to fill data gaps about causes of maternal death.

How does CDC define pregnancy-related deaths?

For reporting purposes, a pregnancy-related death is defined as the death of a woman while pregnant or within 1 year of pregnancy termination—regardless of the duration or site of the pregnancy—from any cause related to or aggravated by the pregnancy or its management, but not from accidental or incidental causes.

How are the data collected and coded?

Each year, CDC requests the 52 reporting areas (50 states, New York City, and Washington DC) to voluntarily send copies of death certificates for all women who died during pregnancy or within 1 year of pregnancy, and copies of the matching birth or fetal death certificates, if they have the ability to perform such record linkage. All of the information obtained is summarized, and medically trained epidemiologists determine the cause and time of death related to the pregnancy. Causes of death are coded by using a system established in 1986 by the American College of Obstetricians and Gynecologists and the Centers for Disease Control and Prevention Maternal Mortality Study Group.

How are the data used?

Data are analyzed by CDC scientists. Information about causes of pregnancy-related deaths and risk factors associated with these deaths is released periodically through peer-reviewed literature, CDC's Morbidity and Mortality Weekly Reports, and the CDC Web site. This information helps clinicians and public health professionals to better understand circumstances surrounding pregnancy-related deaths and to take appropriate action.
Data for CDCs Pregnancy Related Mortality System

Each year, CDC requests the 52 reporting areas (50 states, New York City, and Washington DC) to voluntarily send copies of death certificates for all women who died during pregnancy or within 1 year of pregnancy, and copies of the matching birth or fetal death certificates, if they have the ability to perform such record links. All of the information obtained is summarized, and medically trained epidemiologists determine the cause and time of death related to the pregnancy. Causes of death are coded by using a system established in 1986 by the American College of Obstetricians and Gynecologists and the Centers for Disease Control and Prevention Maternal Mortality Study Group.
Our best existing measure


www.birthbythenumbers.org
Timing of Maternal Deaths


www.birthbythenumbers.org
Timing of Maternal Deaths

If 11.7% of the pregnancy related deaths occur at 42+ days, then the maternal mortality ratio should be approximately 88.3% of the pregnancy related mortality rate.


www.birthbythenumbers.org
Based on assumption of 11.7% of deaths ppm


**Racial Disparities (2015-16):**
- **11.7** White women
- **36.0** Black women
- **10.2** Hispanic

Five key points concerning maternal mortality

1. The persistence of racial disparities

2. The U.S. in a comparative context

3. Maternal mortality is a public health problem more than a clinical one

4. The problem is much bigger than maternal deaths

5. Potential policy solutions
1. The persistence of racial disparities
U.S. Maternal Mortality (per 100,000 live births), 1951-2016* by Race

* Rates from 2008-2016 blend two year averages and based on Petersen E. MMWR vol.68.No. 35 Sept. 6, 2019. 762-765 with pregnancy related rates adjusted for timing of deaths

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(1) The Persistence of Racial Disparities

**U.S. Infant & Maternal Mortality**

**Black to White Ratios, 1915-2016**

Source: NCHS. Maternal Mortality and Related Concepts. Vital & Health Statistics. Series 33; #3. & annual data reports. 1915-1960 data from NCHS. *Vital Statistics Rates In The United States 1940-1960*. NOTE: Shifts in measurement (e.g. not all states were part of registration system prior to 1933; infant race was based on race of the child until 1980 & then race of the mother post 1980) accounts for some of the variation over time. 2007-2016 based on 2 year estimates of the pregnancy related mortality rate: Petersen E. *MMWR*.9/6/19.
Manifestation of Racial Disparities

Leading Underlying Causes of Pregnancy-Related Deaths, by Race-Ethnicity

- Hemorrhage
- Cardiavasc.&Coronary Conditions
- Infection
- Cardiomyopathy
- Embolism
- Preeclampsia & Eclampsia
- Mental Health Cond.


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2. Now that we have a reliably estimated maternal mortality rate, how does the U.S. compare internationally?
Countries in green have fewer than 100,000 births.

Let’s do a more reasonable comparison


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Putting the Problem in Context

**U.S. MMR* Compared to Countries with 300,000+ births, 2016-7**

<table>
<thead>
<tr>
<th>Country</th>
<th>MMR* (per 100,000 births)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Italy</td>
<td>2</td>
</tr>
<tr>
<td>Spain</td>
<td>4</td>
</tr>
<tr>
<td>Japan</td>
<td>5</td>
</tr>
<tr>
<td>Australia</td>
<td>6</td>
</tr>
<tr>
<td>Germany</td>
<td>7</td>
</tr>
<tr>
<td>U.K.</td>
<td>7</td>
</tr>
<tr>
<td>France</td>
<td>8</td>
</tr>
<tr>
<td>Canada</td>
<td>10</td>
</tr>
<tr>
<td>Korea</td>
<td>11</td>
</tr>
<tr>
<td>U.S.</td>
<td>14.8#</td>
</tr>
</tbody>
</table>

* Maternal Mortality per 100,000 births; # Estimated from 2016 U.S. Pregnancy Related Mortality.

WHO estimates U.S. as having an MMR of 19.

Putting the Problem in Context

**U.S. MMR* Compared to Countries with 300,000+ births, 2016-7**

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<tr>
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<td>Japan</td>
<td>5</td>
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<td>Australia</td>
<td>6</td>
</tr>
<tr>
<td>Germany</td>
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</tr>
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<td>U.K.</td>
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<tr>
<td>Canada</td>
<td>10</td>
</tr>
<tr>
<td>Korea</td>
<td>11</td>
</tr>
<tr>
<td>U.S. NHW</td>
<td>11.7</td>
</tr>
<tr>
<td>U.S.</td>
<td>14.8#</td>
</tr>
</tbody>
</table>

* Maternal Mortality per 100,000 births; # Estimated from 2016 U.S. Pregnancy Related Mortality.

Racial Disparities (2015-16):
- 11.7 White women
- 36.0 Black women
- 10.2 Hispanic


www.birthbythenumbers.org
US vs Comparable Countries

Estimated U.S. Maternal Mortality Ratios (per 100K births), 2000-2016, U.S. & Comparable Countries *

Deaths per 100,000 live births

US 26% Increase

OECD 19% Decrease

* Countries with 300,000+ births (2015): Australia, Canada, France, Germany, Italy, Japan, S. Korea, Spain, United Kingdom

3. Maternal mortality is a public health problem more than a clinical one
Remember this chart?
Timing of Pregnancy Related Deaths

Maternal deaths are a public health issue as much as a clinical care issue.

(3) Moving to a Public Health Approach


Moving to a Public Health Approach
Leading Underlying Causes of Pregnancy-Related Deaths, by Timing of Death


www.birthbythenumbers.org
4. The problem is much bigger than maternal deaths
Not just about maternal mortality

Maternal deaths represent the canary in the coal mine for women’s health

By Eugene Declercq and Neel Shah
August 22, 2018
## Births in U.S. by Maternal Age, 2017

<table>
<thead>
<tr>
<th>Age</th>
<th># Births</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;20</td>
<td>196,294</td>
<td>5.1%</td>
</tr>
<tr>
<td>20-24</td>
<td>764,780</td>
<td>19.8%</td>
</tr>
<tr>
<td>25-29</td>
<td>1,123,577</td>
<td>29.1%</td>
</tr>
<tr>
<td>30-34</td>
<td>1,091,917</td>
<td>28.3%</td>
</tr>
<tr>
<td>35+</td>
<td>678,932</td>
<td>17.6%</td>
</tr>
<tr>
<td>Total</td>
<td>3,855,500</td>
<td>100%</td>
</tr>
</tbody>
</table>
The Problem is Bigger than Maternal Mortality

Overall Deaths rates (per 100K), Females 25-34, by Race/Ethnicity, 2010-2017

Death Rates (per 100,000)  
- Non-Hispanic Black 8%  
- Non-Hispanic White 35%  
- Hispanic 26%  
- All 27%  
- Non-Hispanic Asian Pacific Islander -1%

All Female Deaths 25-34  
2010 13,067  
2017 18,066

NOTE: Pregnancy related mortality rate increased by <1% 2010-2017

Source: NCHS.CDC Wonder Online Database

www.birthbythenumbers.org
Ratio of Black/White Female Death Rates, Women 25-34, 2005-2017

NHW Rate Increase 2005-2017: 42.5%
NHB Rate Increase 2005-2017: -7.3%

www.birthbythenumbers.org
## Top 10 Causes of Death for Women 25-34 in 2017

<table>
<thead>
<tr>
<th>Cause of Death</th>
<th>Total Deaths</th>
<th>% of total</th>
<th>Rate per 100 K</th>
<th>% Change in rate 2010-2017</th>
<th>Proportion of 2010-17 Increase</th>
</tr>
</thead>
<tbody>
<tr>
<td>All causes</td>
<td>18,066</td>
<td>100.0</td>
<td>80.8</td>
<td>26.3%</td>
<td>---</td>
</tr>
<tr>
<td>Accidents (unintentional inj.)</td>
<td>6,668</td>
<td>36.9</td>
<td>29.8</td>
<td>61.1%</td>
<td>58.0%</td>
</tr>
<tr>
<td>Malignant neoplasms</td>
<td>1,926</td>
<td>10.7</td>
<td>8.6</td>
<td>-4.4%</td>
<td>1.8%</td>
</tr>
<tr>
<td>Intentional self-harm (suicide) .</td>
<td>1,600</td>
<td>8.9</td>
<td>7.2</td>
<td>35.8%</td>
<td>10.2%</td>
</tr>
<tr>
<td>Diseases of heart</td>
<td>1,232</td>
<td>6.8</td>
<td>5.5</td>
<td>12.2%</td>
<td>4.4%</td>
</tr>
<tr>
<td>Assault (homicide)</td>
<td>881</td>
<td>4.9</td>
<td>3.9</td>
<td>18.2%</td>
<td>3.9%</td>
</tr>
<tr>
<td>Pregnancy, childbirth &amp; puerperium</td>
<td>512</td>
<td>2.8</td>
<td>2.3</td>
<td>27.8%</td>
<td>2.9%</td>
</tr>
<tr>
<td>Chronic liver disease and cirrhosis</td>
<td>367</td>
<td>2.0</td>
<td>1.6</td>
<td>23.1%</td>
<td>2.1%</td>
</tr>
<tr>
<td>Diabetes mellitus</td>
<td>352</td>
<td>1.9</td>
<td>1.6</td>
<td>23.1%</td>
<td>1.9%</td>
</tr>
<tr>
<td>Cerebrovascular diseases</td>
<td>254</td>
<td>1.4</td>
<td>1.1</td>
<td>-8.3%</td>
<td>0.0%</td>
</tr>
<tr>
<td>Septicemia</td>
<td>192</td>
<td>1.1</td>
<td>0.9</td>
<td>0.0%</td>
<td>0.2%</td>
</tr>
<tr>
<td>All other causes (residual)</td>
<td>4,082</td>
<td>22.6</td>
<td>18.3</td>
<td>11.6%</td>
<td></td>
</tr>
</tbody>
</table>


www.birthbythenumbers.org
5. Potential policy solutions
To amend titles XIX and XXI of the Social Security Act to improve Medicaid and the Children’s Health Insurance Program for low-income mothers.

IN THE SENATE OF THE UNITED STATES

SEPTEMBER 25, 2018

Mr. Booker (for himself, Mrs. Gillibrand, Ms. Baldwin, Mr. Cardin, Mr. Blumenthal, and Ms. Harris) introduced the following bill; which was read twice and referred to the Committee on Finance

A BILL

To amend titles XIX and XXI of the Social Security Act to improve Medicaid and the Children’s Health Insurance Program for low-income mothers.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled,

SECTION 1. SHORT TITLE.

This Act may be cited as the “Maximizing Outcomes for Moms through Medicaid Improvement and Enhancement of Services Act”, or the “MOMMIES Act”.

SEC. 2. ENHANCING MEDICAID AND CHIP BENEFITS FOR LOW-INCOME PREGNANT WOMEN.

To support States in their work to end preventable morbidity and mortality in maternity care by using evidence-based quality improvement to protect the health of mothers during pregnancy, childbirth, and in the postpartum period and to reduce neonatal and infant mortality, to eliminate racial disparities in maternal health outcomes, and for other purposes.

IN THE SENATE OF THE UNITED STATES

AUGUST 22, 2018

Ms. Harris (for herself, Mrs. Gillibrand, Mr. Cardin, Mr. Wyden, Mr. Blumenthal, Mr. Nelson, Mr. Jones, Mr. Merkley, Ms. Duckworth, Mr. Carper, Mr. Brown, Ms. Baldwin, Ms. Hirono, and Ms. Stabenow) introduced the following bill; which was read twice and referred to the Committee on Finance

SECTION 1. SHORT TITLE.

This Act may be cited as the “Maternal Care Access and Reducing Emergencies Act” or the “Maternal CARE Act”.

SEC. 2. FINDINGS.

Congress finds the following:

(1) In the United States, maternal mortality rates are among the highest in the developed world and increased by 26.6 percent between 2006 and 2014.
Need is for public health approaches involving improving access for women to preconception, prenatal and postpartum care.

Three components

1. Expanded coverage for Medicaid to fund care – if 12% of the deaths are postpartum why not cover women out to a year?

2. Coverage doesn’t mean anything unless there’s someone to go see – vastly expand midwifery training opportunities in general and for women of color in particular. Likewise expand opportunities for certified doulas to help fill in gaps in the system.

3. Keep women in the system. Problem of loss from the system postpartum.
WHAT WILL DRIVE THE POLICY PROCESS?
POLITICAL WILL & MEDIA COVERAGE

PROPUBLICA’S LOST MOTHERS SERIES
Nothing Protects Black Women From Dying in Pregnancy & Childbirth

Not education. Not income. Not even being an expert on racial disparities in health care.

www.birthbythenumbers.org
May 3, 2020

DC NATIONAL RALLY
A PRE-MOTHER’S DAY MOVEMENT TO MAKE SURE ALL MOMS GET THE CARE THEY DESERVE

Saturday May 2
On the National Mall, in the heart of the nation’s capital.

1:00 - 3:30 PM
Our country’s most inspiring moms (and their families)...
sounding off... on a rock concert stage... in the heart of the nation’s capital.

Learn more at www.MarchforMoms.org

#BeyondMothersDay
• Promote State & Federal Legislative Efforts to Improve Maternal Health
• Drive Media Attention on State of Maternal Health
• Seek City, State and National Proclamations
• Organize Visits in DC on Capitol Hill May 10th
• Rally on National DC Mall on May 11th
• Livestream the Rally on Facebook Live
• Curate and Promote Daily Themes Related to Maternal Health

www.birthbythenumbers.org
<table>
<thead>
<tr>
<th>STATE</th>
<th>Maternal Mortality Review Committee (MMRC)</th>
<th>Perinatal Quality Collaborative (PQC)</th>
<th>Current AIM State</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alabama</td>
<td>YES</td>
<td>YES</td>
<td>-</td>
</tr>
<tr>
<td>Alaska</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
</tr>
<tr>
<td>Arizona</td>
<td>YES</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Arkansas</td>
<td>Implementing review (2019 law)</td>
<td>YES</td>
<td>-</td>
</tr>
<tr>
<td>California</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
</tr>
<tr>
<td>Colorado</td>
<td>YES (2019 law)</td>
<td>YES</td>
<td>YES</td>
</tr>
<tr>
<td>Connecticut</td>
<td>YES (2018 law)</td>
<td>YES</td>
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</tr>
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<td>Delaware</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
</tr>
<tr>
<td>District of Columbia</td>
<td>YES (2018 law)</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Florida</td>
<td>YES</td>
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<td>Georgia</td>
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<td>Hawaii</td>
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<td>Idaho</td>
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<td>Illinois</td>
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<td>Louisiana</td>
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<td>Maine</td>
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<td>Maryland</td>
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<td>Massachusetts</td>
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<td>Michigan</td>
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<td>Minnesota</td>
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</tr>
<tr>
<td>Mississippi</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
</tr>
</tbody>
</table>
Urban-Rural Differences

Source: Maron, D. Maternal Health Care Is Disappearing in Rural America. *Scientific America*. 2/15/17