The Challenge of Maternal Mortality & Its Meaning for Normal Birth

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

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June 27, 2018
Context

• Key process measure

• Status of key health outcomes

Changes in process that lead to improved outcomes are more easily defensible, but that’s not the case in the U.S.

- **Prematurity**: LMP
  - 11.8% Decrease 2006-15

- **Low Birthweight**: OBE

Graph source: BirthByTheNumbers.org
Infant Mortality (per 1,000 births), U.S. 1990-2016

BirthByTheNumbers.org
Infant Mortality (per 1,000 births), U.S. & OECD 2000-2016

* Countries with 100,000+ births): Australia, Belgium, Canada, Czech Republic, France, Germany, Greece, Israel, Italy, Japan, Netherlands, S. Korea, Spain, Sweden, UK

BirthByTheNumbers.org
How can we best capture the change in process in the U.S.?

Gestational Age
Gestational Age, U. S., LMP, 2003

- <34: 4%
- 34: 2%
- 35: 3%
- 36: 5%
- 37: 9%
- 38: 18%
- 39: 25%
- 40: 20%
- 41: 9%
- 42+: 4%

BirthByTheNumbers.org
Gestational Age, U. S., LMP, 2004

BirthByTheNumbers.org
Gestational Age, U. S., LMP, 2005

BirthByTheNumbers.org
Gestational Age, U. S., LMP, 2006

- <34: 4%
- 34: 2%
- 35: 3%
- 36: 5%
- 37: 9%
- 38: 19%
- 39: 25%
- 40: 19%
- 41: 8%
- 42+: 4%
Gestational Age, U. S., LMP, 2007

- <34: 4%
- 34: 2%
- 35: 3%
- 36: 5%
- 37: 9%
- 38: 19%
- 39: 26%
- 40: 19%
- 41: 8%
- 42+: 3%

BirthByTheNumbers.org
Gestational Age, U. S., LMP, 2010

BirthByTheNumbers.org
Gestational Age, U. S., LMP, 2012

BirthByTheNumbers.org
Gestational Age, U. S., LMP, 2013

BirthByTheNumbers.org
Gestational Age, U. S., LMP, 2015

BirthByTheNumbers.org
Gestational Age, U. S., LMP, 2016

BirthByTheNumbers.org
Gestational Age*, U. S., Home Births, 2003

* LMP

BirthByTheNumbers.org
Gestational Age*, U. S., Home Births, 2004

* LMP

BirthByTheNumbers.org
Gestational Age*, U. S., Home Births, 2005

* LMP

BirthByTheNumbers.org
Gestational Age*, U. S., Home Births, 2007

* LMP

BirthByTheNumbers.org
Gestational Age*, U. S., Home Births, 2008

* LMP

- <34: 2%
- 34: 1%
- 35: 1%
- 36: 2%
- 37: 5%
- 38: 12%
- 39: 22%
- 40: 29%
- 41: 17%
- 42+: 9%

BirthByTheNumbers.org
Gestational Age*, U. S., Home Births, 2009

* LMP

<table>
<thead>
<tr>
<th>Gestational Age</th>
<th>Percent</th>
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<tbody>
<tr>
<td>&lt;34</td>
<td>2%</td>
</tr>
<tr>
<td>34</td>
<td>1%</td>
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<tr>
<td>35</td>
<td>1%</td>
</tr>
<tr>
<td>36</td>
<td>2%</td>
</tr>
<tr>
<td>37</td>
<td>5%</td>
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<tr>
<td>38</td>
<td>12%</td>
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<tr>
<td>39</td>
<td>23%</td>
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<tr>
<td>40</td>
<td>29%</td>
</tr>
<tr>
<td>41</td>
<td>16%</td>
</tr>
<tr>
<td>42+</td>
<td>9%</td>
</tr>
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</table>

BirthByTheNumbers.org
Gestational Age*, U. S., Home Births, 2010

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<tr>
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<td>5%</td>
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<td>39</td>
<td>24%</td>
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<td>40</td>
<td>28%</td>
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<tr>
<td>41</td>
<td>17%</td>
</tr>
<tr>
<td>42+</td>
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</table>

* LMP

BirthByTheNumbers.org
Gestational Age*, U. S., Home Births, 2011

* LMP

BirthByTheNumbers.org
Gestational Age*, U. S., Home Births, 2012

* LMP

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<td>34</td>
<td>1%</td>
</tr>
<tr>
<td>35</td>
<td>1%</td>
</tr>
<tr>
<td>36</td>
<td>2%</td>
</tr>
<tr>
<td>37</td>
<td>4%</td>
</tr>
<tr>
<td>38</td>
<td>11%</td>
</tr>
<tr>
<td>39</td>
<td>24%</td>
</tr>
<tr>
<td>40</td>
<td>29%</td>
</tr>
<tr>
<td>41</td>
<td>17%</td>
</tr>
<tr>
<td>42+</td>
<td>9%</td>
</tr>
</tbody>
</table>

* LMP

Source: BirthByTheNumbers.org
Gestational Age*, U. S., Home Births, 2014

* LMP
Gestational Age*, U. S., Home Births, 2015

* LMP

BirthByTheNumbers.org
Gestational Age*, U. S., Home Births, 2016

* LMP

* LMP

BirthByTheNumbers.org
Politically we’re at a point where people are divided and repeatedly talking past each other.

Sense of two worlds with each having their own reality.

*Is there a parallel in childbirth?*
Much of the clinical world sees the solution to the problem of maternal mortality requiring more resources and greater levels of specialized care and medical intervention.

Many here at this conference see the overuse of intervention as the problem and not the solution.

It’s not an internal battle, the media is heavily engaged in the issue....
Focus On Infants During Childbirth Leaves U.S. Moms In Danger

Nothing Protects Black Women From Dying in Pregnancy and Childbirth

How Many American Women Die From Causes Related to Pregnancy or Childbirth? No One Knows.

How can maternal mortality become politicized?
Recent Increases in the U.S. Maternal Mortality Rate

Disentangling Trends From Measurement Issues

Marian F. MacDorman, PhD, Eugene Declercq, PhD, Howard Cabral, PhD, and Christine Morton, PhD

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.
“While the authors would not say there was a direct relationship between the cuts and the rise in maternal deaths, we think…..”
Can we at least find agreement on the status of maternal mortality in the U.S at this time?

Sort of, but that may not be the point. First, the sort of....
Definitions (in the U.S.)

- **Pregnancy Associated Death** — The death of a women while pregnant or **within one year** of termination of pregnancy, **irrespective of cause**. *(WHO calls these “pregnancy related”)*

- **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.

- **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.
Timeline of Maternal Mortality Definition

WHO Definition of Maternal Death

- Pregnancy
- Birth
- Week after Birth
- 42 days PPM
- 42 days PPM to 1 year

PPM – postpartum – period after the birth

BirthByTheNumbers.org
Massachusetts Maternal Deaths, (per 100,000), 1992-2015

Pregnancy Associated Mortality

Maternal Mortality Ratio

Source: Mass DPH

BirthByTheNumbers.org
<table>
<thead>
<tr>
<th>MDG region (in bold)</th>
<th>MMR$^b$</th>
<th>Range of MMR uncertainty (80% UI)</th>
<th>Number of maternal deaths$^b$</th>
<th>Lifetime risk of maternal death,$^c$ 1 in</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Lower estimate</td>
<td>Upper estimate</td>
<td></td>
</tr>
<tr>
<td>World</td>
<td>216</td>
<td>207</td>
<td>249</td>
<td>303 000</td>
</tr>
<tr>
<td>Developed regions$^d$</td>
<td>12</td>
<td>11</td>
<td>14</td>
<td>1 700</td>
</tr>
<tr>
<td>Developing regions</td>
<td>239</td>
<td>229</td>
<td>275</td>
<td>302 000</td>
</tr>
<tr>
<td>Northern Africa$^e$</td>
<td>70</td>
<td>56</td>
<td>92</td>
<td>3 100</td>
</tr>
<tr>
<td>Sub-Saharan Africa$^f$</td>
<td>546</td>
<td>511</td>
<td>652</td>
<td>201 000</td>
</tr>
<tr>
<td>Eastern Asia$^g$</td>
<td>27</td>
<td>23</td>
<td>33</td>
<td>4 800</td>
</tr>
<tr>
<td>Eastern Asia excluding China</td>
<td>43</td>
<td>24</td>
<td>86</td>
<td>378</td>
</tr>
<tr>
<td>Southern Asia$^h$</td>
<td>176</td>
<td>153</td>
<td>216</td>
<td>66 000</td>
</tr>
<tr>
<td>Southern Asia excluding India</td>
<td>180</td>
<td>147</td>
<td>249</td>
<td>21 000</td>
</tr>
<tr>
<td>South-eastern Asia$^i$</td>
<td>110</td>
<td>95</td>
<td>142</td>
<td>13 000</td>
</tr>
<tr>
<td>Western Asia$^j$</td>
<td>91</td>
<td>73</td>
<td>125</td>
<td>4 700</td>
</tr>
<tr>
<td>Caucasus and Central Asia$^k$</td>
<td>33</td>
<td>27</td>
<td>45</td>
<td>610</td>
</tr>
<tr>
<td>Latin America and the Caribbean</td>
<td>67</td>
<td>64</td>
<td>77</td>
<td>7 300</td>
</tr>
<tr>
<td>Latin America$^l$</td>
<td>60</td>
<td>57</td>
<td>66</td>
<td>6 600</td>
</tr>
<tr>
<td>Caribbean$^m$</td>
<td>175</td>
<td>130</td>
<td>265</td>
<td>1 300</td>
</tr>
<tr>
<td>Oceania$^n$</td>
<td>187</td>
<td>95</td>
<td>381</td>
<td>500</td>
</tr>
</tbody>
</table>

MMR Estimates (per 100,000), Number of Deaths & Estimated Lifetime Risk

BirthByTheNumbers.org
Decrease is less a reflection of improvement and more a function of the difficulty in estimating the maternal mortality rate in the U.S.

<table>
<thead>
<tr>
<th>Country and territory</th>
<th>MMR (b)</th>
<th>Lower estimate</th>
<th>Upper estimate</th>
<th>Number of maternal deaths (c)</th>
<th>Lifetime risk of maternal death: (d) 1 in</th>
<th>% of AIDS-related indirect maternal deaths (e)</th>
<th>PM</th>
<th>Range of PM uncertainty (UI 80%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>United Kingdom</td>
<td>9</td>
<td>8</td>
<td>11</td>
<td>74</td>
<td>5,800</td>
<td>2.4</td>
<td>0.8</td>
<td>0.6 - 0.9</td>
</tr>
<tr>
<td>United Republic of Tanzania</td>
<td>398</td>
<td>281</td>
<td>570</td>
<td>8,200</td>
<td>45</td>
<td>18.4</td>
<td>13.0</td>
<td>13.0 - 26.3</td>
</tr>
<tr>
<td>United States of America</td>
<td><strong>14</strong></td>
<td>12</td>
<td>16</td>
<td><strong>550</strong></td>
<td>3,800</td>
<td>2.4</td>
<td>0.8</td>
<td>0.7 - 0.9</td>
</tr>
<tr>
<td>Uruguay</td>
<td>15</td>
<td>11</td>
<td>19</td>
<td>7</td>
<td>3,300</td>
<td>2.4</td>
<td>0.9</td>
<td>0.7 - 1.2</td>
</tr>
<tr>
<td>Uzbekistan</td>
<td>36</td>
<td>20</td>
<td>65</td>
<td>240</td>
<td>1,000</td>
<td>2.2</td>
<td>2.2</td>
<td>1.2 - 4.0</td>
</tr>
</tbody>
</table>
Note: The U.S. NCHS hasn’t reported an official maternal mortality rate since 2007 – led to our work

Source: NCHS. Deaths: Final Data. Annual Reports.
After 2007 no official maternal mortality rate was available to use for monitoring

Maternal Mortality Ratios (per 100K births), 2000-2014, U.S. & Comparable Countries *

* Countries with 300,000+ births (2014): Australia, Canada, France, Germany, Italy, Japan, S. Korea, Spain, United Kingdom

Two More Problems with U.S. Maternal Mortality

U.S. Maternal Mortality (per 100,000 live births) and Neonatal Mortality (per 1,000), 1975-2013

1975-1997
- MMR: -34%
- NMR: -59%

1998-2013
- MMR: +112%
- NMR: -16%

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

CDC and Pregnancy Related Mortality
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 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.

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 Report, 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 actions to prevent them.
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.

Racial Disparities
Rates for 2011-13:

- 12.7 white women
- 43.5 black women
- 11.0 Hispanic
- 14.4 other races

Alternative (Official & Public) Source– CDC Wonder

CDC WONDER is a rich ad-hoc query system for the analysis of public health data. Reports and other query systems are also available.

- WONDER Online Databases
  - AIDS Public Use Data
  - Births
  - Cancer Statistics
  - Environment
  - Health Indicators
  - Mortality
    - Underlying Cause of Death
      - Detailed Mortality
      - Compressed Mortality
  - Multiple Cause of Death (Detailed Mortality)
  - Public Health Image Collection
  - Vital Statistics
  - WONDER Online Tabular + Tabular Information System
  - Population
  - Population Projections (From Census)
  - Sexually Transmitted Disease Mortality
  - Suicide & Adverse Event Reporting

- Reports and References
  - Prevention Guidelines (Archive)
  - Scientific Data and Documentation (Archive)

Other Query Systems
- Healthy People 2020
- Infant Mortality Tables
- Infant Mortality Tables

This page last reviewed: Tuesday, July 12, 2010

BirthByTheNumbers.org
Underlying cause of death

Total maternal deaths (during pregnancy or within 42 days after the end of pregnancy) (A34, O00-O95, O98-O99)

Total direct obstetric causes (A34, O00-O92)
- Pregnancy with abortive outcome (O00-O07)
  - Ectopic pregnancy (O00)
- Hypertensive disorders (O10-O16)
  - Pre-existing hypertension (O10)
  - Eclampsia and pre-eclampsia (O11,O13-O16)
- Obstetric Hemorrhage (O20,043.2,044-046,067,071.0-071.1, O71.3-O71.4,O71.7,O72)
- Pregnancy-related infection (O23,041.1,075.3,085,086,O91)
  - Puerperal sepsis (O85)
- Other obstetric complications (O21-O22,024-028,030-041.0, O41.8-043.1, O43.8-043.9,047--066,068-070,071.2, O71.5, O71.6, O71.8, O71.9,073,075.0-075.2,075.4-075.9,087-O90,092)
  - Diabetes mellitus in pregnancy (O24)
  - Liver disorders in pregnancy (O26.6)
- Other specified pregnancy-related conditions (O26.8)
  - Obstetric embolism (O88)
  - Cardiomyopathy in the puerperium (O90.3)
  - Anesthesia-related complications (O29,074,089)

Total indirect causes (O98-O99)
- Mental disorders and diseases of the nervous system (O99.3)
- Diseases of the circulatory system (O99.4)
- Diseases of the respiratory system (O99.5)
- Other specified diseases and conditions (O99.8)
- Obstetric death of unspecified cause (O95)
- Late maternal causes (43 days-1 year after the end of pregnancy) (O96-O97)

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 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 by immediately 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 DECEDENT 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 filling 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
Table III. Separate questions related to pregnancy on state certificates in 2003

<table>
<thead>
<tr>
<th>State</th>
<th>Question</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</td>
</tr>
<tr>
<td></td>
<td>If female aged 10–54:</td>
</tr>
<tr>
<td></td>
<td>□ not pregnant within past year □ pregnant at time of death □ not pregnant, but pregnant within</td>
</tr>
<tr>
<td>Idaho</td>
<td>42 days of death □ not pregnant, but pregnant 43 days to 1 year before death □ unknown if pregnant within the past year</td>
</tr>
<tr>
<td>Illinois</td>
<td>If female, was there a pregnancy in past three months? □ Yes □ No</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</td>
</tr>
<tr>
<td>Louisiana</td>
<td>If deceased was female 10–49, was she pregnant in the last 90 days? □ 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>At death? □ yes □ no □ unknown</td>
</tr>
<tr>
<td>Mississippi</td>
<td>In last 12 months? □ 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>If female:</td>
</tr>
<tr>
<td></td>
<td>□ not pregnant within past year □ not pregnant but pregnant 42 days of death</td>
</tr>
<tr>
<td>Nebraska</td>
<td>If female, was there a pregnancy in the past 3 months? □ Yes □ No</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>If female:</td>
</tr>
<tr>
<td></td>
<td>□ not pregnant within 1 year of death □ pregnant at time of death □ not pregnant at death, but pregnant within 42 days of death</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>If female:</td>
</tr>
<tr>
<td></td>
<td>□ not pregnant within last year □ pregnant at time of death □ not pregnant, but pregnant 42 days of death</td>
</tr>
<tr>
<td></td>
<td>□ not pregnant at death, but pregnant 43 days to 1 year before death □ unknown if pregnant within 1 year of death</td>
</tr>
<tr>
<td>Texas</td>
<td>Was decedent pregnant within 18 months of death? □ Yes □ No</td>
</tr>
<tr>
<td></td>
<td>Was decedent pregnant at time of death □ Yes □ No □ Unknown</td>
</tr>
<tr>
<td></td>
<td>within last 12 months □ Yes □ No □ Unknown</td>
</tr>
<tr>
<td>Virginia</td>
<td>If female, was there a pregnancy in past 3 months? □ Yes □ No □ Unknown</td>
</tr>
</tbody>
</table>


BirthByTheNumbers.org
### 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>
</tr>
<tr>
<td>2006</td>
<td>4</td>
<td>22</td>
</tr>
<tr>
<td>2007</td>
<td>2</td>
<td>24</td>
</tr>
<tr>
<td>2008</td>
<td>7</td>
<td>31</td>
</tr>
<tr>
<td>2009</td>
<td>0</td>
<td>31</td>
</tr>
<tr>
<td>2010</td>
<td>4</td>
<td>35</td>
</tr>
<tr>
<td>2011</td>
<td>2</td>
<td>37</td>
</tr>
<tr>
<td>2012</td>
<td>4</td>
<td>41</td>
</tr>
<tr>
<td>2013</td>
<td>1</td>
<td>42</td>
</tr>
<tr>
<td>2014</td>
<td>5</td>
<td>47</td>
</tr>
<tr>
<td>2015</td>
<td>2</td>
<td>49</td>
</tr>
<tr>
<td>2016</td>
<td>1</td>
<td>50</td>
</tr>
<tr>
<td>2017</td>
<td>1</td>
<td>51</td>
</tr>
</tbody>
</table>

**New England**

- Connecticut: 2005
- Rhode Island: 2006
- Vermont: 7/2008
- Maine: 2010
- Massachusetts: 9/2014

*Note: Some states adopted change in the middle of the calendar year.*
Maternal Mortality Rates (per 100,000) in States with & without a checkbox, 1996-2003

So adopting the checkbox will solve the problem of under ascertainment & we can report a more accurate national rate after 2003?

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.
Recent Increases in the U.S. Maternal Mortality Rate

Disentangling Trends From Measurement Issues

Marian F. MacDorman, PhD, Eugene Declercq, PhD, Howard Cabral, PhD, and Christine Morton, PhD

**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.
Trends in Maternal Mortality by Sociodemographic Characteristics and Cause of Death in 27 States and the District of Columbia

Marian F. MacDorman, PhD, Eugene Declercq, PhD, and Marie E. Thoma, PhD

Obstet Gynecol 2017;129:811–8
Over Ascertainment??

• Research into the cause of death category finds much of the increase is coming from *less specific 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></td>
<td>Number of deaths</td>
<td>Rate~</td>
<td>Number of deaths</td>
</tr>
<tr>
<td><strong>Total maternal (A34, O00-O05, O98-O99)</strong></td>
<td>780</td>
<td>20.6</td>
<td>907</td>
</tr>
<tr>
<td>Ill-defined causes (O26.8, O95, O99.8)</td>
<td>266</td>
<td>7.0</td>
<td>371</td>
</tr>
<tr>
<td>Total maternal minus ill-defined causes (Remainder)</td>
<td>514</td>
<td>13.5</td>
<td>536</td>
</tr>
<tr>
<td><strong>Total direct obstetric (A34, O00-O92)</strong></td>
<td>527</td>
<td>13.9</td>
<td>595</td>
</tr>
<tr>
<td>Other specified pregnancy-related conditions (O26.8)</td>
<td>130</td>
<td>3.4</td>
<td>212</td>
</tr>
<tr>
<td>Total direct obstetric minus O26.8 (Remainder)</td>
<td>397</td>
<td>10.5</td>
<td>383</td>
</tr>
<tr>
<td><strong>Total indirect causes (O98-O99)</strong></td>
<td>202</td>
<td>5.3</td>
<td>294</td>
</tr>
<tr>
<td>Other specified diseases and conditions (O99.8)</td>
<td>85</td>
<td>2.2</td>
<td>141</td>
</tr>
<tr>
<td>Total indirect causes minus O99.8 (Remainder)</td>
<td>117</td>
<td>3.1</td>
<td>153</td>
</tr>
</tbody>
</table>
REPORT FROM MATERNAL MORTALITY REVIEW COMMITTEES:
A VIEW INTO THEIR CRITICAL ROLE
Impact of the Checkbox – Better and Worse Ascertainment

• The Four Committee data includes a total of 650 potentially pregnancy-related deaths. Among these, 97 [15%) were determined to have no evidence of pregnancy within the year prior to the woman’s death (neither pregnancy-related nor –associated; false positive pregnancy-associated deaths), and so were excluded from further analysis. The predominant reason for these 97 false positives were errors on the death certificate from the pregnancy checkbox. 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 and 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.
Given the multiple measurement problems, let’s return to the most reliable measure of maternal deaths in the U.S.

Racial Disparities

Rates for 2011-13:

12.7 white women
43.5 black women
11.0 Hispanic
14.4 other races


*Note: Number of pregnancy-related deaths per 100,000 live births per year.
Timing of Maternal Deaths

- Before Delivery: 30.5%
- Day of Delivery: 18.2%
- 7-41 Days PPM: 21.3%
- 42-365 Days PPM: 13.2%

Using a more conservative estimate
Adjusting the CDC Pregnancy Related Mortality data
to reflect a maternal mortality rate

Estimated for 2011-2013 (per 100,000 live births):

- All women: 14.8
- Non-Hispanic white women: 11.3
- Non-Hispanic black women: 36.2
- Hispanic women: 10.0
- Black-white disparity: 3.2

So with this data how does the U.S. fare when compared to wealthy countries with 300,000+ births?
U.S. MMR* Compared to Countries with 300,000+ births, 2014, using WHO Estimates

<table>
<thead>
<tr>
<th>Country</th>
<th>MMR per 100,000 births</th>
</tr>
</thead>
<tbody>
<tr>
<td>Italy</td>
<td>4</td>
</tr>
<tr>
<td>Spain</td>
<td>5</td>
</tr>
<tr>
<td>Japan</td>
<td>5</td>
</tr>
<tr>
<td>Australia</td>
<td>6</td>
</tr>
<tr>
<td>Germany</td>
<td>6</td>
</tr>
<tr>
<td>Canada</td>
<td>7</td>
</tr>
<tr>
<td>France</td>
<td>8</td>
</tr>
<tr>
<td>U.K.</td>
<td>9</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

U.S. MMR* Compared to Countries with 300,000+ births, 2014, using WHO Estimates

* Maternal Mortality Ratio per 100,000 births

With extensive media coverage and policy concern rising, what’s been the response to this poor showing?
March for Moms

ALLIANCE FOR INNOVATION ON MATERNAL HEALTH A I M
Legislation at National & State Levels

115TH CONGRESS 1ST SESSION

H. R. 1318  115TH CONGRESS 1ST SESSION  S. 1112

To support States in their work to save and sustain the health of mothers during pregnancy, childbirth, and in the postpartum period, to eliminate disparities in maternal health outcomes for pregnancy-related and pregnancy-associated deaths, to identify solutions to improve health care quality and health outcomes for mothers, and for other purposes.

New state law requires deeper look at maternal deaths
TRIBUNE-REVIEW (Pennsylvania) | Thursday, May 10, 2018, 5:03 p.m.

Rep. Kelly (Ill.) sponsors legislation to advance maternal health
By Provided News on May 17, 2018 - 12:47pm

Lawmakers (MO) want to solve mysterious maternal deaths
by Kimberly Leonard
| May 22, 2018 12:01 AM
State Maternal Mortality Reviews

Understanding Maternal Deaths in Colorado:

Ohio Department of Health: Bureau of Maternal and Child Health (BMCH)
Ohio Pregnancy-Associated Mortality Review (PAMR) 2015

Pregnancy-Associated Mortality Review
Florida Department of Health, Bureau of Family Health Services
Pregnancy-Related Deaths Due to Infection 2005-2014
So, we’ve identified a problem in the U.S. and we’re taken steps to resolve it. The system’s working right?
Sort of.....with a focus on two areas: (1) Better measurement; and (2) addressing the clinical problems associated with maternal deaths.

Far less attention is paid to the public health components.
Timing of Maternal Deaths

- Before Delivery: 30.5%
- Day of Delivery: 16.8%
- 1-6 Days PPM: 21.3%
- 7-41 Days PPM: 18.2%
- 42-365 Days PPM: 13.2%

Only 35% of maternal deaths are occurring at birth or in the following week.


Implication of these distributions is that any attempt to resolve the problem of maternal death that doesn’t encompass both clinical and public health approaches is destined to miss a significant portion of women at risk. Also influenced by participation in the Mass. MMRC.

Which got me thinking......
“Looking where there’s light”

“One searches where there is light”

Johann Wolfgang von Goethe  1749–1832

• Women surveyed in May & June, 2002 about their childbirth experiences. Included if they gave birth within 2 years prior to survey

Postpartum Depression

• 19% of mothers scored 13+ on the Edinburgh Postnatal Depression Scale, meaning they were probably experiencing some degree of depression in the week preceding the survey.

What happened when this overall finding was stratified by time since birth?
Proportion of Women Scoring 13 + on Edinburgh Postnatal Depression Scale

- 6 months or less: 23%
- 7-12 months: 17%
- 13-18 months: 17%
- 19-24 months: 20%

BirthByTheNumbers.org
How much of what we term *postpartum depression* is chronic depression we happen to be measuring at that point in time?

*What does this have to do with maternal mortality?*

How much of what we’re measuring as “*the unacceptable level of maternal mortality*” is actually capturing a general problem in the health of women of reproductive age and we have chosen to shine a light on it for the period of conception to 1 year postpartum?

Number of female deaths, 15-49 in 2015: 76,872.
Maternal deaths = ~1% of all those.

Source: NCHS. Deaths, Final Data for 2015

BirthByTheNumbers.org
This is a less discussed reason why the work of MMRCs is so important:

**MMRCs documentation of pregnancy associated deaths provides our most systematic insights into the death of women of reproductive age**
The importance of studying pregnancy-associated deaths

<table>
<thead>
<tr>
<th>Pregnancy Status</th>
<th>Not pregnancy-related</th>
<th>Pregnancy-related</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Number</td>
<td>Percent</td>
</tr>
<tr>
<td>During pregnancy</td>
<td>15</td>
<td>12.5</td>
</tr>
<tr>
<td>1-42 days postpartum (within 6 weeks)</td>
<td>15</td>
<td>12.5</td>
</tr>
<tr>
<td>43-365 days postpartum (7-52 weeks)</td>
<td>90</td>
<td>75.0</td>
</tr>
<tr>
<td>Total</td>
<td>120</td>
<td>100.0</td>
</tr>
</tbody>
</table>
So, is there one thing that could be done that would begin to address the larger issue of women's health?

State policies can play a role....with apologies to our colleagues from Canada and Europe
Variation in Medicaid Eligibility by Pregnancy Status

<table>
<thead>
<tr>
<th>Medicaid Eligibility for women if:</th>
<th>Pregnant</th>
<th>Adult in Family</th>
</tr>
</thead>
<tbody>
<tr>
<td>Massachusetts</td>
<td>214%</td>
<td>138%</td>
</tr>
<tr>
<td>Alabama</td>
<td>146%</td>
<td>18%</td>
</tr>
<tr>
<td>California</td>
<td>213%</td>
<td>138%</td>
</tr>
<tr>
<td>Florida</td>
<td>196%</td>
<td>33%</td>
</tr>
<tr>
<td>Iowa</td>
<td>380%</td>
<td>138%</td>
</tr>
<tr>
<td>New York</td>
<td>223%</td>
<td>138%</td>
</tr>
<tr>
<td>Texas</td>
<td>203%</td>
<td>18%</td>
</tr>
<tr>
<td>Michigan</td>
<td>200%</td>
<td>138%</td>
</tr>
</tbody>
</table>

For a family of 3, the poverty level is $20,160. 18% of that $3,629.

BirthByTheNumbers.org
Three Points to Keep in Mind about the problem of Maternal Mortality

• **Clinical care does matter** – need continued efforts to improve care establishment of state or regional *Perinatal Quality Collaboratives* to address clinical care issues and reduce preventable deaths (IL study found 32.4% potentially preventable)

• **Policy Issue as well as medical one** – state policies that fail to cover women when they’re not pregnant are a major problem that is reflected in maternal deaths.

• **Focus on women’s public health** – since maternal deaths involve more than childbirth, focus on women’s health not just because she might someday have a child, but because *women’s health in itself is important*. Can result in women being healthier when they become pregnant and better cared for after they have a baby.