Dr. Burgis has *no* disclosures relative to this subject
Maternal Mortality

Important indicator of the quality of health care both nationally and internationally.
Maternal Mortality

Success story

20th Century  900/100,000 live births
2007        12.7/100,000 live births

Actually appears to be increasing in this century!!
Maternal Mortality Rate in U.S. Rises, Defying Global Trend, Study Finds

WASHINGTON — One of the biggest worldwide public health triumphs in recent decades has been the reduction of maternal mortality. The United Nations has set a goal of reducing maternal deaths by 70% by 2015.

A Woman Dies After Childbirth, and Her Husband Asks Why

By SAMANTHA SCHMIDT  SEPTEMBER 28, 2016

Gilbert Kwok with his son Zachary, who was born prematurely on Aug. 1. His wife, Amy Lam, died less than 12 hours after giving birth. “When the boys ask me what happened, how do I answer them?” said Mr. Kwok,
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

Editorial

Drilling Down on Maternal Mortality

In the January 2015 issue of Obstetrics & Gynecology, we published the latest statistics on maternal mortality ratios from the Centers for Disease Control and Prevention, which showed that there had been a steady increase from 9.1 per 100,000 live births between 1987 and 1990 to 16.0 per 100,000 live births from 2006 to 2010.

In this month’s issue, MacDorman et al (see page 447) report their findings, which result from an analysis of the maternal mortality ratio that shows the results to be much worse. The authors explain the reasons that the United States has been unable to report a national maternal mortality rate since 2007 and call it an “international embarrassment.” They use combined data from 48 states and the District of Columbia, all of which had begun using the national death certificate requiring a “tick box” to indicate the deceased’s pregnancy status. This change has been gradual, muddying the data when they’re combined to statistic. These authors show that the baseline rate...
Overview of Maternal Mortality in the USA

Learning Objectives

Understand the problem
Learn how deaths are identified
Be aware of emerging issues and difficulty with interpreting the data trend
Definition

Number of deaths/100,000 live births

- Used in the denominator to approximate population of pregnant women at risk of maternal death because the number of live births can be known precisely
- Number of pregnancies can only be estimated
Definition

ICD 9 and ICD 10 definition
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 pregnancy or its management.
Scope of the Problem

- 600 to 800 mothers die in the United States each year
- USA ratio is higher than that of other developed nations
- Racial disparity exists
- Maternal morbidity is more common than maternal death
Trends and Patterns

Pregnancy-related deaths continue to trend upward in the US

Pregnancy-related deaths per 100,000 live births

SOURCE: CDC Pregnancy Mortality Surveillance System
CREDIT: Sarah Frostenson
### Trends and Patterns

#### Table 2. Estimated Maternal Mortality Rates, 48 States and the District of Columbia, 2000–2014*

<table>
<thead>
<tr>
<th>Year</th>
<th>Maternal Mortality Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>2000</td>
<td>18.8</td>
</tr>
<tr>
<td>2001</td>
<td>19.2</td>
</tr>
<tr>
<td>2002</td>
<td>19.5</td>
</tr>
<tr>
<td>2003</td>
<td>19.9</td>
</tr>
<tr>
<td>2004</td>
<td>20.3</td>
</tr>
<tr>
<td>2005</td>
<td>20.6</td>
</tr>
<tr>
<td>2006</td>
<td>21.0</td>
</tr>
<tr>
<td>2007</td>
<td>21.3</td>
</tr>
<tr>
<td>2008</td>
<td>21.7</td>
</tr>
<tr>
<td>2009</td>
<td>22.0</td>
</tr>
<tr>
<td>2010</td>
<td>22.4</td>
</tr>
<tr>
<td>2011</td>
<td>22.8</td>
</tr>
<tr>
<td>2012</td>
<td>23.1</td>
</tr>
<tr>
<td>2013</td>
<td>23.5</td>
</tr>
<tr>
<td>2014</td>
<td>23.8</td>
</tr>
</tbody>
</table>

Rates back-estimated from reported 2014 rate for states with the standard pregnancy question using a weighted average of the slopes from groups 1–4; see “Materials and Methods.”

* Excludes California and Texas.
The US is an outlier. In most wealthier nations, the maternal mortality rate is dropping.

*Pregnancy-related deaths per 100,000 live births*

**SOURCE:** IHME  
**CREDIT:** Sarah Frostenson
More than three times as many black women die from childbirth, and the gap is widening

Percentage of pregnancy-related deaths by race

2011

<table>
<thead>
<tr>
<th>Race</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Black women</td>
<td>42.8%</td>
</tr>
<tr>
<td>White women</td>
<td>12.5%</td>
</tr>
<tr>
<td>Total</td>
<td>55.3%</td>
</tr>
</tbody>
</table>

SOURCE: CDC Pregnancy Mortality Surveillance System
CREDIT: Sarah Frostenson
Fewer women are dying from emergency pregnancy complications

<table>
<thead>
<tr>
<th>1987-'90</th>
<th>2006-'10</th>
</tr>
</thead>
<tbody>
<tr>
<td>28.7%</td>
<td>11.4%</td>
</tr>
<tr>
<td>19.7%</td>
<td>14.9%</td>
</tr>
<tr>
<td>17.6%</td>
<td>4.8%</td>
</tr>
<tr>
<td>2.5%</td>
<td>0.7%</td>
</tr>
</tbody>
</table>

Percentage of pregnancy-related deaths due to a specific complication

SOURCE: CDC Pregnancy Mortality Surveillance System
CREDIT: Sarah Frostenson
Trends and Patterns

The percentage of pregnancy deaths caused by chronic diseases is steadily rising

1987-'90
- Cardiovascular conditions: 3%
- Cardiomyopathy: 5.6
- Infections: 13.1

2006-'10
- Cardiovascular conditions: 14.6%
- Cardiomyopathy: 11.8
- Infections: 13.6

SOURCE: CDC Pregnancy Mortality Surveillance System
CREDIT: Sarah Frostenson
Identifying Maternal Deaths

- Vital statistics
- 1933 state based registration began
- 1946 transferred to US Public Health System
- Today National Center for Health Statistics (NCHS) compiles the official count using death certificates sent in by states
Case Identification

- Cause of death is coded using ICD codes for death related to complications of pregnancy, childbirth and the puerperium.
Case Identification

ICD 10
Began in 1999
More codes
Additional diagnoses
Increased number of maternal deaths identified
Case Identification

- 23 states and District of Columbia had adopted by 2007
- Pregnancy checkbox
  - was decedent pregnant at the time of death
  - Pregnant within 42 days of death
  - Pregnant within one year of death
# Certificate of Death

## State of South Carolina
Department of Health and Environmental Control

### Certificate of Death

<table>
<thead>
<tr>
<th>Field</th>
<th>Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>DECEDENT'S LEGAL NAME</td>
<td>Include AKAs, if any (First, Middle, Last)</td>
</tr>
<tr>
<td>AGE-Last Birthday (Years)</td>
<td></td>
</tr>
<tr>
<td>UNDER 1 YEAR</td>
<td>Months, Days, Hours, Minutes</td>
</tr>
<tr>
<td>UNDER 1 DAY</td>
<td></td>
</tr>
<tr>
<td>DATE OF BIRTH (MM/DD/YYYY)</td>
<td></td>
</tr>
<tr>
<td>BIRTHPLACE (City and State or Foreign Country)</td>
<td></td>
</tr>
<tr>
<td>RESIDENCE-STATE</td>
<td></td>
</tr>
<tr>
<td>COUNTY</td>
<td></td>
</tr>
<tr>
<td>CITY OR TOWN</td>
<td></td>
</tr>
<tr>
<td>STREET AND NUMBER</td>
<td></td>
</tr>
<tr>
<td>APT. NO.</td>
<td></td>
</tr>
<tr>
<td>ZIP CODE</td>
<td></td>
</tr>
<tr>
<td>INSIDE CITY LIMITS?</td>
<td>Yes, No</td>
</tr>
<tr>
<td>EVER IN US ARMED FORCES?</td>
<td>Married, Married, but separated, Widowed, Divorced, Never Married, Unknown</td>
</tr>
<tr>
<td>MARITAL STATUS AT TIME OF DEATH</td>
<td>Married, Married, but separated, Widowed, Divorced, Never Married, Unknown</td>
</tr>
<tr>
<td>SURVIVING SPOUSE'S NAME (If wife, give name prior to first marriage)</td>
<td></td>
</tr>
<tr>
<td>WERE AUTO ACCIDENTS A CONTRIBUTING CAUSE?</td>
<td></td>
</tr>
<tr>
<td>IF FEMALE</td>
<td>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 one year before death, Unknown if pregnant within the past year</td>
</tr>
<tr>
<td>MANNER OF DEATH</td>
<td>Natural, Accident, Suicide</td>
</tr>
</tbody>
</table>
Increased Identification

ICD 10

Pregnancy check boxes
Case Identification

In 1986 recognized that vital record surveillance only had limitations

More information needed

CDC/ACOG/state health departments formed Maternal Mortality Study Group (MMSG)

Enhanced surveillance

First linkage of death/ birth certificates

New definition
Case Identification

**Pregnancy-associated death**
All deaths during or within the 1 year of pregnancy

**Pregnancy-related death**
All deaths during or within one year of pregnancy due to:
Complication of pregnancy, aggravation of an unrelated condition by the physiology of pregnancy, or a chain of events initiated by pregnancy
Trends and Patterns in Pregnancy Related Mortality

Increasing numbers of deaths

Linkage death and birth certificates

ICD 10

Pregnancy checkbox

“Casting a wide net”
Trends and Patterns in Pregnancy Related Mortality

Racial Disparity remains
Pregnancy related mortality increases with increasing maternal age
Majority of deaths occur after a live birth
Trends and Patterns in Pregnancy Related Mortality

Relationship between pregnancy related death and timing of onset of prenatal care

Only ascertained:

Women who had a live birth or fetal death
Linkage between death certificate and birth/fetal death report
Trends and Patterns in Pregnancy Related Mortality

Relationship between onset of prenatal care
- consistent *null* association
- exception is no prenatal care/maternal death

Says little about the quality of prenatal care
Suggests something “*more than traditional care*” is needed when considering prevention!
Causes of Pregnancy Related Mortality

19 years of data
Hemorrhage/ectopic less
Cardiovascular more
US similar to UK
State and regional surveillance needs to be active and make their findings known
Causes of pregnancy-related death in the United States: 2011

Note: The cause of death is unknown for 5.9% of all pregnancy-related deaths.
In 2011, there were 18 states with active maternal mortality review boards.

2015 SC Proviso 34.53.
(DHEC: Maternal Morbidity and Mortality Review Committee)

(A) From the funds appropriated to or authorized for the Department of Health and Environmental Control in Fiscal Year 2015-16, the department shall establish a Maternal Morbidity and Mortality Review Committee to review maternal deaths and to develop strategies for the prevention of maternal deaths. The committee must be multidisciplinary and composed of members deemed appropriate by the department. The committee also may review severe maternal morbidity. The department may contract with an external organization to assist in collecting, analyzing, and disseminating maternal mortality information, organizing and convening meetings of the committee, and performing other tasks as may be incident to these activities, including providing the necessary data, information, and resources to ensure successful completion of the ongoing review required by this provision.

(B) The committee shall:
1) identify maternal death cases, as defined as a death within one year of pregnancy with a direct or indirect causation related to the pregnancy or postpartum period;
2) review medical records and other relevant data;
3) contact family members and other affected or involved persons to collect additional data;
4) consult with relevant experts to evaluate the records and data;
5) make determinations regarding the preventability of maternal deaths;
6) develop recommendations for the prevention of maternal deaths; and
7) disseminate findings and recommendations pursuant to subsection (F).
Requires DHEC to establish a maternal mortality and morbidity review committee to study deaths of pregnant women and report their findings to the General Assembly

Signed 3/14/2016
South Carolina MMMR

Improving Mother’s Outcomes in South Carolina

Organized to review maternal deaths
Meets quarterly
Housed at DHEC
Publish a report annually
First review meeting June 2016
Committee Mission

The mission of the South Carolina Maternal Mortality and Morbidity Review Committee (SC MMMR) is to identify pregnancy-associated deaths (deaths during or within a year of pregnancy), review those caused by pregnancy complications and other selected deaths, and identify problems contributing to these deaths and interventions that may reduce these deaths.
Case Identification

Improving Mother’s Outcomes in South Carolina

Voluntary reporting

MMMR@dhec.sc.gov

Vital records
February 29, 2016

South Carolina Hospitals

Dear Hospital Administrator,

The US pregnancy-related mortality rate has increased from 14.7 deaths per 100,000 live births in 2000 to 17.8 in 2011. Accurate statistics for South Carolina are difficult to obtain because a detailed case review is often necessary to determine whether a death during pregnancy is truly pregnancy-related. However, it is estimated that South Carolina’s pregnancy-related mortality rate of over 33 deaths per 100,000 live births in 2011 is among the highest in the nation. The purpose of the review committee is not punitive in nature and will not be used to establish blame in cases of maternal deaths. All case materials will be de-identified for the purpose of committee review. Reported maternal deaths will also be compared to vital records information in quality assurance efforts within DHEC.

We welcome you into this partnership and hope we can count on your cooperation in order to make this a successful venture as we seek to reduce maternal mortality in South Carolina.

For more information, please contact the Maternal Mortality and Morbidity Committee at MMMR@dhec.sc.gov.

Sincerely,

Lisa A. Davis
Director, Health Services

Dr. Judith T. Burgess
Chair, South Carolina Maternal Mortality and Morbidity Review Committee
## South Carolina Committee Composition

1. MFM Specialist
2. Critical Care/Anesthesiologist
3. SC ACOG Representative
4. Mental Health Provider
5. Domestic Violence Specialist
6. SC Perinatal Association
7. Nurse Midwife
8. Department of Social Services
9. Family Medicine
10. Pathology/Coroner
11. Substance Use Specialist
12. SCHA
13. DHHS
14. Law Enforcement
South Carolina

Birth and Death Certificates linked

2011-2015

WHO – Death during pregnancy or 42 days
64 Maternal Deaths

2011 rate  19.2/100,000 live births
2014 rate  33.0/100,000 live births
2015 rate  20.6/100,000 live births
## Number and % of pregnancy related deaths by cause 2011-2015

<table>
<thead>
<tr>
<th>Cause of Death</th>
<th># Pregnancy related Deaths</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ectopic Pregnancy</td>
<td>4</td>
<td>6.3</td>
</tr>
<tr>
<td>Cardiovascular</td>
<td>12</td>
<td>18.8</td>
</tr>
<tr>
<td>Hypertensive</td>
<td>10</td>
<td>15.6</td>
</tr>
<tr>
<td>Cerebrovascular Disease</td>
<td>3</td>
<td>4.7</td>
</tr>
<tr>
<td>Medical Conditions Complicating</td>
<td>21</td>
<td>32.8</td>
</tr>
<tr>
<td>Complications of Labor and Delivery</td>
<td>8</td>
<td>12.5</td>
</tr>
<tr>
<td>Other</td>
<td>6</td>
<td>9.4</td>
</tr>
</tbody>
</table>
South Carolina 2011-15

Highest Rate - for women 35 years of age or older

64.9 deaths per 100,000 live births
South Carolina 2011-15

Non Hispanic Black women had a rate 3.7 times greater than white women
South Carolina 2011-15

Majority of deaths were in a hospital

17.2% of the deaths occurred outside of a hospital
Future Directions

• Firmly establish mortality review
• Expand to review morbidity
• Expand to non obstetric deaths
• Work with BOI to institute quality measures
• Improve the health of S.C. Mothers
Hemorrhage is the leading cause of Pregnancy-Related maternal death in Florida. (1)

Placental disorders (including placenta previa, accreta/increta/percreta) accounted for 21% of hemorrhage related deaths > 20 weeks gestation. (1)

With the rising cesarean rate, the incidence of placenta accreta has increased. (2)

Urgent Maternal Mortality Message to Providers

Diagnosis is essential before delivery

Implementation of hemorrhage protocols in all Florida delivery hospitals is mandatory, and should be in place before a bleeding episode occurs.

If you have called for help and cannot control the bleeding surgically, compress the aorta or uterine vessels while waiting for help to arrive.

For more information, contact:
Rhonda Brown, R.N., B.S.N.
Program Administrator
Maternal and Child Health
Florida Department of Health
Rhonda.Brown@flhealth.gov
(850) 245-4469

Future Directions

10 year maternal death by violence compared with obstetric causes in Illinois

Thank you!

Questions?