Maternal Mortality Rates in the U.S.

Robert N. Anderson, PhD
Chief, Statistical Analysis and Surveillance Branch
Division of Vital Statistics

July 22, 2024
The National Vital Statistics System (NVSS)

- NVSS is the official source for U.S. maternal mortality statistics used in international, state, and demographic comparisons
- Follows the World Health Organization definition of maternal death:
  - “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”
    - Does not include external causes of death like homicide, suicide, drug overdose, etc.
    - Late maternal death = death of a woman from direct or indirect obstetric causes more than 42 days but less than 1 year after the end of pregnancy
- NCHS uses ICD-10 codes to classify maternal deaths
  - Based on checkbox and written info about cause of death
Death Certificates

### U.S. Standard Certificate of Death

#### Cause of Death

32. **PART I.** Enter the chain of events—diseases, injuries, or complications—that directly caused the death. DO NOT enter terminal events such as cardiac arrest, respiratory arrest, or ventricular fibrillation without showing the etiology. DO NOT ABBREVIATE. Enter only one cause on a line. Add additional lines if necessary.

- **IMMEDIATE CAUSE (Final disease or condition resulting in death)**
  - a. __________________________ Due to (or as a consequence of): __________________________
  - b. __________________________ Due to (or as a consequence of): __________________________
  - c. __________________________ Due to (or as a consequence of): __________________________
  - d. __________________________ Due to (or as a consequence of): __________________________

- **Sequentially list conditions, if any, leading to the cause listed on line a.** Enter the UNDERLYING CAUSE (disease or injury that initiated the events resulting in death) LAST.

- **PART II.** Enter other significant conditions contributing to death but not resulting in the underlying cause given in **PART I**

#### Contributing Conditions

33. **WAS AN AUTOPSY PERFORMED?**
   - □ Yes □ No

34. **WERE AUTOPSY FINDINGS AVAILABLE TO COMPLETE THE CAUSE OF DEATH?**
   - □ Yes □ No

*Illustration of the causal sequence leading to death and contributing conditions.*
Prior to the checkbox, there was substantial underreporting of maternal deaths

- 30%–70% of pregnancies were not captured based on cause-of-death alone
- Only 62% of maternal deaths in Maryland were captured prior to the checkbox
  - Studies used detailed data linkages and review of medical examiner data to validate the death certificate information and determine pregnancy status

MacKay, Rochat, Smith & Berg, 2000: https://doi.org/10.1016/S0749-3797(00)00171-9
### The Pregnancy Checkbox

#### CAUSE OF DEATH

<table>
<thead>
<tr>
<th>Part I</th>
<th>Enter the chain of events—diseases, injuries, or complications—that led to the death, arrest, respiratory arrest, or ventricular fibrillation without showing the etiology if necessary.</th>
</tr>
</thead>
<tbody>
<tr>
<td>IMMEDIATE CAUSE</td>
<td>Final disease or condition resulting in death</td>
</tr>
<tr>
<td>a.</td>
<td>Due to (or as a consequence of)</td>
</tr>
<tr>
<td>b.</td>
<td>Due to (or as a consequence of)</td>
</tr>
<tr>
<td>c.</td>
<td>Due to (or as a consequence of)</td>
</tr>
<tr>
<td>d.</td>
<td>Due to (or as a consequence of)</td>
</tr>
</tbody>
</table>

#### PART II

Enter other significant conditions contributing to death but not resulting in the underlying cause given in PART I.

#### 36. 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

#### 37. MANNER OF DEATH

- Natural
- Homicide
- Accident
- Pending Investigation
- Suicide
- Could not be determined
Adoption of the Pregnancy Checkbox

- States adopted the revised certificate at different times between 2003 and 2017
- Difficult to estimate national-level trends in maternal mortality over this time period
NCHS Evaluations of the Pregnancy Checkbox

Evaluation of the Pregnancy Status Checkbox on the Identification of Maternal Deaths

by Donna L. Hoyert, Ph.D., Division of Vital Statistics, Sayeeda F.G. Uddin, M.D., M.P.H., Office of the Director, and Arashid M. Minlao, M.P.H., Division of Vital Statistics

Abstract

Objectives—This report quantifies the impact of the inclusion of a pregnancy status checkbox item on the U.S. Standard Certificate of Death on the number of deaths classified as maternal. Maternal mortality rates calculated with and without using the checkbox information for deaths in 2015 and 2016 are presented.

Methods—This report is based on cause-of-death information from 2015 and 2016 death certificates collected through the National Vital Statistics System. Records originally assigned to a specified range of ICD-10 codes (i.e., A34, Q00-Q09) when using information from the checkbox item were recoded without using the checkbox item. Ratios of deaths assigned as maternal deaths using checkbox item information to deaths assigned without checkbox item information were calculated to quantify the impact of the pregnancy status checkbox.

Keywords: maternal mortality • death certificate • National Vital Statistics System

Introduction

Maternal mortality has historically been used as a key indicator of the health of a population. Currently, it is one of a limited number of health indicators included in the Sustainable Development Goals that address countries' success in improving human wellbeing without harming the environment (1). In the United States, the U.S. National Vital Statistics System (NVSS) at the National Center for Health Statistics (NCHS) generates the official mortality statistics, including maternal mortality rates, that are used within the United States and internationally. NVSS identifies deaths of pregnant or recently pregnant women using information reported on the women's death certificates.

https://www.cdc.gov/nchs/data/series/sr_03/sr03_044-508.pdf
If the checkbox was implemented in all states at the same time, we would have seen an increase of 9.6 maternal deaths per 100,000 live births.
Trends in observed maternal mortality rates: United States, 1999–2017

Checkbox gradually added across various states

Pre-checkbox

https://www.cdc.gov/nchs/data/series/sr_03/sr03_044-508.pdf

If we assume that we had the pregnancy checkbox across all states starting in 1999, maternal mortality rates would have appeared stable.

If we assume that we never implemented the checkbox, maternal mortality rates would have appeared stable, but too low.

https://www.cdc.gov/nchs/data/series/sr_03/sr03_044-508.pdf
Examinations after the checkbox have found both false positives and false negatives

- False positives = incorrectly reported as pregnant at the time of death or pregnant within the past year
- False negatives = incorrectly reported as not pregnant within the past year
- Based on validations from a few states:
  - 15-32% false positives
  - 8-30% false negatives
- False positives much higher for older age groups - about half (46%) of false positives occurred among women 45 and older
With the 2018 data, changes to the coding process were implemented to reduce errors

- Prior to 2018, checkbox was considered for women ages 10-54
- Revised coding process restricts checkbox to women 10-44 years
  - If obstetric or pregnancy-related conditions are included in the cause-of-death information, these deaths are included regardless of age
  - Reduced false positives by about one-half
- Coding changes do not help with false negatives (missed maternal deaths)
Trends in monthly death rates from 2018-2022

- All-cause death rate for females 15-44 years
- All-cause death rate without COVID-19
- Maternal mortality rate
- Maternal COVID-19
NCHS has ongoing activities in place to improve data quality

- Monitoring quality of coding to identify and correct coding errors
- Training and tools to help medical certifiers
  - Online courses on improving cause of death reporting
  - Guidance documents on reporting death certificate data, including one specific to pregnancy mortality
- States asked to verify/correct pregnancy checkbox information through:
  - Ongoing linkage of records
  - Follow up of records containing questionable information
States hold the key to further improvements in maternal death data quality

- States could further minimize errors by:
  - Providing/promoting training for data providers
  - Modifying death registration systems to confirm checkbox information at the time of data entry:
    • Adding prompts, e.g.: “You have indicated that the decedent was pregnant within the past year. Is this correct?”
    • Adding follow-up questions, e.g.,: Outcome of pregnancy? Date of delivery/pregnancy termination?

- States have access to sources of information for correcting errors when they occur
  - Medical certifiers, medical examiner records, hospital discharge data, obituaries, data linkages, etc.