

Maternal Mortality Rates in the U.S.

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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 (See instructions and examples)			Approximate interval: Onset to death
<p>32. PART I. Enter the <u>chain of events</u>--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.</p>			
IMMEDIATE CAUSE (Final disease or condition -----> resulting in death)	a. _____ Due to (or as a consequence of):	<div>Causal sequence leading to death</div>	_____
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	b. _____ Due to (or as a consequence of):		_____
	c. _____ Due to (or as a consequence of):		_____
	d. _____		_____
<p>PART II. Enter other <u>significant conditions contributing to death</u> but not resulting in the underlying cause given in PART I</p> <div>Contributing conditions</div>			<p>33. WAS AN AUTOPSY PERFORMED? <input type="checkbox"/> Yes <input type="checkbox"/> No</p> <p>34. WERE AUTOPSY FINDINGS AVAILABLE TO COMPLETE THE CAUSE OF DEATH? <input type="checkbox"/> Yes <input type="checkbox"/> No</p>

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

Horon & Cheng, 2001: <https://pubmed.ncbi.nlm.nih.gov/11255421/>

Horon, 2005: <https://pubmed.ncbi.nlm.nih.gov/15727980/>

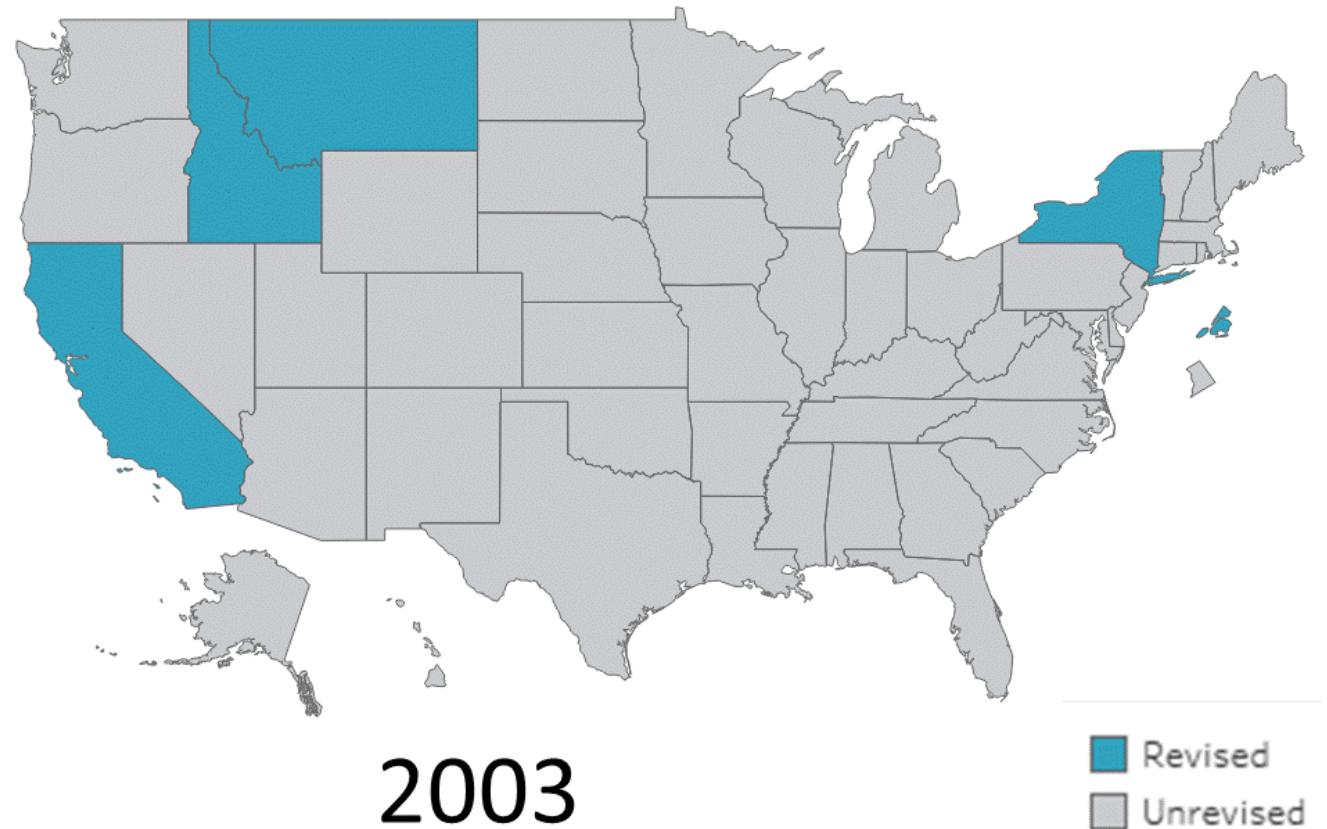
MacKay, Rochat, Smith & Berg, 2000: [https://doi.org/10.1016/S0749-3797\(00\)00171-9](https://doi.org/10.1016/S0749-3797(00)00171-9)

The Pregnancy Checkbox

U.S. STANDARD	
CAUSE OF DEATH (See instructions) 32. PART I. Enter the <u>chain of events</u> —diseases, injuries, or complications—that caused death, starting with the immediate cause, and ending with the underlying cause, in the following order: arrest, respiratory arrest, or ventricular fibrillation without showing the etiology of the immediate cause on lines if necessary. IMMEDIATE CAUSE (Final disease or condition -----> resulting in death) a. _____ 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 b. _____ Due to (or as a consequence of): c. _____ Due to (or as a consequence of): d. _____ Due to (or as a consequence of):	
PART II. Enter other <u>significant conditions contributing to death</u> but not resulting in the underlying cause given in PART I	
35. DID TOBACCO USE CONTRIBUTE TO DEATH? <input type="checkbox"/> Yes <input type="checkbox"/> Probably <input type="checkbox"/> No <input type="checkbox"/> Unknown	36. IF FEMALE: <input type="checkbox"/> Not pregnant within past year <input type="checkbox"/> Pregnant at time of death <input type="checkbox"/> Not pregnant, but pregnant within 42 days of death <input type="checkbox"/> Not pregnant, but pregnant 43 days to 1 year before death <input type="checkbox"/> Unknown if pregnant within the past year
33. WAS AN AUTOPSY PERFORMED? <input type="checkbox"/> Yes <input type="checkbox"/> No	
34. WERE AUTOPSY FINDINGS AVAILABLE TO COMPLETE THE CAUSE OF DEATH? <input type="checkbox"/> Yes <input type="checkbox"/> No	
37. MANNER OF DEATH <input type="checkbox"/> Natural <input type="checkbox"/> Homicide <input type="checkbox"/> Accident <input type="checkbox"/> Pending Investigation <input type="checkbox"/> Suicide <input type="checkbox"/> 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

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

by Donna L. Hoyert, Ph.D., Division of Vital Statistics, Sayeedha F.G. Uddin, M.D., M.P.H., Office of the Director, and Arialdi M. Miniño, 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, 000–099) 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

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/nvsr/nvsr69/nvsr69_01-508.pdf

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

NATIONAL CENTER FOR HEALTH STATISTICS

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The Impact of the Pregnancy Checkbox and Misclassification on Maternal Mortality Trends in the United States, 1999–2017

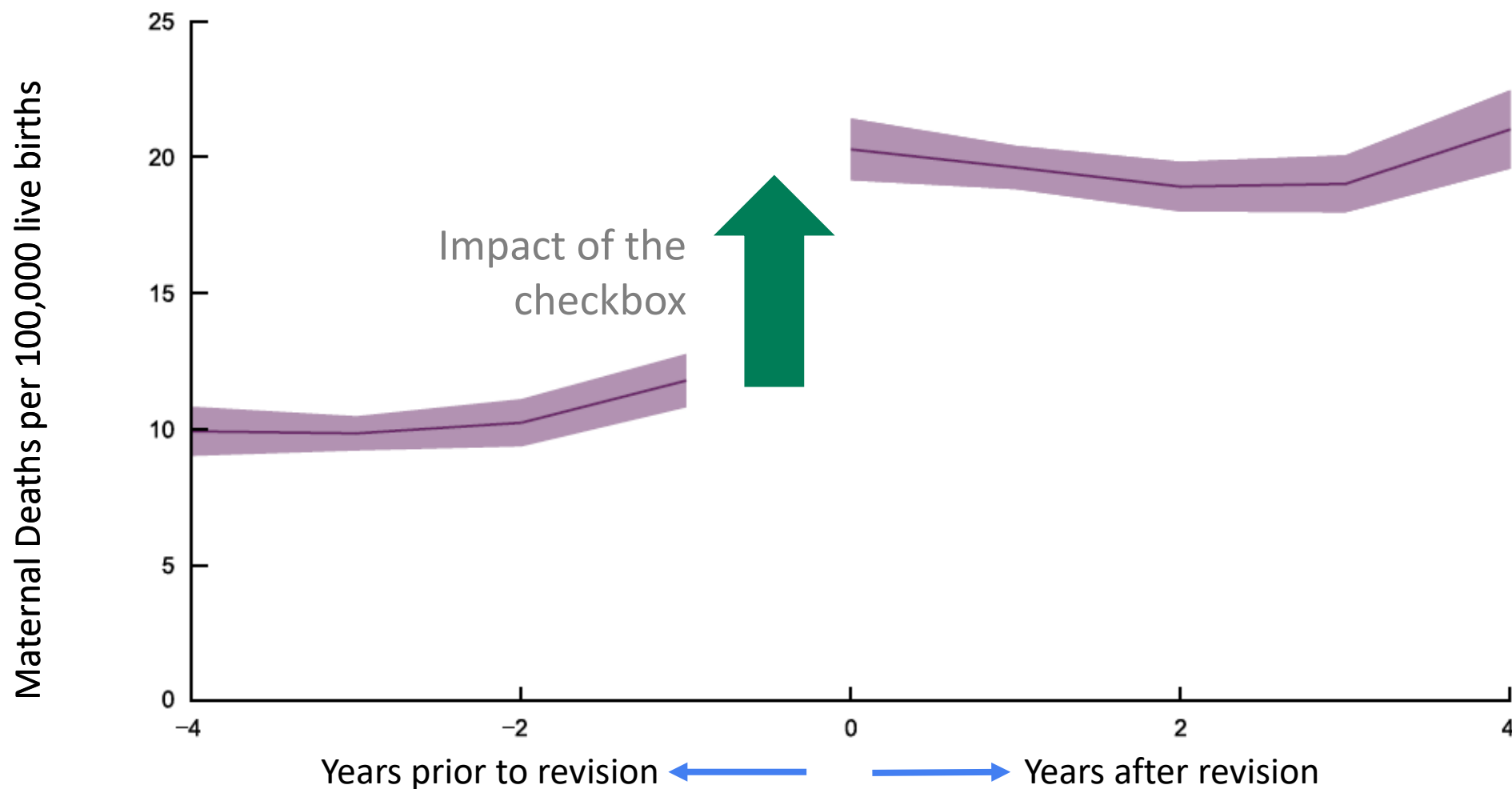
Analytical and Epidemiological Studies



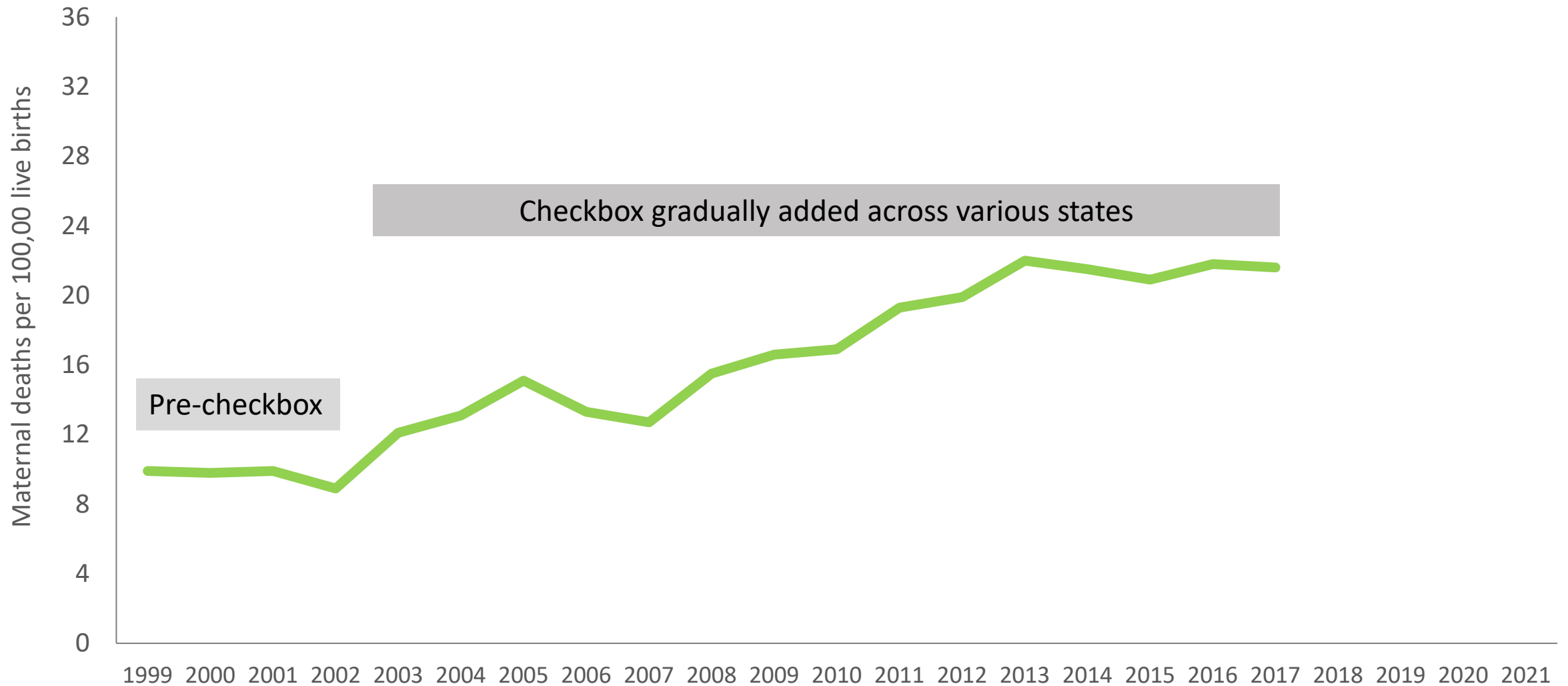
U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
Centers for Disease Control and Prevention
National Center for Health Statistics

NCHS reports can be downloaded from: <https://www.cdc.gov/nchs/products/index.htm>.

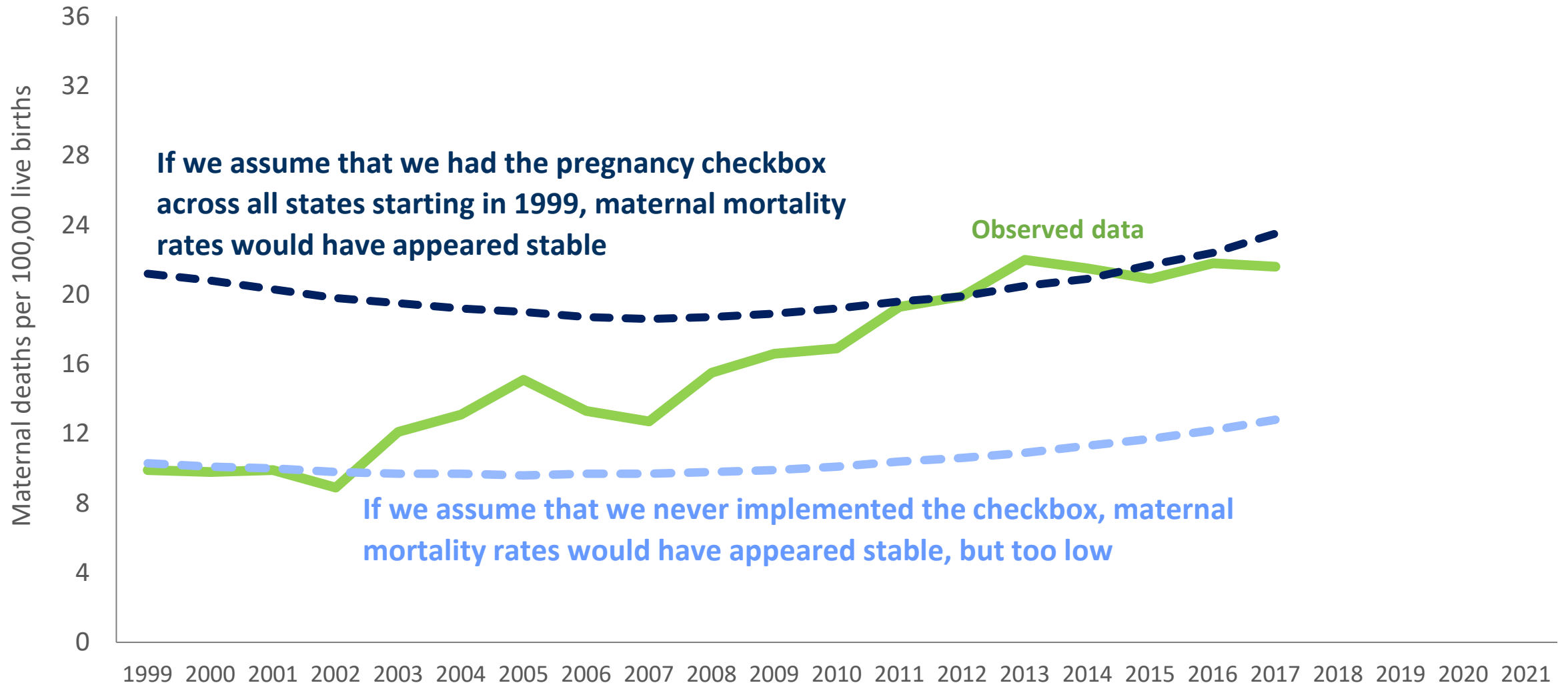
If the checkbox was implemented in all states at the same time, we would have seen an increase of 9.6 maternal deaths per 100,000 live births



Trends in observed maternal mortality rates: United States, 1999–2017



Trends in maternal mortality rates accounting for the pregnancy checkbox: United States, 1999–2017



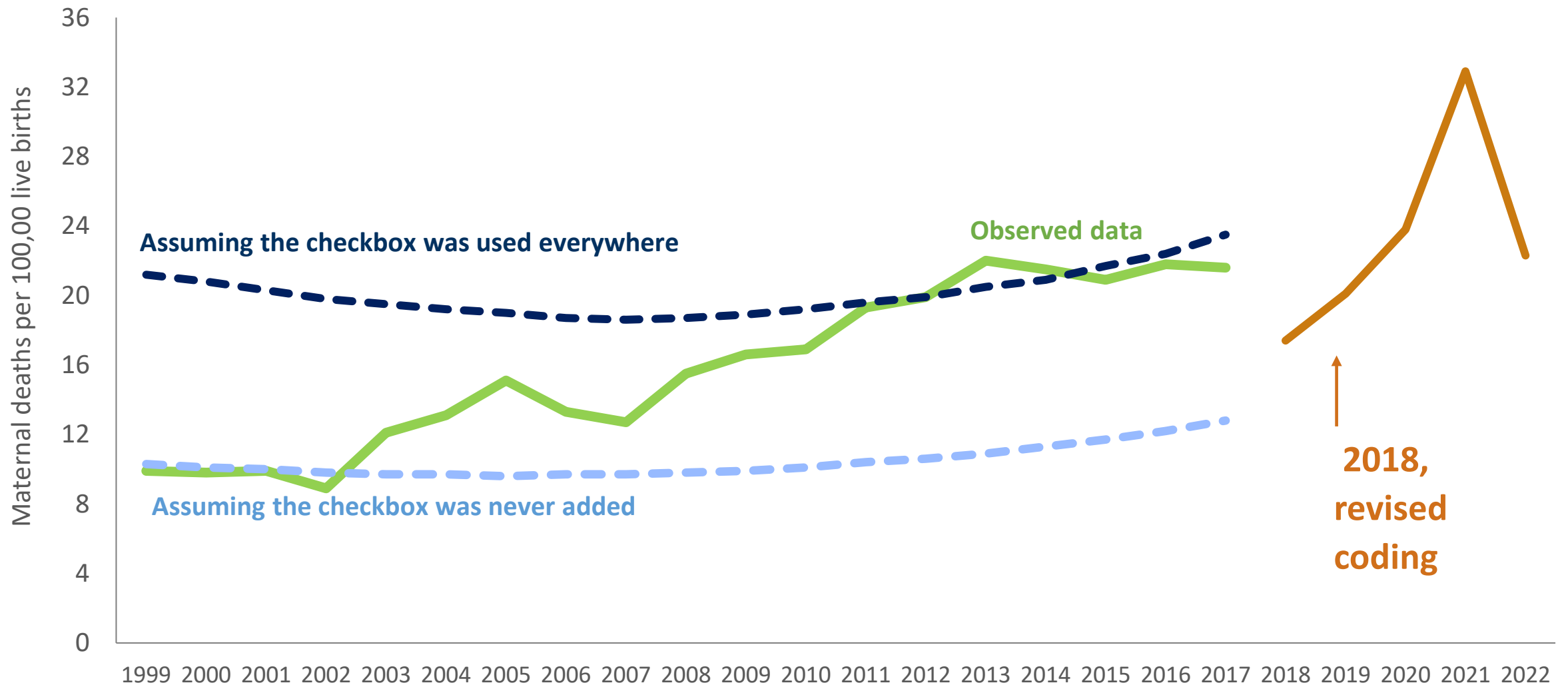
Examinations after the checkbox have found both false positives and false negatives

- 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

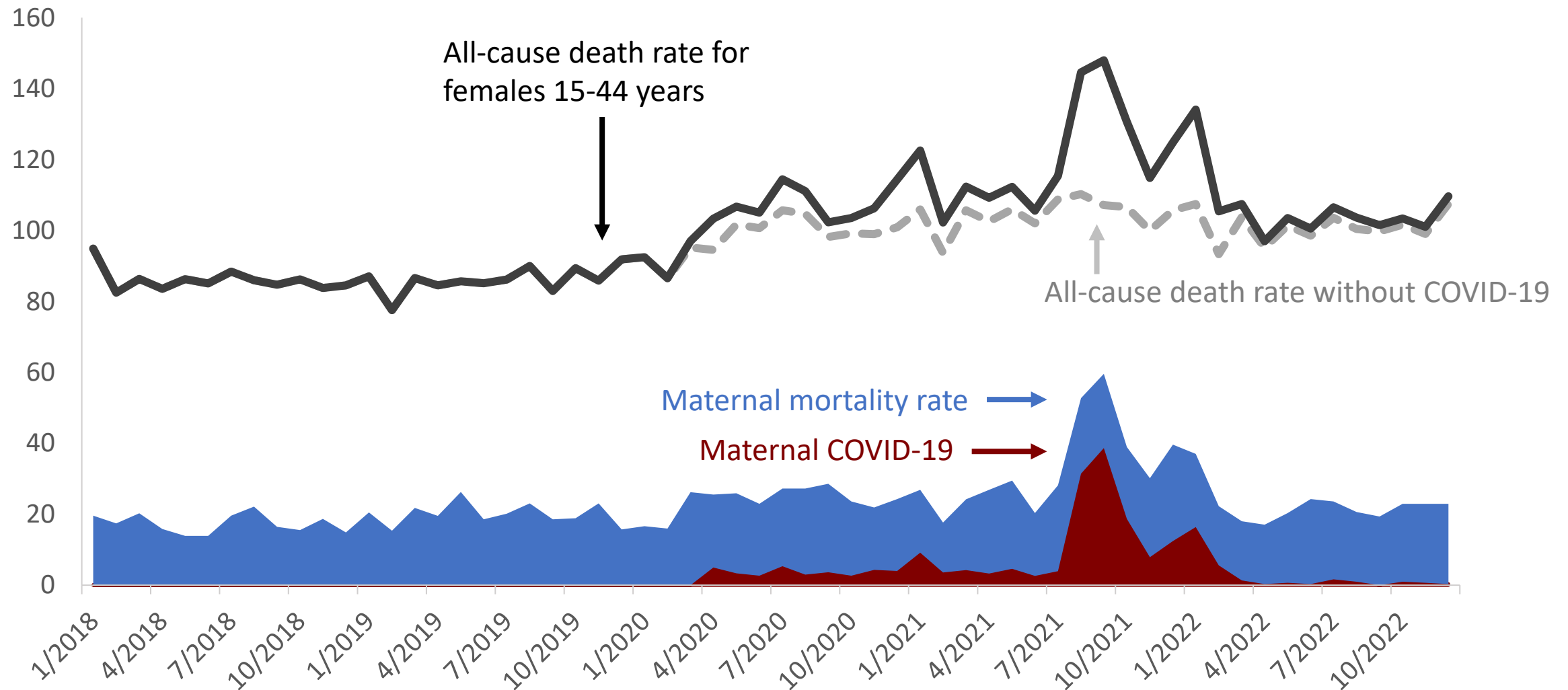
With the 2018 data, changes to the coding process were implemented to reduce errors

- 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)

Observed and predicted maternal mortality rates: United States, 1999–2017, and 2018-2022



Trends in monthly death rates from 2018-2022



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

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**Maternal Mortality in the United States: Changes
in Coding, Publication, and Data Release, 2018**

by Donna L. Hoyert, Ph.D., and Arialdi M. Miniño, M.P.H., Division of Vital Statistics



Vital Statistics Reporting Guidance

Report No. 4 • March 2022



**A Reference Guide for Certification of Deaths
Associated With Pregnancy on Death Certificates**

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.